



**ASIIN Seal**

# **Accreditation Report**

**Bachelor's Degree Programme**

*Mathematics*

*Mathematics Education*

*Science Education*

Provided by

**Universitas Sebelas Maret**

Version: 05.04.2024

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## A About the Accreditation Process

Name of the degree programme (in original language)	(Official) English translation of the name	Labels applied for <sup>1</sup>	Previous accreditation (issuing agency, validity)	Involved Technical Committees (TC) <sup>2</sup>
Matematika	Mathematics	ASIIN	BAN-PT (No. 1932/SK/BAN-PT/Akred/S/VI/2019, 12.06.2019 – 12.06.2024)	12
Pendidikan Matematika	Mathematics Education	ASIIN	LAMDIK 365/SK/LAMDIK/Ak/S/X/2022	12
Pendidikan Ilmu Pengetahuan Alam (IPA)	Science Education	ASIIN	BAN PT 01.04.2021 – 31.03.2026	09, 10, 13
<p><b>Date of the contract:</b> 25.05.2022</p> <p><b>Submission of the final version of the self-assessment report:</b> 31.03.2023</p> <p><b>Date of the onsite visit:</b> 16.–17.10.2023</p> <p><b>at:</b> Main Campus UNS in Surakarta</p>				
<p><b>Expert panel:</b></p> <p>Khaeruddin, Universitas Hasanuddin</p> <p>Andreas Müller, University of Geneva</p> <p>Priyambodo, Universitas Lampung</p> <p>Hans-Georg Weigand, University of Würzburg</p> <p>Alexandra Dreiseidler, Emil-Fischer Gymnasium in Euskirchen</p> <p>Fidah Rahmah Fitria, student at Universitas Jember</p>				

<sup>1</sup> ASIIN Seal for degree programs.

<sup>2</sup> TC: Technical Committee for the following subject areas: TC 09 - Chemistry; TC 10 - Life Sciences; TC 12 - Mathematics; TC 13 - Physics.

A About the **Accreditation Process**

<b>Representative of the ASIIN headquarter:</b> Andrea Kern	
<b>Responsible decision-making committee:</b> Accreditation Commission for Degree Programmes	
<b>Criteria used:</b> European Standards and Guidelines as of May 15, 2015 ASIIN General Criteria, as of December 10, 2015 Subject-Specific Criteria of Technical Committee 12 – Mathematics as of December 9, 2016	

## B Characteristics of the Degree Programs

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF <sup>3</sup>	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
Bachelor of Mathematics	S. Math (Sarjana Matematika)/ Bachelor of Mathematics	N/A	6	Full time	-	8 semester	216 ECTS credits / 144 SKS credits	Annually in August / 1996
Bachelor of Mathematics Education	Sarjana Pendidikan (S.Pd) / Bachelor of Education	N/A	6	Full time	-	8 semester	219 ECTS credits / 146 SKS credits	Annually in August / 1976
Bachelor of Science Education	Sarjana Pendidikan (S.Pd) / Bachelor of Education	N/A	6	Full time	-	8 semester	222 ECTS credits / 148 SKS credits	Annually in August / 2016

The Sebelas Maret University (Universitas Sebelas Maret, UNS) is a state university located in the city of Surakarta (often referred to its former name Solo) in central Java (Indonesia). The university was established in 1976 with the name of Universitas Negeri Surakarta Sebelas Maret (therefore the abbreviation UNS) by merging local universities. In 1982, the name was officially changed to Universitas Sebelas Maret.

UNS has received an institutional accreditation by the Decree of the National Accreditation Agency in 2018, receiving the score A (“Excellent”). In 2020, UNS reached the status of becoming an autonomous state university, which makes it the youngest autonomous university in Indonesia. UNS operates its main campus in Surakarta, which received an award as an environmentally friendly campus. In addition, UNS operates six satellite campuses. In its vision, UNS describes that it wants to become a world-class center of development for science, technology, and art-based on the noble values of national culture. Its mission lists the following three aspects on its webpage:

1. “To provide education and teaching that necessitate educator self-development and encourage student independence in acquiring knowledge, skills, and attitudes.
2. To conduct research that leads to discoveries in sciences, technologies, and arts.
3. To hold community service programs with focus in community empowerment.”

Today, UNS has eleven faculties, one vocational school and one postgraduate school. UNS offers 66 undergraduate programs, 46 master programs, 20 doctoral programs, and addi-

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<sup>3</sup> EQF = The European Qualifications Framework for lifelong learning

## B Characteristics of the Degree Programs

tional vocational, professional and medical specialist education programs. Furthermore, UNS manages seven centers of excellence. UNS observed a strong increase of student applications during the last years, which the representatives of the rector's office consider as a sign that they are developing in the right direction. This positive trend is supported by improving ranks in the Times Higher Education Ranking. The university has defined in its strategic plan that it will enhance the quality of education to meet global standards. Following this aim, UNS seeks to expand its international collaborations. In the discussion, the representatives of the rector's office highlight that they already have international collaborations with institutions across Asia such as Thailand, Philippines, and Malaysia, but search for new opportunities beyond this region. Therefore, the representatives of the rector's office expect that an international accreditation will increase their recognition and generate new prospects for staff and student exchange programs.

In this accreditation procedure, the experts review the bachelor programs Mathematics, Mathematics Education and Science Education. While the bachelor Mathematics is associated with the Faculty of Mathematics and Natural Sciences, the bachelor programs of Mathematics Education and Science Education are based in the Faculty of Teacher Training and Education.

For the bachelor's degree program Mathematics, UNS has presented the following vision, mission and goals on their webpage:

“Vision:

To become a superior center for learning, studying, developing mathematics and its application at the international level based on the pillars of the philosophy of science.

Mission:

1. Organizing student-centred mathematics education and learning and lecturer self-development as well as encouraging student independence in knowledge, skills, and attitudes.
2. Equipping graduates to have mathematical thinking, have high creativity and innovation and have various alternative problem solving, Scientific Communicating Orally and in writing, capable of developing themselves and their potential.
3. Develop research in the field of mathematics and its application whose use can be felt by the wider community.
4. Empower networking with alumni in increasing the role of the institution. Building collaborative initiatives with other institutions, both local, regional, national and international to increase the relevance of graduates and the image of the institution.

## B Characteristics of the Degree Programs

### Goals:

1. Creating a conducive academic climate for increasing productivity, creativity, and enthusiasm for work for the entire academic community.
2. Produce graduates who can internalize academic values, norms, and ethics; independent with high competitiveness; and the ability to continue their studies to a higher level.
3. Produce mathematical research outputs and their applications that are useful for the development of science and technology (IPTEK).
4. Optimizing the participation of alumni in the implementation of education in the Mathematics Study Program, FMIPA UNS as well as self-image, promotion and publication of study programs in the world of work, stakeholders, and the wider community.
5. Creating quantity and quality of cooperation with government institutions, business and industry both nationally and internationally

For the bachelor's degree program Mathematics Education, UNS has presented the following vision and objectives on their webpage:

#### "Vision:

Vision Mathematics Education Study Program is to develop mathematics education based on the principles of cognitive learning theory based on the noble values of national culture.

#### Objectives:

1. Develop knowledge, skills, and develop attitudes as professional mathematics educators.
2. Creative and innovative in applying knowledge and skills to solve mathematics education problems through research and community service.
3. Have a spirit of leadership and independence to strengthen the entrepreneurial mindset.

For the bachelor's degree program Science Education, UNS has presented the following vision, mission and goals on their webpage:

#### "Vision:

## B Characteristics of **the Degree Programs**

Becoming bachelor program who develop internationally reputed science education program based on national value of Indonesia”

### Mission:

1. Conducting education and teaching to establish globally minded science education bachelor without abandoning national values;
2. Perform science and science education research;
3. Perform community service in science and science education in the implementation of its existence.

### Goals:

1. Establishing science education bachelor who has capability of mastering science and science education concept, principal, technology, and pedagogy.
2. Establishing science education bachelor as teacher and practitioner of education who has capability of applying, managing, and developing science and science education.
3. Establishing science education bachelor who is able to solve the real-life problem in the globalization era based on science and science education objective scientific rule.
4. Establishing a science education bachelor who is able to extend crucial networking to strengthen science and science education improvement.”



## C Expert Report for the ASIIN Seal

### 1. The Degree Program: Concept, Content & Implementation

#### Criterion 1.1 Objectives and Learning Outcomes of a Degree Program (Intended Qualifications Profile)

##### Evidence:

- Self-assessment report
- Webpage UNS <https://uns.ac.id/id/>
- Webpage Mathematics <https://mipa.uns.ac.id/matematika/>
- Webpage Mathematics Education <https://math.fkip.uns.ac.id/>
- Webpage Science Education <https://ipa.fkip.uns.ac.id/>
- Diploma Supplement of each study program
- Objective-Module Matrix of each study program
- Discussion during the audit

##### Preliminary assessment and analysis of the experts:

After studying the submitted documentation, the experts learn that each study program at UNS has defined program educational objectives (PEOs), graduate profiles and program learning outcomes (PLOs). UNS has defined skills all students should reach during their bachelor studies plus additional subject-specific skills.

According to the representatives of the rector's office, the bachelor program Mathematics has achieved high ranks in the national accreditation. The research flagships inside the faculty are the areas of combinatorial mathematics (graph theory, coding theory and cryptography); other specializations are possible in pure mathematics, applied mathematics and mathematic soft computing.

According to the self-assessment report, UNS has defined the following objective for the program Mathematics:

PEO 1	<b>Mathematical knowledge.</b> Students should demonstrate an understanding of the foundations of calculus and linear algebra as well as the ability
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	to think logically and critically.
PEO 2	<b>Problem solving skills.</b> Students should formulate, analyze, and solve problems through analytical and computational techniques and apply them to other disciplines when appropriate.
PEO 3	<b>Employment skills.</b> Students should attain the needed written and oral communication skills to translate their degree into a viable career path.

To reach these objectives, students in the program *Mathematics* at UNS need to gain the following competences:

PLO 1	Mastering theoretical concepts and basic principles in mathematics including exploration, logical reasoning, generalization, abstraction, and formal evidence
PLO 2	Mastering the principles and applications of mathematics, computing, and its technology (such as software)
PLO 3	Mastering the principles of data processing, methods/techniques, and experimentation
PLO 4	Mastering knowledge of technology computation and software in solving mathematical problems
PLO 5	Able to identify real problems, formulate, and design them mathematically and analyze the results
PLO 6	Able to observe, recognize, collect and utilize data, as well as calculate, estimate, interpret, and other standard technical skills related to each course with and without the help of software
PLO 7	Able to analyze various alternative solutions existing in real problems with mathematics and conclude them for the right decision making
PLO 8	Able to solve non routine problem solving and conduct a job/task and develop something relatively new, either independently or in a team/group of mathematicians or across expertise
PLO 9	Able to disseminate the results of studies orally and in the form of reports or paper works based on international scientific standard by utilizing Information and Communication Technology

PLO 10	Able to adapt to technological changes, develop themselves independently and sustainably. Communicate and be a good team worker and be responsive to contemporary issues
PLO 11	Able to behave as a mathematician with good learning behavior, work ethic, attitude and personality, including curiosity, perseverance, tenacity, accuracy, creativity, honesty and self-confidence as well as understanding professional ethics
PLO 12	Able to learn endlessly and equip themselves with the most up-to-date knowledge and information

In the self-assessment report, UNS presents how the PLOs correspond to the subject-specific criteria of the Technical Committee 12 – Mathematics. The experts confirm that all major topics are addressed in the study program Mathematics.

According to the representatives of the rector's office, graduates from the bachelor program Mathematics work most often as expert, educator, public servant or entrepreneur. Other continue their studies and are employed as researchers. The expert panel acknowledges this overview, but questions to which degree graduations of a bachelor program can be employed as "experts", especially since the program does not deal with high-level technology. The program coordinators are aware that students can only receive basic knowledge in bachelor studies; yet they highlight that students have the possibilities to specialize in an area based on their electives and the MBKM program (Merdeka Belajar Kampus Merdeka, Independent learning, independent campus, see criterion 1.3). This allows them to become experts in a field of expertise. The program coordinators continue that they conduct tracer studies to verify the current occupation of graduates and present data showing employment as experts. In addition, they state that they are in contact with alumni and stakeholders from the industry. Therefore, they can confirm that graduates from the bachelor program Mathematics work as consultants in the industry, which can be considered as experts. Alumni work as consultants especially in banks and as data analysts. The experts approve the comments by the teaching staff, who want to strengthen the connection to the industry. According to the teaching staff, the study program should focus more on contribution towards innovation, which requires a good collaboration with industrial partners. The experts approve this statement and support this strategy for the future of the study program Mathematics.

The bachelor program Mathematics Education combines skills in mathematics and pedagogy. The teaching staff of the study program describes to the experts that UNS plans to

develop the program towards an international standard program. According to the national accreditation, it was awarded “Unggul” (“Excellent”).

According to the self-assessment report, UNS has defined the following objective for the program Mathematics Education:

PEO 1	Develop knowledge, skills, and develop attitudes as professional mathematics educators.
PEO 2	Creative and innovative in applying knowledge and skills to solve mathematics education problems through research and community service.
PEO 3	Have a spirit of leadership and independence to strengthen the entrepreneurial mindset.

UNS has summarized its expected competences for each student of the program Mathematics Education in the following PLOs according to the self-assessment report:

Specific knowledge and skills	PLO 1	Mastering the scientific concepts of mathematics which include: algebra, analysis, geometry, statistics, and applied mathematics, as a provision for pursuing further studies and carrying out mathematics learning in primary and secondary education.
	PLO 2	Mastering didactic-pedagogical and mathematical scientific principles to plan, implement, and conduct innovative learning assessments in primary and secondary education.
	PLO 3	Able to design and implement innovative mathematics learning in primary and secondary education based on didactic-pedagogic and mathematical scientific principles.
	PLO 4	Able to study and apply scientific concepts of mathematics in the development of knowledge and problem-solving life skills orientation.
	PLO 5	Able to apply the use of information and communication technology to solve problems related to science and learning mathematics.
	PLO 6	Able to design and carry out research studies related to problems in the field of mathematics education and publish them.

<b>General attitudes and skills</b>	PLO 7	Presenting oneself as a person who fears God Almighty, has a spirit of nationalism, has noble character, and sets an example for the surrounding community.
	PLO 8	Able to apply leadership principles by displaying an independent, responsible person and a high work ethic to strengthen the entrepreneurial spirit.
	PLO 9	Able to communicate verbally and non-verbally effectively in the context of various languages and cultures through logical, analytical, systematic, critical and creative thinking processes.

The experts review these skills and competences with the ASIIN subject-specific criteria of the Technical Committee 12 – Mathematics. They conclude that the objectives and PLOs match with the desired outcomes of the ASIIN criteria.

According to the self-assessment report, these PLOs prepare the graduates of the bachelor program Mathematics Education to find employment as educators, researchers and edupreneurs (entrepreneurs in education). The presented data of tracer studies shows that 70% of all graduates work as educators (teachers, lecturers, tutors).

The representatives of the rector’s office describe to the experts that the bachelor program Science Education is the youngest program in the Faculty of Teacher Training and Education. The program focuses on educating teachers for elementary school to junior high school.

According to the self-assessment report, UNS has defined the following objective for the program Science Education:

PEO 1	have competence to implement knowledge and skill in integrated science for solving global problems,
PEO 2	have integrity, work ethics, leadership, independent, collaborative, life-long learning,
PEO 3	be professional that have the ability to communicate effectively, adaptive, and innovative.

Students of the study program Science Education reach the following PLOs in the study program Science education as described in the self-assessment report.

<b>Specialist competences</b>	PLO 1	Demonstrate comprehensive knowledge of core concepts in physics, biology, chemistry, and earth science
	PLO 2	Demonstrate integrated knowledge of natural sciences
	PLO 3	Demonstrate pedagogical knowledge of designing, implementing, evaluating learning
	PLO 4	Demonstrate knowledge about the functions and benefits of technology, especially information and communication technology for developing the quality of science education
	PLO 5	Demonstrate knowledge related to science education research
<b>Specific skills</b>	PLO 6	Design, implement, and evaluate science learning using ICT
	PLO 7	Analyze and solve problems in science education through research with correct methodology and disseminate the results.
	PLO 8	Plan and manage resources in organizing classes, schools and educational institutions which are their responsibility, and comprehensively evaluate their activities
<b>Social Competencies: General skills and attitudes</b>	PLO 9	Are able to identify problems and apply logical and critical thinking in the context of science and technology
	PLO 10	Are able to communicate both oral and written effectively in scientific community
	PLO 11	Are able to be responsible for the achievement of independent and group work results
	PLO 12	Are able to organize data and information in science education-based entrepreneurship
	PLO 13	Demonstrate human, cultural values and attitudes in professional-related task

	PLO 14	promote the quality improvement of life in society, nation, and state, and internalizing academic values, ethics, and entrepreneurship
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According to the self-assessment report, graduates from this study program mainly work as educators, educational practitioners and entrepreneurs. Based on the most recent tracer studies, UNS presents statistics showing 49% of all graduates work as educators, 35% continue their studies, while 4% work as entrepreneurs and 8% as practitioners.

Students in the program Science Education highlight that they enjoy the combination of three subjects of natural sciences in their curriculum. The students are convinced that their study programs allows them to become teachers at an international level. This is supported by the teaching staff, who wants to continue to work towards establishing an internationally recognized study program in science education. However, the experts notice several shortcomings in the documentation of the program Science Education. In their opinion, the structure and the curriculum requires improvements, both with respect to content and study volume. The experts miss a substantial foundation in the disciplinary knowledge of the sciences involved (biology, chemistry and physics). Although the program coordinators refer to transversal courses, the experts are concerned regarding fundamental topics in the various fields cannot be addressed in the current study program. As guidelines, the experts mention several topics listed in the ASIIN subject-specific criteria of the Technical Committees 09 – Chemistry, Pharmacy, 10 – Life Sciences and 13 – Physics, identifies discrepancies with the curriculum. A deeper discussion can be found in criterion 1.3., concluding that the experts approve the scientific content of the program. However, improvements in the presentation of the single scientific topics are further suggested as well as a stronger collaboration with the Faculty of Mathematics and Natural Sciences.

In the discussion, various stakeholder confirmed to the experts that they have the opportunities to give feedback on the study programs. This includes the alumni, who state that they have two ways to give feedback on the study programs. One considers filling out a questionnaire whereas the second option is taking part in a twice a year event on campus to discuss the study programs. The alumni state that they have also criticized the programs in the past, which lead to improvements. The industry partners confirm this statement. They add that they were also invited to a workshop to discuss the curriculum in regards to skills necessary for the next generation of graduates. Communications between external stakeholders and UNS takes additionally placed on informal level, including webpages, casual meetings or whatsapp. The experts learn in the discussion with the

industry partners that they approve the study programs under review. The stakeholders include various schools, who employed graduates and receive students during internships. They report to the experts that the graduates and students have reached excellent qualifications in their field. They highlight especially that the students have competences beyond teaching, including skills in management, IT, and curriculum development. The different industry partners emphasize that the students and graduates of UNS are very good team workers, who can quickly adapt to real-world settings. They further highlight competences such as logical thinking and a strong level of independent working skills.

The experts summarize, that UNS has defined objectives and learning outcomes (the intended competence profile) for the bachelor programs Mathematics, Mathematics Education and Science Education. These are transparently anchored and published and thus are available to students, lecturers and interested third parties. The experts confirm that the targeted academic qualification level of EQF 6 is reached in all three study programs.

With the intended competence profile, a professional activity corresponding to the level of qualification (according to the European Qualifications Framework) can be taken up (professional classification). The experts consider that the addressed topics are relevant to the job market and society. UNS has sufficiently documented how they conduct regular reviews of the study programs and their graduation profiles. The experts confirm that this process involves the relevant stakeholders (in particular from higher education and professional practice) and, if necessary, the objectives are revised accordingly. Although the targeted level of EQF 6 is reached on all study programs, the experts suggest improvements for the bachelor program Science Education, which is described in more detail in criterion 1.3. Among other things, the experts highlight especially the need to strengthen the basic foundations in biology, chemistry and physics. According to the experts, a closer collaboration among the scientific study programs at the Faculty of Mathematics and Natural Sciences and the bachelor program Science Education might be beneficial to continue to develop the study program.

### **Criterion 1.2 Name of the Degree Programme**

#### **Evidence:**

- Self-assessment report
- Examples Diploma, Diploma Supplement, Transcript of Records
- Webpage Mathematics <https://mipa.uns.ac.id/matematika/>
- Webpage Mathematics Education <https://math.fkip.uns.ac.id/>



- Webpage Science Education <https://ipa.fkip.uns.ac.id/>
- Webpage Faculty of Teacher Training and Education <https://fkip.uns.ac.id/en/undergraduate/>
- Discussion during the audit

**Preliminary assessment and analysis of the experts:**

After studying the submitted self-assessment report, the experts know that the names of the three study programs under review are in line with the government of Indonesia. While in the study program *Mathematics*, the graduates receive a degree “Bachelor of Mathematics”, students are awarded a “Bachelor of Education” after finishing their studies in the programs *Mathematics Education* and *Science Education*.

The experts confirm that the selected titles of the degree programs reflect the intended objectives and learning outcomes. The names of the study programs are in line with the teaching and learning content and the teaching language of the programs. The names of the study programs are consistently used in the presented documents and on the webpage. Nevertheless, the experts want to highlight that on the webpage of the Faculty of Teacher Training and Education, the bachelor program in Science Education is occasionally translated as bachelor in “Natural Science Education.” The experts remark that it is crucial to use only one form of translation in all the documents as well as online.

**Criterion 1.3 Curriculum**

**Evidence:**

- Self-assessment report
- Curriculum documents of each study program
- Module handbook of each study program
- Objective-module matrix
- Data on student mobility
- Discussion during the audit

**Preliminary assessment and analysis of the experts:**

Content

According to the self-assessment report, the curricula of all study programs at UNS follow the governmental guidelines and the Indonesian Qualification Framework and UNS’s own curriculum guidelines. The curricula are out-come based and they consider recent devel-

opments in the industry, science, technology and the society. All three study programs encourage the formation of hard and soft skills. All curricula contain basic courses including among other English, Indonesian, Civic Education, Pancasila and Religion Education. Already in the first semester, the students receive subject-specific courses to start to build their subject-specific expertise.

In the bachelor program *Mathematics*, the curriculum is created considering the recommendation of professional organizations such as the Indonesian Mathematical Society (IndoMS). Further discussions with alumni, stakeholders and users have an impact on the selection of courses. The curriculum combines these three main aspects as listed in the self-assessment report:

1. “The scope of mathematics study program graduates in the work industry encompasses quite a lot of potential fields, namely: the field of research and development, the field of experts, as educators in the world of education, as teamwork leaders.
2. A complex occupation in the field of mathematics always involves teamwork between fields, therefore, it needs supporting competencies, for example, leadership skills, communication, presentation, and decent social attitudes.
3. Mathematics becomes the mother of various sciences, which gave birth to various sciences and their derivatives, and gave birth to various technological creations that made human life easier. The success of applying science is influential toward the development of technology today.”

The program *Mathematics* focuses on developing students' critical thinking, problem-solving, mathematical reasoning, quantitative, programming, collaboration, time management, organization, and professionalism skills. Students receive a basic education in science (biology, physics, chemistry), next to an in-depth education in the various fields of mathematics. The students are welcome to join one of four existing research groups in order to develop their field of expertise. These include (1) combinatorial mathematics, (2) pure mathematics and application, (3) mathematical soft computing, and (4) applied mathematical analysis.

The curriculum of the bachelor program *Mathematics Education* considers professional, pedagogic, and research competences next to personality development, and skills in entrepreneurship, communication and collaboration. According to UNS, the curriculum considers a balance of the depth and breadth of the subjects between the topics of mathematics and pedagogy. The curriculum includes courses on pure mathematics, applied mathematics, statistics as well as mathematics at school. These are accompanied by fundamental pedagogy as well as teaching and learning, including academic ethics. The re-

search methodologies also introduce the students to data analysis. Furthermore, a set of courses focuses on soft skills and entrepreneurship. The curriculum provides insights into pedagogy and mathematics right from the beginning.

The bachelor program Science Education is the youngest study program at the Faculty of Teacher Training and Education. The curriculum was developed in various meetings between physics, chemistry and biology to develop study materials of the integrated courses as well as related faculty members and experts. The courses as well as the number of credits were adapted in reviews every two years. UNS collected input of Head of Science Education programs across Indonesia, the Association of Indonesian Science Education as well as Biology Education, Physics Education and Chemistry Education to improve the curriculum. The curriculum of the study program aims to combine the elements of the fields of natural sciences to be able to understand and teach the processes. The curriculum therefore combines three science study materials (1) foundational science knowledge; (2) chemistry, physics, biology in a strong integration; (3) interdisciplinary applied knowledge and educational knowledge. All topics combine theoretical and practical courses.

The experts raise their concern on the low content of foundational science courses in the bachelor program Science Education. In comparison, on an international level, the science content would be around 100-110 European Credit Transfer and Accumulation System (ECTS) credits. The program coordinators explain that their curriculum is in line with the Association of Indonesian Science Education and was developed in collaboration between representatives of the single discipline. Based on this association, they developed courses integrating natural sciences in one course with the aim to present the students (and later the students at school) how natural sciences are connected. Thus, this is also the demand for teachers at schools. However, the experts notice that the current documentation of the curriculum contains does not allow to identify the topics addressed in the integrated courses according to the module handbook.

While the students state that they do not consider there is a lack of knowledge in their studies; they specify that they are able to progress with their learning and that they have sufficient competences from previous semesters to proceed, the experts specifically ask the students if and where they learn e.g. waves, optics or modern biology and modern physics. The students are not sure but emphasize that the guiding idea is to learn integrated science. The teaching staff support the students' statement on the integrated method of teaching natural science. They add that three different lecturers (one from biology, one from physics and one from chemistry) teach the integrated courses. At first, each of them will present their content by themselves before they illustrate the connections to the students. Therefore, some of the courses, which may sound more advanced, might also contain basic knowledge. The teaching staff of the program Science Education

continues that there are no separated courses on modern physics, but the content should be available in the integrated courses. If the students are interested to get more information on one topic, they are encouraged to take additional activities through the MBKM program. The experts acknowledge their explanation; nevertheless, they are unaware if all basic topics are sufficiently covered; the recurrent statement of the integrated approach cannot ensure that the necessary content is sufficiently treated. A reasoned approach has to be developed to determine the breadth and depth of treatment suitable for teacher education. The experts consider that the coverage of the scientific content has to be explicitly described in the study program (PLOs), and this information has to be included in the module handbook. In addition, the experts continue to question if all fundamentals are sufficiently covered in the curriculum. They would welcome a stronger focus on scientific work, which could be achieved by a stronger collaboration of the bachelor study programs Biology, Chemistry and Physics of the Faculty of Mathematics and Natural Science.

The experts consider that the curricula of the three study programs under review allow the students to achieve the intended learning outcomes. The experts approve that learning outcomes are defined for each module, which, in total, enable the achievement of the overarching programme objectives. The experts raise several issues with the curriculum in the bachelor program *Science Education*. In the opinion of the experts, especially two issues appear critical. One focuses on the volume of courses in foundational sciences while the other includes the level of experiments in the laboratory courses. The experts acknowledge that part of their criticism could be based on problems with the submitted documentations during the on-site visit. This includes problems with the module handbooks of all three programs as well as specific problems in terminology and module descriptions in *Science Education*. The experts, therefore, insist that the module handbooks need to be improved (see further criterion 4.1). Furthermore, the experts require that for the program *Science Education*, the program coordinators should submit a document illustrating, which fields of science are integrated in which courses. This should provide a basis to overcome the problem of including multiple topics in the integrated courses. As a guideline, the experts suggest to focus on the important scientific topics listed in the ASIIN subject-specific criteria of the Technical Committees 09 – Chemistry, Pharmacy, 10 – Life Sciences and 13 – Physics. Furthermore, the experts consider it necessary to create more synergies with the scientific programs Biology, Chemistry and Physics. This should allow the students to increase their knowledge beyond the level of the school classroom and gain insight into scientific work and research. According to the opinion of the experts, this will have a positive impact of the scientific understanding of the students and influence the way they comprehend science.

### Structure of the programme

The bachelor programs Mathematics, Mathematics Education and Science Education and UNS are build up of modules (or courses) according to the submitted documents. While the program Mathematics has a total amount of 144 Indonesian credits (equal to 216 ECTS credits), the program Mathematics Education has 146 Indonesian credits (equal to 219 ECTS credits) and the program Science Education has a volume of 148 Indonesian credits (equal to 222 ECTS credits). The curriculum of each program considers compulsory and elective courses with varying numbers according to the program. In addition, students can join the MBKM program, which allows them to collect credits in activities outside the campus.

The experts identify that the number of courses in Mathematics and Mathematics Education is above 70, but it remains unclear how many are compulsory or elective. Students from Mathematics Education add that they have to choose five elective courses, which they consider sufficient. However, they indicate that a minimum number of 10 students are necessary to open one elective course. The students in the program Mathematics add that they are free to choose their electives based on their interest. They remark that they are satisfied with the number of mandatory and elective courses. Students from Science Education report a similar situation; they add that they choose their elective courses after consultation with their academic advisor. They continue that their electives are not specially from physics, chemistry or biology, but contain a wider range of options and interdisciplinary subjects. They are allowed to select electives starting from the fifth semester. The experts approve the statements of the students about the amount and selection of elective courses. However, they note that the number to open an elective course is quite high, considering that the number of students in one semester has a maximum number of 80 people. The experts form the opinion that a lower threshold to open an elective course might benefit the students to develop their profile according to their interest. The teaching staff adds that students receive support for selecting their individual focus. Each student has an academic advisor, with whom they meet on a regular basis during the semester. The academic advisor meets with them to discuss their interests and suggests elective courses for them. Later in their studies, the academic advisor can also establish a contact to potential supervisors in order to discuss thesis topics. First year students also receive a general introduction to the campus and the curriculum of their study program. More information is linked on the webpages of the study programs, which includes information on (international) internships and the MBKM program. Therefore, the experts confirm that sufficient information is available online in Bahasa Indonesia and English.

The experts discuss the laboratory practice in all three study programs under review. The program coordinators describe that in the program Science Education, the courses con-

tain lectures, practicum and field experience. In some courses, different methods are combined. As example, they name basic chemistry, where one Indonesian credit relates to practicum (in the laboratory) whereas one Indonesian credit accounts for lectures. The program coordinators highlight that laboratory classes are supported by student assistants. Usually, students work in groups of three. The program coordinators of the program Mathematics add that the curriculum includes only computer laboratory classes as practicums. In the Department of Mathematics, they have four laboratories for basic computer science, soft computing, data mining and research. They ensure that all students have access to one computer. Additionally, one person coordinates all computer laboratories. In the program Mathematics Education, the study plan contains three different kind of laboratories. It includes practicum in computer laboratories, multimedia laboratories and a development laboratory. While students in the computer laboratory receive basis training in programming, students learn in the multimedia laboratory how to apply learning media. The development laboratory combines computer skills, competences in multi-media and experience in microteaching in one practicum. All laboratories are overseen by the leader of the program. The students confirm to the experts that they are satisfied with the laboratories in their study programs. While students from Mathematics and Mathematics Education state that their available equipment is sufficient, students from Science Education add that experiments are done in the laboratories of the program Science Education and the relevant disciplines. In case equipment is missing in their laboratory, they have the opportunity to borrow it from the relevant disciplines, who operate their own laboratories. Overall, the experts notice that they consider the amount of practical training in their study programs as well balanced. All students further highlight that lecturers support them during the practical part of their lectures. The students confirm that assignments can be on an individual or group-basis. In the program Science Education, students explain to the experts that they frequently receive homework, which the students have to submit then inside their online learning system prior to the lecture; during the next class, they are going to discuss the correct solutions of the homework. In the program Mathematics Education, the students receive homework in some of the courses. While some lecturers give homework with mathematical exercises, others state a more general problem they need to work on. In both cases, the solution is discussed in the next meeting. The students from Mathematics add that they mainly work on case studies. Although the industry partners appreciate the use of case-based exercises, they describe to the experts that they would prefer if the students had more real-life experience. The experts approve of their suggestions and advise UNS to integrate examples and problems from the real world. This should allow the students to practice their skills on real world problems and therefore prepare them for their careers. The submitted assignment is corrected by the lecturer or assistant lectures and handed back to them.

The experts acknowledge the effort to include exercises in the classroom and laboratories. In spite of amount of laboratory courses in Science Education, the experts identify an inadequate scientific level of the experiments. They describe that the presented scientific experiments did not exceed the level required for the classroom at schools. In the opinion of the experts, however, it is essential that the students at UNS gain experience beyond the basics required at school. This advanced knowledge should increase their understanding and build a solid foundation to teach Science Education at school. The experts therefore demand that the scientific level of the experiments in the laboratories in Science Education needs to be increased to provide the students missing practical competences in the different fields of science.

The experts also discuss the MBKM program during the on-site visit. The program coordinators state that with the program Mathematics, 25 students went to participate in an internship in the industry while others took courses at other universities or the government (online or offline). In both, Mathematics Education and Science Education, students mainly spend time at schools or other universities. If students plan to take part in the MBKM program, they are required to discuss how to integrate the off-campus learning in their personal study plan. The students and lecturers compare the learning outcomes of the off-campus activities and verify which courses can be substituted. Usually, students convert electives to off-campus learning. Compulsory courses can only be taken at another university when the learning outcomes are comparable. In the programs Mathematics Education and Science Education, a school internship is mandatory. This requires at least a time equivalent to four Indonesian credit points. An extension can be arranged by using credit points from their electives. At the end of all off-campus activities, UNS organizes a comprehensive examination to verify that the competences and skills of the learning outcomes are reached. The students confirm to the experts that they are aware of the MBKM program. They state that they are allowed to take up to 20 Indonesian credits within the MBKM framework. According to the students, the recognition of credits from off-campus learning takes place without any problems. Various attendees of the discussion with the industry partners describe to the experts that they receive students within the MBKM program. These include vocational high schools, state junior high schools, as well as companies such as publishers or marketing companies. These stakeholders are aware of the MBKM regulations and explain to the experts that the internship of students have to be arranged before the students arrive at their company/school. At most places, a responsible person for the collaboration organizes the internships, who knows the regulations and how many students can be accommodated in one semester.

In the program Science Education, the students are required to take a three months internship in school. This internships is a full-day internship, where the students work to-

gether with teachers and practice how to observe students, how to teach students, and how to grade students. During this internship, the students are under close supervision by the university. A possible second internship can be taken in the industry. Previously, students took internships with national publishers, for example. These internships are not compulsory, but take part within the MBKM framework. The students explain to the experts that the additional MBKM program can give them four additional month of internship outside the campus. They confirm that they have two supervisors during this internship, which is concluded by an examination. In most cases, they had to present the content and conclusion of their MBKM activities in front of a small examination panel. The industry partners confirm to the experts, that students often stay up to six months in their teaching internships at their schools. Evaluations of the students' performance is done on a weekly basis.

The students in the program Mathematics Education further confirm to the experts that they are required to take part in a teaching internship for three months as well. They feel well prepared for this internship as they received clear guidelines. As the students in Science Education, they have two supervisors (one at school and one from UNS). They add that the supervisor from their department at UNS visited them twice during their internship to check on their progress and well-being.

In summary, the experts confirm that each module represents a well-matched unit of teaching and learning in the study programs under review. The arrangement of these modules enables the students to gain knowledge, skills and competences, which build upon each other. Each program is organized in a way to allow the students to select their individual subjects of interest. The experts appreciate that students have opportunities to take part in internships; these are well integrated into the curriculum. The experts learn that UNS takes responsibility for the content and structure of these internships and supports the students in the organization and coordination. Nevertheless, the experts identify issues for improvement. These include the high number of students necessary to open elective courses. The experts consider it would give the students more opportunities to specify in their field of interest if the number of students to start an elective course would be reduced to five students (instead of 10 students currently). In addition, the experts consider comments made by various attendees during the on-site visit, which call for an improvement of the English competences of students. Although the basic English skills are sufficient to describe problems e.g. at schools, the experts think of spoken English in general. They recommend to increase the use of English in the classroom and for discussions to allow the students to gain more experience and practice in English.

#### Student mobility



UNS submitted documents listing students' activities in MBKM activities and student exchange programs. The data confirms that students from the program Mathematics are taking part in industrial and educational internships as well as community service in the rural development project. Outbound MBKM activities further include participation in courses at other universities at companies, universities and governmental programs. The experts observe that students mainly search for further possibilities in the field of programming, artificial intelligence, and machine learning. Other students take part in exchange programs taking courses in financial mathematics or elementary linear algebra at domestic universities. The experts acknowledge that students in the program Mathematics Education take part in international exchange within the SEA Teacher and TRU TEACHER programs. Main destinations are Thailand and the Philippines in the most recent years. Additional students take part in the MBKM programs. Similarly, students in the program Science Education went to Thailand for teaching internships as well as various internships in education, industry, and community service.

In the discussion with the program coordinators, the experts learn that UNS wants to increase the number of international students as well as the student mobility on campus. The program coordinators highlight that UNS offers international educational internships in collaboration with SEAMEO for students enrolled in Mathematics Education and Science Education. (SEA Teacher program; <https://seateacher.seameo.org/> ) This program contains internship exchange schemes as well as teaching practicum exchange. This semester five students went to the Philippines whereas five students from the Philippines joined them at UNS. The students continue that they know a high number of students, who took part in this teaching internship program. This exchange program considers scholarships of the host university for students. Additional student mobility is based on cooperation between UNS and other universities. The Mathematics Alumni association provides scholarships for international exchange programs for students in Mathematics. Currently, three students are studying at the Taiwan University. The students add that scholarships are further available at the international office's "Global Challenge". Additional scholarships are available at the governmental level. The students confirm to the experts that they have received sufficient information on student mobility programs from their lecturers, colleagues, and the international office at UNS.

The experts approve UNS's effort to support and increase student mobility. The experts confirm that UNS supports the students in their outbound activities, especially within the MBKM framework and the SEA Teacher program. However, the experts further recommend to expand their collaborations. The experts appreciate the strong focus on Southeast Asia, but recommend expanding the student exchange opportunities to partners in the Americas, Australia and New Zealand as well as Europe. The experts further suggest

to consider developing bilateral exchange programs that allows students to regularly stay at partner universities.

#### Periodic Review of the Curriculum

UNS gives details in the documents and during the on-site visit on the review of the curricula of their study programs. The experts approve that a review takes place every two years. The review is a joint effort involving human resources, management and institutional support as well as lecturers. It considers infrastructure as well as new developments in the field of expertise. The revision includes data collected by the end-semester students' questionnaires as well as advice by external stakeholders. The experts see evidence that all changes are well documented. The program coordinators state that they have the capacity to run different curricula in parallel to accommodate different curricula versions of one study program. This allows them also to integrate changes in regulations, e.g. if the school curriculum of the government is changed for the study programs Mathematics Education and Science Education.

Thus, the experts confirm that the curricula of the study program Mathematics, Mathematics Education and Science Education are periodically reviewed. These changes are well documented, communicated and available online. These reviews involve internal and external stakeholders.

#### **Criterion 1.4 Admission Requirements**

##### **Evidence:**

- Self-assessment report
- UNS webpage <https://uns.ac.id/en/>
- Discussions during the audit

##### **Preliminary assessment and analysis of the experts:**

Student admission is centrally organized at UNS under the responsibility of the rector. According to the Self-Assessment Report, the admission procedures and policies for new students in the study programs follow the governmental regulations of Indonesia. There are three different ways by which students can be admitted to a bachelor study program at UNJ:

1. National Selection based on Achievement (SNBP)
2. Joint Entrance Test for State Universities (SNBT)
3. UNS Admission Test (SM-UNS)

Within the UNS admission test, several selection methods are in place including independent selection due to a written test, institutional partners, high achievers, disabilities, and international class. In the discussion, the representatives of the rector's office state that 40% of all students enter UNS based on the National Selection exam, while 40% enroll based on the results of the joint entrance test. The remaining 20% take the UNS admission test.

According to the self-assessment report, UNS provides a special platform for international students to test if they are allowed to enter the university. UNS offers various types of scholarships to international students, which cover tuition fees, dormitories, Indonesian language courses, and living cost.

The experts are interested in more details regarding the transparency of the independent admission test. The representatives of the rector's office comment that UNS's rules of admission and their admission tests are transparent. All students can access their test results online, regardless of their results. The independent test is conducted by UNS, which is organized by a special unit. They are in contact with other universities to compare their test strategies and mechanisms. To ensure fair and transparent conduction, the government of Indonesia checked on the conditions inside the universities; two years ago UNS has successfully passed the inspection. The experts also discuss with the students, which type of admission they participated. The experts learn that the majority of students entered UNS through the independent test. Overall, they highlight that the admission process is transparent as the criteria are well displayed. According to the students, everyone receives an announcement whether they pass or fail the test.

UNS provide the following acceptance rates for the bachelor programs Mathematics, Mathematics Education and Science Education.

Table 1. Acceptance student rate in the bachelor program Mathematics (source: self-assessment report)

Admission System	2019			2020			2021			2022		
	Applicants	Accepted	Acceptance Ratio	Applicants	Accepted	Acceptance Ratio	Applicants	Accepted	Acceptance Ratio	Applicants	Accepted	Acceptance Ratio
SNMPTN	372	29	1:13	354	19	1:19	347	16	1:22	260	18	1:15
SBMPTN	429	47	1:19	544	33	1:16	414	29	1:14	402	32	1:13
UNS Campus Admission Test	308	25	1:12	769	23	1:33	950	63	1:15	702	64	1:11
Total	1109	101	1:11	1667	75	1:22	1711	108	1:16	1364	114	1:12

Table 3. Acceptance student rate in the bachelor program Mathematics Education (source: self-assessment report)

Admission System	2019			2020			2021			2022		
	Applicants	Accepted	Acceptance Ratio	Applicants	Accepted	Acceptance Ratio	Applicants	Accepted	Acceptance Ratio	Applicants	Accepted	Acceptance Ratio
SNMPTN	617	24	1:26	485	21	1:23	377	16	1:24	321	18	1:18
SBMPTN	407	38	1:11	609	42	1:15	499	28	1:18	562	32	1:18
UNS Campus Admission Test	319	15	1:21	737	32	1:23	624	55	1:11	496	63	1:8
Total	1343	77	1:17	1831	95	1:19	1500	99	1:15	1379	113	1:13

Table 4. Acceptance student rate in the bachelor program Science Education (source: self-assessment report)

Admission System	2019			2020			2021			2022		
	Applicants	Accepted	Acceptance Ratio	Applicants	Accepted	Acceptance Ratio	Applicants	Accepted	Acceptance Ratio	Applicants	Accepted	Acceptance Ratio
SNMPTN	166	23	1:7	223	20	1:11	198	16	1:12	237	20	1:12
SBMPTN	758	37	1:20	293	37	1:8	316	28	1:11	348	35	1:10
UNS Campus Admission Test	224	23	1:10	173	24	1:7	438	59	1:7	323	73	1:5
Total	1148	83	1:14	689	81	1:9	952	103	1:9	908	128	1:8

The experts question the representatives of the rector's office on their strategy to counteract the national trend of decreasing number of applications in the study program Mathematics. They describe that UNS has already taken action by improving the quality of the program to ensure graduates are competitive on the job market. In addition, the promotion in high schools was increased including organized competitions at schools to increase their visibility (e.g., Mathematics Olympiad). As a result, the application for the bachelor Mathematics at UNS remained stable. The representatives of the rector's office remark that UNS is aware of this development in various fields of STEM; thus, they are engaging in discussions on a national level to develop solutions to overcome this issue. In addition, they are in contact with the governor to increase the funding for scholarships, which is often a limiting factor for students.

From the representatives of the rector's office, the experts also learn that none of the admission criteria for the programs Mathematics Education or Science Education considers pedagogical skills or teaching motivation.

The experts ask for more details on the priority admission for students based on religious achievements. The representatives of the rector's office clarify that this refers to all Indonesian state religions and background. Applicants need to prove their achievements in this field and take an additional test. Afterwards, the students have the opportunity to enroll in study programs suggested by the university. These are usually in relation to faith, art and/or history; therefore, this sort of admission might rarely be applicable for the study programs under review.

Moreover, the experts inquire if UNS has specific regulations regarding students with disabilities. The representatives of the rector's office describe that UNS collaboration on a national level to establish criteria to promote the access of students with disabilities to higher education. UNS currently provides a quote to facilitate the admission of students with disabilities. Additionally, they cooperate with the national Paralympics committee to invite athletes to become students at the Faculty of Sports. UNS operates a center for their students with disabilities, which allows them to support students. UNS also offers specific scholarships for students with disabilities. The representatives of the rector's office point out that this includes not only health disabilities but also environmental disabilities and social disabilities. In this context, UNS is also working on international scientific collaborations with universities in Malaysia with a focus on improving the teaching and learning in special education programs. In the Faculty of Teacher Training and Education, there are currently seven students with disabilities.

In conclusion, the experts confirm that the admission requirements and procedures at UNS are binding and transparent. They ensure that students are in principle able to successfully graduate from the programs. The experts acknowledge that UNS has defined rules for the recognition of qualifications achieved externally (e.g. at other higher education institutions or outside the higher education sector) are clearly defined.

### **Criterion 1.5 Workload and Credits**

#### **Evidence:**

- Self-assessment report
- Module handbook of each study program
- Curriculum documents of each study program

- Rector's Regulation No. 31 of 2020 regulating study load
- Guideline for the development of higher education curriculum based on the Indonesian Qualification Framework in the Era 4.0 Industrial revolution – Society: 5.0: Independent learning campus
- Discussion during the audit

**Preliminary assessment and analysis of the experts:**

After studying the submitted documents and the information discussion during the on-site visit, the experts learn that the workload at UNS contains detailed information on how much time students spend in face-to-face learning, in structured assignments and self-study. The experts approve that each bachelor program at UNS needs to have at least 144 Indonesian credit points, considering at least 84 credits for specific courses of the study program.

In the discussion, the program coordinators describe that the workload of each module is based on the learning outcomes. The lecturers decide the most suitable teaching and learning methods and consider if practical lessons, assignment or projects are suitable to reach the final competences. At the end of the semester, the students are asked for their actual workload in the end-semester evaluation. According to the self-assessment report, the credit score for each course is determined based on the student's need to achieve a competence or learning outcome in a particular subject in accordance with the chosen learning method, the time it takes for the students to master the course materials, and the depth of the material specified in the course.

The self-assessment report gives the following details on the definition of one Indonesian credit point: "One credit of learning activities for lectures is equivalent to a learning process of 50 minutes/week/semester. One credit of structured assignment activity is 60 minutes/week/semester, and one for self-study activities is 60 minutes/week/semester. One credit of learning in the form of practicum is equivalent to 170 minutes or 3 hours/week/semester. One credit of courses in the form of seminars or other similar forms has a learning process load of 100 minutes/ week/semester, and one for independent activities is 70 minutes/week/semester."

To convert the Indonesian credit points to the European Credit Transfer and Accumulation System (ECTS), UNS has submitted the following chart:

Table 4: Overview of time spent on different learning processes (source: Guideline for the development of higher education curriculum based on the Indonesian Qualification Framework in the Era 4.0 Industrial revolution – Society: 5.0: In-dependent learning campus).

Learning process	Learning activity		Structured Assignment Activity		Independent Activity	
	In credit	In ECTS	In credit	In ECTS	In credit	In ECTS
Lecture, practice test, tutorial	50 minutes /week /semester	75 minutes /week /semester	60 minutes /week /semester	90 minutes/week /semester	60 minutes /week /semester	90 minutes /week /semester
Seminars or other similar forms	100 minutes /week /semester	150 minutes /week /semester	-	-	70 Minutes /week /sem	105 minutes /week /sem
Practicum, studio practice, workshop practice, field practice, work practice, research, design or development, military training, student exchange, internship, entrepreneurship, and or community service	170 minutes /week /semester	255 minutes /week /semester	-	-	-	-

To summarize, UNS added the following table to convert ECTS credits to Indonesian credits.

Table 5: Conversion of ECTS credits to Indonesian credits shown per credit, semester and year. (source: Guideline for the development of higher education curriculum based on the Indonesian Qualification Framework in the Era 4.0 Industrial revolution – Society: 5.0: In-dependent learning campus).

No	Time	ECTS to credit units	Credit units to ECTS
1	per year	$60 : 40 = 3 : 2$	$40 : 60 = 2 : 3$
2	per semester	$30 : 20 = 3 : 2$	$20 : 30 = 2 : 3$
3	per credit	$1 : 0.67 = 3 : 2$	$1 : 1.5 = 2 : 3$

Nevertheless, the experts consider the numbers presented in the self-assessment report. They notice, that if one credits accounts to a workload of 170 minutes, a workload of 23 Indonesian credit points will result in 65 hours per week. The program coordinators acknowledge that the workload in their study programs is high. They emphasize that the number of credits in each semester differs. The first semesters at UNS usually starts with lectures comprising in total 21 credits. In the following year, the number of credits is determined by the grade point average (GPA) of the previous semester. This allows students performing above-average to take a higher number of credits whereas students performing below average will receive a lower workload. The program coordinators explain to the

experts that each student has an academic advisor, who is responsible to develop an individual study plan with an individually suitable workload. The program coordinators state that the academic advisors meet at least three times a semester with their students. Within the UNS online system, the schedule for these meetings is monitored to ensure students have sufficient advice to make decision to continue their studies. When the academic advisor identify a problem, they can also bring this to the program coordinator for discussion. The program coordinators add that informal communication via e.g. whatsapp complements the formal meetings. Upon the question of the experts, the program coordinators specify that they ensure that the academic advisors have a suitable qualification for their jobs, including holding at least a master degree.

The students further confirm that they are able to cope with the high workload. They demonstrate to the experts that they are well aware of the definition of one credit point in respect to included workload. Upon the question of the experts, they state that they receive material to guide them during their self-study time. The students confirm that they know several students who take up to 24 credits in one semester and are able to manage their private life. Furthermore, they highlight of the importance of their academic advisor to give them guidance during their studies.

Based on this information, the experts confirm that UNS has implemented a credit system based on the student workload. Various documents explain that the workload includes contact hours and self-study time. The amount of awarded credits considers the respective workload. All compulsory components of the study programme are included.

In the opinion of the experts, the estimated workload is high; however, students confirm that the workload is realistic and manageable so that they are able to conclude the study program in the standard period of study. The experts consider that the study plans in the three programs under review consider an even workload during the semesters and within one semester. UNS has presented evidence showing that the workload of the students is monitored to evaluate whether the credits awarded for each module correspond to the actual student workload. In this process, students are asked to submit their opinion.

### **Criterion 1.6 Didactic and Teaching Methodology**

#### **Evidence:**

- Self-assessment report
- Module handbook of each study program
- Rector's Regulation No. 31 of 2020



- Guideline for the development of higher education curriculum based on the Indonesian Qualification Framework in the Era 4.0 Industrial revolution – Society: 5.0: Independent learning campus
- Discussion during the audit

**Preliminary assessment and analysis of the experts:**

The experts evaluate the various documents submitted by UNS on the didactic concepts implemented in the bachelor programs *Mathematics*, *Mathematics Education* and *Science Education*. UNS describes that the learning activities are interactive, holistic, integrative, scientific, contextual, thematic, effective, collaborative, and student-centered. The experts appreciate these goals and hope that this is really brought to practice. Learning methods are chosen based on the PLOs the students shall achieve in each module. Teaching methods often consider group discussions, simulations, case studies, collaborative learning, cooperative learning, project-based learning, problem-based learning, journal studies, or others. The experts acknowledge that this is a very high demand and they really hope that at least some of the lectures will fulfill these requirements. Additional documents describe UNS's strategy for blended learning development. UNS monitors if the selected learning methods are suitable to reach the PLOs. It applies an integrated syllabus system, which gives the university access to the lesson plan of each module. These online lesson plans are also available to all students and are online on the webpage of the study program. Students are invited to comment on the learning methods at the end of the semester in a survey. The program coordinators additionally ask the students for feedback in person.

The experts summarize that practical training is integrated into modules, combining theory and practice. The program coordinators add that exercises are considered as assignments. These refer to a wide range of teaching methods, such as team-based projects or individual assignments comparable to homework or exercises in the classroom. Assignments are submitted, corrected and given back to the students.

The experts reflect on the high number of case-based and project-based learning in all three programs under review. According to the program coordinators, national regulations encourage to integrate these methods; a minimum content has to be at 35%. Therefore, they integrated case-based and project-based learning if they considered them suitable. Currently, the course evaluation is based around 50% on case-based or project-based assignments. Case-based and project-based assignments can either be done in groups or alone; presentations are usually included at the end. Students are often encouraged to give grades to their fellow students inside a group work, which will be considered by the lecturers. The teaching staff comments that it also gives project as assign-

ments; these projects usually last for four weeks, in which the students have to develop something by themselves. They receive reading materials, but no tutorials. At the end, the students have to present the results in front of the students, who are discussing the results. The teaching staff specifies that they also give the students homework, which usually comprise exercises they need to solve until the next lecture. In the programs Mathematics and Mathematics Education, the teachers further offer tutorials for the students to develop their skills in programming. The teaching staff of the program Mathematics describe to the experts that they include a high number of real work problems in their lectures. Around Surakarta, there are many companies, which contact UNS when they encounter problems. In many cases, these problems are related to transportation, which allows them to develop assignments on simulation and optimization. In these cases, the assignments are performed in collaboration with their industrial partners. The experts acknowledge that there is a difference to the presentation of the industry partners; therefore they are not certain to which extent this content is accepted by the students and think that these activities could be expanded.

Overall, the experts consider the teaching methods suitable for reaching the learning outcomes in the study programs under review. The experts confirm that a variety of teaching methods and didactic means are used. During the on-site visit, the experts saw evidence that the study programs contain an adequate balance of contact hours and self-study time. Next to learning necessary soft skills, the students are further introduced to independent scientific work. Furthermore, the experts confirm that students are regularly asked to comment and contribute on improving the learning methods of each course. In addition, UNS monitors the utilized learning and teaching methods. Although the experts acknowledge the use of project-based and case-based learning, they identify a strong focus on these two methods in the study programs under review. The experts appreciate the benefit of these methods, but recommend considering alternatives. The experts highlight that a more diverse mix of teaching methods in the three study programs might be beneficial for all students.

**Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 1:**

Ad criterion 1.1.

The experts approve UNS's statement and additionally provided documents, which gives further insight into the structure and background of the bachelor study program Science Education. Many of the critical issues could be resolved after studying the additional ma-

materials. The experts acknowledge that their main concerns were based on the insufficient transparency of the presentation of the scientific content and orientation of the program for experts outside Indonesia. The experts continue to recommend improving the presentation of the content of the study program Science Education. Although the experts consider most issues resolved, they continue to recommend to strengthen the scientific foundations of the study programs by improving the collaboration with the Faculty of Mathematics and Natural Sciences in the respected field. The experts decide on the recommendation E8.

Ad criterion 1.3.

UNS clarifies in its statement that the scientific volume in the bachelor program Science Education amounts for a total of 75 Indonesian credits, equal to 112.5 ECTS credits. These credits are distributed to the courses on basic science, basic integrated science, and integrated science. The experts appreciate this explanation and clarification of this misunderstanding. They consider that the main problem in their review was the “integrated” nature of many courses, where the content of the different fields of science were not explicitly state in the module description. Further problems with the content of the curriculum were clarified by UNS statement as it describes that graduates of Science Education are only allowed to teach until the level of Junior High Schools/Secondary Level 1. Nevertheless, the experts would appreciate a more differentiated documentation of the science content of the basic integrated courses and integrated science course to allow outsiders to understand the extent of the students’ knowledge in the fields of biology, chemistry and physics. Furthermore, the experts form the option that a stronger collaboration between the scientific courses at the Faculty of Mathematics and Natural Sciences at UNS would benefit the further development of the curriculum by putting a stronger emphasize on the scientific content. This should foster the fundamental basics in the disciplines and therefore close a gap to the advanced integrated science courses. Furthermore, the experts consider that this collaboration would further positively influence the laboratory courses in Science Education. In the opinion of the experts, it remains necessary that students are able to perform experiments beyond the school level to gain a deeper knowledge in the different scientific subjects. The experts, therefore, continue to issue the requirement A1 and the recommendation E8. Furthermore, the experts highlight that errors in the text in this regard were corrected.

In addition, the experts decide on the recommendation E1 to develop strategies how to improve the English competences of students in the classroom. Although several opportunities exist at UNS, the experts consider it important that all students in the study programs under review reach a certain level in English at graduation. Furthermore, the ex-

experts want to encourage the students to take part in student exchange programs, especially long-term exchange programs. The experts issue the recommendation E2.

The experts further consider that the program of Mathematics Education would benefit from a higher diversity of collaboration partners outside Southeast Asia. To support this, they describe the recommendation E7.

Moreover, the experts delete the recommendation on the number to open elective courses as this seems to be based on a misunderstanding during the on-site visit. The experts emphasize that the students might not be aware of the current regulations and therefore the experts want UNS to confirm if the regulations are put into practice across all study programs.

Ad criterion 1.5.

UNS did not address the topic of didactics and teaching methods in its statement. The experts therefore continue to decide on the recommendation E3 to critically reflect on the teaching methods, especially regarding the high use of project-based and case-based learning.

## 2. Exams: System, Concept and Organization

### Criterion 2 Exams: System, Concept and Organization

#### Evidence:

- Self-assessment report
- Module handbook of each study program
- Thesis guidelines
- Examples of examinations
- Examples of bachelor thesis of each study program
- Discussion during the audit

#### Preliminary assessment and analysis of the experts:

In its documents, UNS defines that the assessment system is carried out to determine the students' achievement of the intended course learning outcomes and finally the program learning outcomes. In the module handbook, UNS lists the learning outcomes to inform students on the competences they should learn in the course. UNS has submitted documentation of its internal assessment system, listing assessment methods of each activity

including among other lectures, community service, internships, and thesis. Each course coordinator is responsible for analyzing the degree to which students are able to reach the PLOs of their course. Each lecturer is responsible to choose the assessment methods of their course. Before the beginning of the semester, the lecturers are required to submit their semester learning plan, which are evaluated by the course coordinator and later on by UNS to verify the application of the governmental key performance indicators. The experts learn from the teaching staff that the examinations questions are aligned with the intended learning outcomes of the modules. At the beginning of each semester, the teaching staff of one study programs meets to discuss the content of their lectures. In some courses, team teaching is arranged.

The students' assessments include their participatory activities, the project results and the cogitative/knowledge (continuous assessment due to assignment, quizzes, mid-term exams and final exams). The experts confirm that UNS publishes an examination schedule for each semester and study program at the beginning of the semester. Further, students have access to a document listing the assessment instruments in each course. UNS measures the assessment weight in percent to illustrate the students their achievements or success score. A cumulative grade is applied in all courses.

UNS uses the following grading scales.

*Table 6: Overview of the applied grading scale (source: self-assessment report).*

Range	Grade Point	Grade Letter
S > 85	4,0	A
80 < S < 85	3,7	A -
75 < S < 80	3,3	B +
70 < S < 75	3,0	B
65 < S < 70	2,7	C +
60 < S < 65	2,0	C
55 < S < 60	1,0	D
S < 55	0,0	E

The experts appreciate the detailed description of the assessment system and assessment concepts UNS has summarized in its self-assessment report. The experts learn that students can voluntarily retake courses to improve their grades. If students miss an exam due to illness or other circumstances, they must present an explanation to the lecturer before they are allowed to retake the exam. The experts are interested in the average percentages of students passing examinations. The program coordinators state that this strongly depends on the type of lecture; they mention that in courses, which are considered difficultly by the students, the success rate can drop down to 40%. On the average, the estimated passing rate is approximately 70%.

In the discussion with the experts, the program coordinators summarize the most common methods of examination in the programs under review. They commend that at the end of the semester, the majority of examinations are written tests. In addition, oral examinations and project assignments are getting more common. In certain modules like in Science Education (e.g. Ecosystems), online tests within the university online system are integrated. The teaching staff confirms that they have integrated a variety of examination forms. In most modules, they use a mid-term and final exam as well as continuous assessment (quizzes, etc.). Especially in the program Mathematics Education, oral examinations are more common to demonstrate their skills in explaining mathematics problems. Some of these examinations are also conducted in English. Additional examinations using projects and other written assignments are common. The experts observe that UNS also lists questionnaires as an assessment tools. The teaching staff explains that questionnaires are used as a diagnostic assessment of the students' skills. If the lecturers identify gaps in knowledge, they can modify the content of the lecture. In other assignments, they can group or mix students based on their previous knowledge. The teachers of Mathematics Education add that they also use digital assessment tools for self-evaluation of the students. The results will be compared with the opinion of the lecturer in personal conversations. If students pass one exam, they have achieved the intended learning outcomes. Overall, there is also a review board in place at UNS to discuss exams and exam questions.

The students confirm to the experts that they receive information on the examination schedule of the beginning of each semester. Therefore, they are aware of the dates and have sufficient time to prepare for the exams. The students from Mathematics Education add that their student association usually collects the questions of the former years, which they consider during their preparations. To support the students in Science Education, the lecturers usually share a set of similar questions to help them prepare for their exams.

The experts further inquire if the students consistently receive feedback to their exams. While in many cases, the students receive feedback on their projects, not all lecturers return exercises and exams. According to the students, some lecturers share the results of examinations, but not all of them. The experts encourage all lecturers to give feedback on assignments and examinations. They emphasize that the feedback is essential for students to know their status of skills and competences. Nevertheless, the experts approve that students are aware of the way to complain about their grades and submit an appeal to review examination grades.

The experts raise the topic of assessment during the practical sessions such as laboratory classes. The teaching staff of the program Mathematics describes that the main laborato-

ry courses are on programming; in this case, each student receives a computer and has to develop a small program. The results are uploaded in a cloud, where the lectures will evaluate their work. The students mainly do their programming using open source software such as Python and R. In the program Mathematics Education, the lecturers describe that they have a microteaching laboratory. The students initially receive an introduction to use all equipment before the students are allowed to practice. The assessment of the students' skills will be done based on observation. According to the teaching staff, the students in Mathematics Education also receive training in programming. They use the computer laboratory, where students will receive an introduction to all the important software including MATLAB, Mathematica and Geogebra. Assessment is based on the results of the students on their computer assignments. The teaching staff from the study program Science Education add that the curriculum considers various courses with activities in the laboratories. They specify that an assistant usually supports the lecturer to ensure good supervision of the students. The assistants are students, who have completed the course and received additional training. The assessment of the skills usually is based on assignments and reports on the laboratory work.

Furthermore, the experts consider the documentation regarding the final thesis. In each study program under review, students are required to write a bachelor thesis. Each semester, there are two deadlines for submitting the final project proposal (second and tenth week of the semester). Usually, students have at least two supervisors for their final thesis. In the process of writing the final thesis, the students need to take part in the proposal seminar before the thesis exam. In the program Mathematics, students have an additional seminar named "result seminar." The thesis exam is an oral exam in front of an exam panel consisting of four members. According to the self-assessment report, the exam evaluates thesis quality, experimental results, and students' ability to accurately answer questions during oral exams. The experts discuss the final thesis with the students. The students describe that they are able to choose a thesis topic based on their interest. In some cases, the students do their bachelor thesis within a larger scientific project of their supervisor(s). Students from Science Education describe that they discuss topics of interest with their advisor, who gives them several scientific publications for guidance. Afterwards, they meet again with their supervisors to improve their idea and decide on the thesis topic. Similarly, the students from Mathematics Education discuss possible topics with their thesis supervisor. The students of Mathematics support these statements. The experts acknowledge the high satisfaction of the students in regard to their final thesis.

The experts conclude that UNS assessment system considers the various assessment methods integrated in the three study programs under review. The presented examina-

tions allow assessing the extent to which the defined learning objectives have been achieved. The experts acknowledge that various assessment types are applied in each study program. These provide students with feedback on the competencies that they have acquired. The experts further confirm that the final thesis demonstrates that the students are able to work independently on a task suitable for a bachelor level. The experts verify that transparent criteria are in place and that students have opportunities to consult with their lecturer on examinations.

In the opinion of the experts, UNS has transparent rules for make-up exams, non-attendance, cases of illness as well as compensation of disadvantages in the case of students with disabilities or special needs (e.g. pregnancy, childcare, caring for relatives) etc. They consider the number and distribution of exams ensure an adequate workload as well as sufficient time for preparation. The students confirm to the experts that the organization of the exams ensures a smooth study process.

The experts are allowed to view evidence for regular reviews of the assessment methods within a well-established system.

### 3. Resources

#### Criterion 3.1 Staff and Staff Development

##### Evidence:

- Self-assessment report
- Staff handbook of each study program
- Overview research funds
- Discussion during the audit

##### Preliminary assessment and analysis of the experts:

Based on the documents submitted by UNS, the experts get to know the composition of the teaching staff in the study programs under review. In the program *Mathematics*, there are 15 lecturers, of which eight hold a doctoral degree and seven a master's degree. A third of the staff has completed their higher education outside of Indonesia. One staff member has already reached the status of a full professor while four are associate professors and three are assistant professors. UNS presents data illustrating an average teaching load of 14.4 credits of each lecturer. This is equivalent to three to five courses per semester. The lecturers are organized in teaching groups and research groups. Additional duties



include head of the study program or head of a computer laboratory. The teaching staff associated with the study program Mathematics Education consists of 20 members of which 55% hold a doctoral degree. Four members got their higher education outside of Indonesia. One member of the teaching staff was already promoted to professor, two have the status of an associate professor and 17 are assistant professors. The average workload of each teacher is approximately 14.5 credits per semester. Inside the program Science Education, 26 teachers are employed, 80% of those have completed their higher education in Indonesia. Of the staff, 69% hold a doctoral degree and 31% have completed a master's program. Two of the staff members are full professors whereas nine are associate professors and 14 are assistant professors. According to the documents, the experts observe that the student to staff ratio is below 1:20 in all study programs under review.

The experts inquire about UNS strategy for promotion. The program coordinators explain that UNS has a career development system. Each lecturer needs to collect credits in order to be promoted; lectures, staff development, scientific publications or conferences contribute to their scores. The minimum amount of time to receive promotion is two years. The academic staff receives support from UNS's unit for human resource development. The program coordinators add that UNS monitors their staff duties and achievements. Each lecturer needs to fulfill between 12 and 16 credits of education, research and community service year semester. When employees go above the 16 credits threshold, UNS pays incentives, whereas lower rates than 12 might result in sanctions. The experts are interested, how the credits are distributed between teaching, research and community service. The program coordinators emphasize that teaching and research combined needs to exceed nine credits. The precise distribution is based on each person individually. The teaching staff adds that they work for 40 hours per week. They describe to the experts that they have to additionally supervise students, which can take up to 20% of their time.

The experts learn that UNS pays incentives to foster research; this includes being speaker at an international conference, participating in a publication review, research collaboration, writing any form of scientific publication or developing a prototype. Additional incentives are paid if one student is able to produce a publication based on their thesis. The experts also identify a small decrease in the total numbers of publications, which the program coordinators explain took place due to a shift towards a higher quality of publications and a stronger focus on international publications. The teaching staff of the program Mathematics remark that they work in research groups to be able to work on larger research projects. They remark that the decreasing number in 2022 is caused due to a delay in the review and acceptance of several publications, not because of a reduced research effort. After reviewing the scientific activities and their research output, the experts conclude that these are suitable for the study programs. The experts consider the number of

the scientific publications are very high concerning the study programs Mathematics Education and Mathematics, resulting in very good h-index of the staff members. Similarly, the research productivity in the Science Education program is also appreciated.

The experts further address the topics of staff mobility. The teaching staff explains that they are encouraged to join international conferences. UNS offers special competitive grants, for which they can apply. When they receive external funding from e.g. the government, they are permitted to spend time at other domestic or international universities. UNS requires them to organize their teaching load during their absence, which can either be covered by a colleague or be conducted online. Under these conditions and with a confirmation to return, UNS grants its academic staff permission to spend one year outside the university. The experts confirm that members of the teaching staff have participated in this program and stayed up to one year in countries including among others Japan, Taiwan and Finland. In addition, the teaching staff mentions that they participate in international conferences. Students are also encouraged to apply for funding to join their supervisors at international events.

The experts approve the strong support of the academic staff to pursue a PhD. According to UNS regulations, lecturers below 40 years of age holding a master degree are required to continue their higher education outside Indonesia preferably overseas. The teaching staff states that they acknowledge this regulation; however, several staff members do not want to study abroad and therefore postpone their PhD studies beyond the age of 40. Arguments against going abroad are mainly family and language barriers (although UNS provides courses to improve English competences). Furthermore, UNS encourages its staff to earn a lecturer certificate. The UNS Institute for Development and Quality Assurance of Education also provides mandatory training in pedagogy for all personnel involved in teaching. Additional training is offered by the Human Resources Development. The UNS Language center organizes training in English. Each teaching staff member has to request to take part in staff development programs, which has to be submitted on either program, study program, faculty or university. UNS highlights that staff exchange programs require governmental funding whereas international universities are encouraged to sign a MoU with UNS.

After reviewing the documents and following informative discussions during the on-site visit, the experts form the opinion that the composition, professional orientation and qualification of the teaching staff are suitable for successfully delivering the three study programs under review. The experts acknowledge that the research and development of the teaching staff exceeds the desired level of education. Members of the teaching staff have several opportunity to further develop their professional and didactic skills. The experts consider that the student to staff ratio is very good and comply with the Indonesian

regulations. Furthermore, the experts appreciate UNS's support for research. Nevertheless, the experts recommend to increase UNS focus on international research collaborations. This could also include internationally funded research projects, which would foster UNS's strategy to become a research university. Alternatively, collaboration projects with industry should be of interest for UNS. The experts explain that a joint research project should also lead to an increase of the international staff mobility. In addition, they highlight that these projects should involve several members of the scientific staff to foster collaborations also among colleagues and/or different units of UNS. This applies especially for the bachelor programs in Mathematics and Mathematics Education.

### **Criterion 3.2 Funds and equipment**

#### **Evidence:**

- Self-assessment report
- Visit of the campus
- Discussion during the audit

#### **Preliminary assessment and analysis of the experts:**

After studying the self-assessment report, the experts acknowledge that UNS receives funding from the government as well as public funds (non-tax state revenues) and cooperation funds (governmental agencies, industry, and other partners). Additional financial source derives from students' tuition fees. Cooperation funds are mainly used for research, training, scholarships and equipment. UNS describes that it develops five-year business plans in collaboration with the faculties and departments. Funds are only released after submission of the terms of references for each proposed activity. UNS uses a centralized financial management system to oversee the operational and investment costs.

The representatives of the rector's office describe to the experts that UNS supports research by using 25% of all internal funds. Grants are offered on a competitive basis inside UNS; however, the academic staff is encouraged to apply for funds provided by the government (Indonesian government spends 20% of its national budget to support research and innovation). Additional options include grants at industries and international schemes, such as DAAD. UNS requires of every faculty member to have at least one research grant; depending on the grant, UNS will support them with offering assistants or equipment. UNS does not keep any overhead money from public grants, but there is a charge of 6% institutional fee. The representatives of the rector's office commend that they are content with the number of research grants of its staff.

The experts inquire how the program coordinators ensure that sufficient laboratory equipment is available. Concerning the study program Mathematics, the program coordinators state that they provide a sufficient number of computers for their practical classes. In the study program Science Education, the program coordinators established a new laboratory, where groups in three have sufficient equipment to perform their experiments. The program coordinators meet with the lecturers annually to check on the equipment quality and quantity. Concerning the program Mathematics Education, the situation is similar. The program coordinators highlight that the students are asked each semester to give suggestions concerning the facilities at the end-semester questionnaire. The students state to the experts that they have sufficient space in the computer laboratories for one class (30 to 40 students).

The experts focus especially on the applied software in the programs Mathematics and Mathematics Education. The program coordinators describe that they focus on the use of open access software. In Mathematics, the students additionally learn to use Mathematica and MATLAB (free version). The students are also satisfied with their access to software. They confirm that they mainly use open-course software or limited licenses like MATLAB. However, the main software in the programs is Python and R in the study programs Mathematics and Mathematics Education. Within Mathematics Education, the students further receive training in the free software tools such as Mathigon and Geogebra. After reviewing a full list of available software, the experts conclude that the applied software in the program Mathematics and Mathematics Education is up-to-date.

Concerning the library and their access to (online) literature, the students show a high satisfaction. They state to the experts that they have access to various journals through their webpage using their UNS email address. Furthermore, UNS also provides search portal for books in the library and previous theses, which the students consider as very useful. UNS provides a list to the experts documenting that it subscribed to several electronic journals (e-journals) such as EBSCO, ProQuest, Cambridge, IGI Global, Science Direct, SCOPUS, Emerald, and those under the National Library. The experts approve the presented evidences.

The students further describe the health facilities on campus as suitable to their needs. Students receive free treatment on the campus hospital once they provide their students ID card. The experts further learn that the facilities of the Department of Mathematics are fully accessible by wheelchair.

The experts conclude that the financial resources and the available equipment constitute a sustainable basis for delivering the study programs. This includes a secure funding and

reliable financial planning, and a sufficient infrastructure in terms of both quantity and quality.

**Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 3:**

Ad criterion 3.1.

UNS outlines in its statement the existing collaborations between their researchers and international partners. The experts appreciate this comment. The experts encourage that the international collaborations might also result in an increased number of publications in international journals. Therefore, the experts issue E4.

In addition, the experts recommend UNS to place a stronger focus on international research from national science foundations, international science foundation and/or industry collaborations. This applies to the bachelor study programs Mathematics, where particularly industrial collaborations should be intensified. The experts decide on the recommendation E6.

The experts further appreciate the international connections of the study program Mathematics Education. However, the experts continue to expand the collaboration partners to different regions, including among others for example partners in other countries in Southern or Northern America, in New Zealand or Australia or in mainland Europe. The experts support recommendation E7.

## 4. Transparency and Documentation

### Criterion 4.1 Module Descriptions

**Evidence:**

- Self-assessment report
- Module handbook of each study program
- Webpage Mathematics <https://mipa.uns.ac.id/eng/bachelor-of-mathematics/>
- Webpage Mathematics Education <https://math.fkip.uns.ac.id/>
- Webpage Science Education <https://ipa.fkip.uns.ac.id/>
- Discussion during the audit

**Preliminary assessment and analysis of the experts:**

After studying the submitted documents by UNS, the experts identify several issues with the module handbooks. The experts summarize that the presented module handbooks do not provide a clear understanding of the curriculum of each study program and the content of the modules. Information is missing in the module descriptions. The experts identify the main problems are regarding teaching methods, learning methods, and forms of examinations and the weighing for the final grade. In single cases, parts of the module description were in Indonesian. Furthermore, if team teaching is applied, the module description should contain not only the name of the responsible lecturer but also the person who is teaching. The experts suggest adding information on dates of last revision in order to keep track of changes in the modules. Moreover, the experts suggest keeping the reading list up-to date. As example, they state that the newest references in the module “Thermoregulation” dates to 2012, the ones from “Biotechnology” to 2014.

Therefore, the experts explain the need to improve the current module handbooks. The experts suggest that the module handbook should also contain an overview of the curriculum structure to allow the students to follow the content each semester. The experts further highlight that the module descriptions need to be accessible to all students and staff; a presentation online is advisable.

**Criterion 4.2 Diploma and Diploma Supplement**

**Evidence:**

- Self-assessment report
- Example Certificate
- Example Diploma Supplement
- Example Transcript of Records

**Preliminary assessment and analysis of the experts:**

After studying the submitted documents attached to the self-assessment report, the experts confirm that UNS issues a Certificate, accompanied by a Diploma Supplement and a Transcript of Records. The documents proof that the Certificates are issues in two languages, Indonesian and English. The Transcript of Records and the Diploma Supplement are both issues bilingual. The experts consider that the presented documents provide sufficient information on the student's qualifications profile and individual performance as well as the classification of the study programs with regard to the respective education system.

The experts approve the detailed information presented in the Diploma Supplement. However, they remark that the Transcript of Records need to contain a conversion of Indonesian credits to ECTS credits. In this document, the experts further miss a grading scale to give third parties more information on the students' scores. Thus, the experts state that UNS needs to develop an updated version of the Transcript of Records in the study programs under review.

### **Criterion 4.3 Relevant Rules**

#### **Evidence:**

- Self-assessment report
- Webpage UNS <https://uns.ac.id/en>
- Webpage Faculty of Teacher Training and Education <https://fkip.uns.ac.id/en/>
- Webpage Faculty of Mathematics and Natural Sciences <https://mipa.uns.ac.id/eng/>

#### **Preliminary assessment and analysis of the experts:**

UNS describes in their self-assessment report that the rules and regulations on campus are guided by rector's regulations. These contain documents on the responsibility of UNS, the teaching staff, and the students. Rules are also in place to manage campus life and regulation access to scholarships. Rights and obligations of students are published in Bahasa Indonesia and English to ensure national and international students have access to information. The experts confirm that guidelines and regulations are available online for all students, teachers, and third parties.

#### **Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 4:**

Ad criterion 4.1.

Together with its statement, UNS also submitted new module handbooks. The experts confirm that the quality of the updated handbooks strongly improved. The new version contains module descriptions of all study programs and all necessary information in English. The experts approve the new module handbooks. However, for the bachelor study program Science Education, the experts recommend to adequately present the addressed scientific topics in the module descriptions of each module (recommendation E9). As described in criterion 1.3., the experts missed transparency in the single scientific topics,

especially regarding the integrated courses. The experts recommend that they are addressed in the module descriptions, where they should be listed as keywords to allow third parties to quickly understand the various contents of one integrated lecture.

## 5. Quality management: quality assessment and development

### Criterion 5 Quality management: quality assessment and development

#### Evidence:

- Self-assessment report
- Policy document of internal quality assurance
- Documents on internal monitoring instruments
- Results of student surveys
- Discussion during the audit

#### Preliminary assessment and analysis of the experts:

UNS describes in its self-assessment report that its internal quality assurance system is applied to academic (e.g. education, research and community service) and non-academic processes (e.g. human resources, finances, facilities). UNS has issued quality management policies to coordinate its quality management processes. The representatives of the rector's office highlight to the experts in their initial statement that the quality assurance system is divided in three layers. It includes an internal quality assurance system and external quality assurance system on national level and an external quality assurance system on international level. The internal quality assurance operates on an institutional level as well as inside faculties and the study programs. Additionally, UNS organizes internal audits on an annual basis, which are organized on university and faculty level.

To achieve high standards, UNS has implemented the following cycle in all their quality management processes:



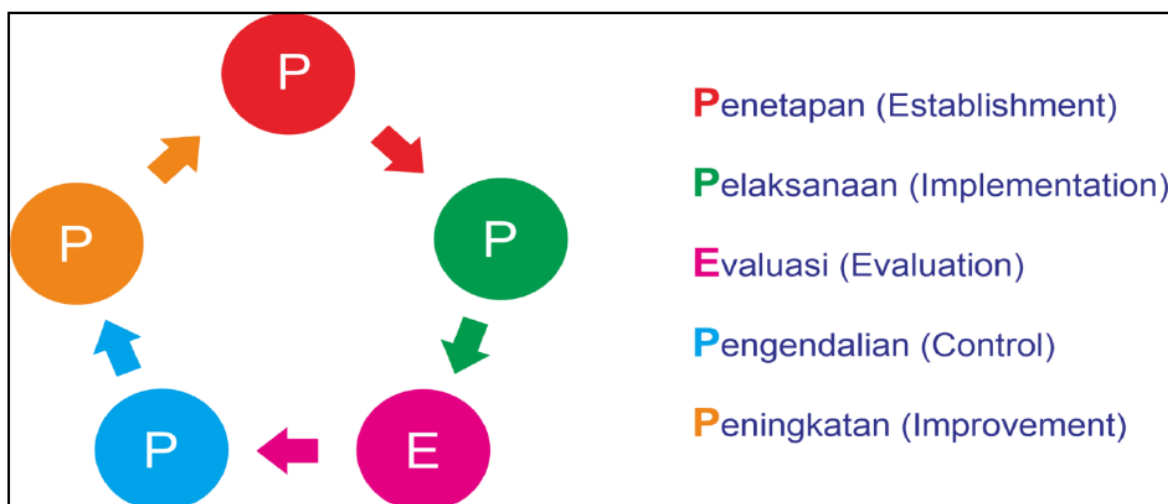


Figure 1. Internal quality management cycle at UNS (source: self-assessment report)

According to the evidences, the experts confirm that UNS defines key indicators in standard documents to evaluate the quality of the internal processes. For example, educations standards consider 1) graduate competency standards, 2) learning content standards, 3) learning process standards, 4) learning assessment standards, 5) lecturer and education personnel standards, 6) facilities and infrastructure standards, 7) learning management standards, 8) learning financing standards. Therefore, the experts form the option that UNS’s quality management of the study programs involves a mechanism to measure the degree of achievement of the learning outcomes. UNS further states that it sets high standards, especially in programs on environmentally friendly campus, inclusive education on campus and health standards on campus.

According to the representatives of the rector’s office, they consider the student evaluations of the module at the end semester as the most useful tool for the continuous improvement of the study programs. UNS distributes the questionnaire online; the students are required to participate. These questionnaires contain questions on the teachers’ performance, learning materials we all as the students’ experience during the lectures. In addition, the representatives of the rector’s office greatly value the annual student satisfaction surveys. In the discussion, they continue to explain to the experts that they also hold meeting of the head of the program and all student organization representatives. This event is based on a MoU between the dean and the student boards and will be evaluated during the next year. Within this forum, the students can give feedback on their study programs, including on questions on design and organization. Topics addressed by the students in this meeting will be put on the agenda of the next management review meeting. As one example, the representatives of the rector’s office state a students’ complaint on the internet stability; as a result, the management review meeting decided to expand the network access on campus.

Overall, UNS describes in its self-assessment report that students have important roles in various decision-making bodies. Students are organized in the Student Council and the Student Executive Board, which are represented at faculty and university level. Additionally, the Study Program Student Association operates on the level of the study programs. The Student Council and the Student Executive Board are directly involved in issuing policies. The Student Executive Board further addresses needs of the campus community whereas the Study program Student Association organizes student support on the study program level. Students are further included in the University Council Board, which is responsible for policies and supervision.

The experts consider that the drop out rate is an important tool for the quality of the study program. In the case of the study programs under review, the drop out rate is almost zero percent. However, the representatives of the rector's office clarify that the drop-out rate considers only the students, who have problems during their studies and therefore exceed the maximum duration provided for a study program. Once UNS identifies that students are not studying within a reasonable timeframe, the head of the department contacts the students. If students decide to switch to another study program or university, they are not counted as a "drop-out" student, but as a resigned student. According to the definition by UNS, all student resignations, who voluntarily decide to stop their studies, are not classified as drop-outs. The sum of resigned students is presented as a "withdrawn rate." Based on this clarification, the experts analyze the withdrawn rate and notice that the withdrawn rate ranges between 15 and 25%. The representatives of the rector's office are aware of the high number of resigned students but point out that the rate was decreasing during the last five year. In the year 2022, the number of resigned students was reduced to one (Mathematics Education and Science Education) and two (Mathematics). The students confirm to the experts that they know several students who withdraw from their study programs. The majority of the resigned students changed the study program while a certain amount also enrolled in another university. The experts welcome UNS's strategy of keeping withdrawn and drop-out rates low. However, the experts highlight that the numbers are initially very confusion for everyone from the outside. They suggest UNS should following clearly define their used terms in the future in order to avoid confusions with third parties.

The representatives of the rector's office describe that UNS monitors the progress of all students during their studies. They focus especially on those, who do not proceed according to schedule. The contact to these students provides data from UNS to identify problems and thresholds for students UNS will work on in the future. In the past, students highlighted problems with facilities, which resulted in a new plan to improve the campus.

In addition to internal stakeholders, the experts learn that UNS also collects feedback from external stakeholders on a regular basis. According to UNS documents, it conducts surveys among the partners of the industry and employers to collect data on user satisfaction on the graduate's performance. The faculty and study program coordination are responsible for these surveys. Alumni are further invited to participate in questionnaires to provide feedback and suggestions for their university and study program. In its self-assessment report, UNS presents data of the tracer studies of the three study programs under review. Based on this evidence, the experts confirm that the majority of students find employment within three months after graduation. Therefore, the experts consider that the graduates are well received on the job market.

In conclusion, the experts consider that UNS has established a well-functional internal quality assurance system on three levels. After the discussion during the on-site visit, the experts confirm that the study programs are subject to periodical internal quality assurance, which include all stakeholders. The results of these processes are incorporated into the continuous development of the programs. Based on internal documents, these processes and responsibilities are defined and clear to the responsible units. The experts learn that the students have online access to the results of the end-semester evaluation, in addition, these results are discussed with students during a forum once a semester. On these events, students can additionally address any topic of their concern. The experts approve the various methods UNS has put in place to give feedback to its students.

**Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 5:**

The experts acknowledge UNS statement and its limitation towards the used terminology in its quality management. Nevertheless, the experts would appreciate if UNS would address and critically review this matter on a university level. Therefore, they continue to recommend following international terminology when determining drop-out rates (vs. withdraw rates) in recommendation E5.

## **D Additional Documents**

No additional documents needed.

## **E Comment of the Higher Education Institution (19.02.2024)**

The institution provided a detailed/ statement:

Thank you ever so much for dedicating your time to thoroughly review our report. UNS is grateful for the consideration, assistance, and insightful feedback that our colleagues have given us. Overall, we appreciate all of the criticism, and we will act upon the positive remarks from our peers and continue to make improvements.

### **Criterion 1.**

#### **Mathematics**

The term “expert” for mathematics graduates is indeed confusing to the experts. After discussing with the program coordinators and the lecturer, we agree to change the term to “consultant.”

Indeed, we notice that the information of compulsory and elective courses is available on the courses list table. (<https://math.mipa.uns.ac.id/list-of-courses-and-module-handbooks/>). Responding to the expert suggestion, we will briefly summarize the curriculum before the table provided. The total credits provided consist of 107 credits of compulsory courses (50 courses), 11 credits of directed electives courses (five courses), and 66 credits of electives courses (29 courses).

We are very concerned about the student's English proficiency; one thing we already did was add an extra course in English literacy, so the student will study 4 credits of English, compared to previous years, which is only 2 credits.

#### **Mathematics Education**

Page 25

Peer’s comment: *The number of students necessary to open elective courses is too large. The experts consider it would give the students more opportunities to specify in their field*

*of interest if the number of students to start an elective course would be reduced to five students (instead of 10 students currently).*

Thank you very much for your valuable insights and suggestions regarding the minimum number of students required to open one elective course. We will follow up on the implementation the 2021 curriculum of the Mathematics Education Study Program which contains 146 credits, consisting of 126 credits of compulsory subjects and 20 credits of elective subjects.

For elective courses, students can choose 10 courses (20 credits) from the 21 courses (42 credits) offered, according to their interests. The minimum number of students necessary to open an elective course is 5 students, in accordance with Rector's Regulation No. 31 of 2020.

Page 25

Peer's comment: *Experts recommend that there is a need to increase English language competency for students, for example through the use of English in class or in various student activities, so that they gain more experience and practice in English.*

Thank you very much for your valuable suggestions for us. Regarding improving students' English language skills, the 2021 curriculum for the Mathematics Education Study Program contains two supporting courses, namely English for Academic Purposes and English for Mathematics. For other activities, the study program student association (Himmadika) has formed the "Mathematics English Club (MEC)" as a medium to provide English learning experiences for students.

Meanwhile, according to advice from experts, we will follow up by providing English language strengthening in the classroom, for example by using English or bilingual for several courses and optimizing learning resources in English.

## **Science Education**

### **1.1**

*Peer's comment (page 15)*

*In their opinion, the structure and the curriculum require improvements, both with respect to content and study volume. The experts miss a substantial foundation in the disciplinary knowledge of the sciences involved (biology, chemistry and physics), as defined by the ASI-IN subject-specific criteria.*

(page 16)

*experts suggest improvements in the structure and curriculum of the bachelor program Science Education, which is described in more detail in criterion 1.3. Among other things, the experts highlight especially the need to improve the basic education in biology, chemistry and physics. According to the experts, a closer collaboration among the scientific study programs and the bachelor program Science Education might be beneficial to continue to develop the study program.*

We appreciate and thank you for the suggestions. Science Education Learning Outcome of developed based on the Indonesian Qualification Framework Level 6, Ministry Regulation No.3 2020 (National Standard of Higher Education and Consortiums of Science Education Association of Indonesia). Adjustment of SSC ASIIN including physics, life science and chemistry has been mapped and the consortium have SSC adaptation for Science Education in Indonesia. The PLOs are similar with Science Education Study Program (the same Association) that has been ASIIN fully accredited as well: Science Education – Surabaya State University page 110 of their report [http://www.asiin-ev.de/akkr\\_dokumente/Accreditation\\_Report2\\_UNESA\\_Cluster\\_Science\\_Edu\\_2022-03-18.pdf](http://www.asiin-ev.de/akkr_dokumente/Accreditation_Report2_UNESA_Cluster_Science_Edu_2022-03-18.pdf).

Department of Science Education would have curriculum review on May 2024 and would include all peer's recommendation on this report to be discussed in the association forum as well due to different policy and curriculum development. However, as we mentioned instead of explicit course in basic science (Basic Chemistry, Basic Biology, and Basic Physics) in the level course are also include in basic integrated course (Semester II dan III) in those courses, lecturers taught the basic concepts as well. The proof is can be seen on the module descriptions, learning materials and sample students' test (details in comment 1.3)

## **1.2**

*Peer's comment (page 17)*

*the experts want to highlight that on the webpage of the Faculty of Teacher Training and Education, the bachelor program in Science Education is occasionally translated as bachelor in "Natural Science Education." The experts remark that it is crucial to use only one form of translation in all the documents as well as online.*

We have been updated the webpage of Faculty of Teacher Training and Education to be one form of translation for Science Education Department (Bachelor, Master as well as doctoral degree program of our webpage) <https://fkip.uns.ac.id/en/undergraduate/>

### **1.3.**

*Peers' comment (page 19)*

*The experts raise their concern on the low content of foundational science courses in the bachelor program Science Education. In comparison, on an international level, the science content would be around 100-110 European Credit Transfer and Accumulation System (ECTS) credits.*

As written in our curriculum documents, our science content reached 75 credits equals to 112,5 ECTS that distributed into basic science, basic integrated science, and integrated science courses that already update in the module handbook based on the category of the course.

*Experts notice that the curriculum contains a series of gaps between the science modules and the SSCs. The table provides examples for these gaps for several topics, which should be covered to a reasonable extent, in particular as the Bachelor Science Education qualifies also for teaching on Senior High School/Secondary Level II (ISCED level 3-4). The examples are chosen in view of topics, which seem to be not sufficiently covered or altogether missing according to the module handbook.*

Our graduates are teacher's candidate for elementary until Junior High Schools/Secondary Level 1 (Phase D) (Bachelor of Science Education) based on Regulation of Ministry Education No.5 2022 regarding students learning outcome. In International Standard based UNESCO level, we are at level 2 (Lower Secondary Education Level). Our faculty has 3-separated departments for teachers (Level 3) in Senior High Schools: Bachelor of Chemistry Education, Bachelor of Physics Education and Bachelor of Biology Education itself.

We made the mapping of SSC'ASIIN mentioned into PLO 1. That been mentioned by expert in page 19-20



*For example*

*Biology: sound fundamental knowledge of*

*– molecular [partially covered], cell and organismic biology (including the environmental dimension)*

Details of Courses and Learning Materials ([Appendix 1](#))

Course 1-Basic Biology: Cells, Passive and Active Transport, Classification of living things, Developmental Structure of Plants and Animals, Physiology of Plants and Animals.

Course 2: Physical Chemistry of Life Organization: Levels of organization of living Things: cell, tissue, organ, Digestive system, Respiratory system, Circulatory System (Cardiovascular), Excretory System, Reproductive system, Nervous system, Chemical compounds that living things need, Carbohydrate, Proteins, Fat, Nucleic Acid, Enzyme, Hormone

Course 3: Ecosystem: Climate change, Greenhouse effect, Heat capacity of soil and water (with lab experiment), Interaction of living things, Ecological Pyramid, Theory of Systems, Adaptation of living things, Biodiversity, Chemistry of Life, Chemical Bonds in the body Environmental Issues and Ecotoxicology.

*– mathematics and the natural sciences with relevance to the life sciences*

*– Chemistry Relevant Mathematics*

Course 1- Observation and Science Measurement (Semester I)

Content: Basic concepts of science observation and measurement, Magnitude (principal and derivative quantities); Unit of Measurement (International Standard Unit); Measurements (accuracy and precision, important numbers, rounding of numbers); Scientific Notation Dimensional analysis, Types of measurement uncertainty, Traceability of physics equipment, Measurement in Kinematics, Dynamics, and Energy

*Chemistry: sound fundamental knowledge of*

*– the core subjects of chemistry, including inorganic, organic chemistry, and analytical chemistry*

Covered in courses: Basic Chemistry, Physical Chemistry of Life Organization, Instrumentation of Science, Thermodynamics, Redox and Electrochemistry, Food Metabolism, Particles and Atomic Reactions.

*Another comment*

*– being familiar with standard topics of modern physics: quantum physics, solid state (and soft matter) physics; nuclear and elementary particle physics.*

Modern Physics are covered in course of Particles and Atomic reaction, see the details from lecture proof <https://drive.google.com/drive/u/0/folders/16iq57UL-9zISGHZwg-tBfvEZcvWQhKPc>

*Peers' comment (page 21)*

*the program coordinators should submit a document illustrating, which fields of science are integrated in which courses. This should provide a basis to overcome the problem of including multiple topics in the integrated courses. As a guideline, the experts suggest to focus on the important scientific topics listed in the ASIIN subject-specific criteria of the Technical Committees 09 – Chemistry, Pharmacy, 10 – Life Sciences and 13 – Physics. Furthermore, the experts consider it necessary to create more synergies with the scientific programs Biology, Chemistry and Physics. This should allow the students to increase their knowledge beyond the level of the school classroom and gain insight into scientific work and research.*

We wrote the documents in [appendix 2](#) regarding matrix for ASIIN SSCs and important scientific topics. The revision of the documents (including module handbook) after on-site visit has illustrated the content (depth and width) the basic science beyond the school level as we graduate teachers' candidate on IQF level 6 – UNESCO Level 2.

*Peers' comment (page 25)*

*Nevertheless, the experts identify issues for improvement. This includes the high number of students necessary to open elective courses. The experts consider it would give the students more opportunities to specify in their field of interest if the number of students to start an elective course would be reduced to five students (instead of 10 students currently).*

In Science Education, it is clear that the elective course can be open with a minimum of 5 students join. It is based on the Rector Regulation No.31 2020 article 12 regarding minimum number students in science program is five students ([https://drive.google.com/file/d/1YOFGQCKDhJvybSxP7wNBNnq\\_OKzCPk-b/view?usp=sharing](https://drive.google.com/file/d/1YOFGQCKDhJvybSxP7wNBNnq_OKzCPk-b/view?usp=sharing)).

<p style="text-align: center;"><b>CHAPTER IX</b> <b>MANAGEMENT OF LEARNING</b></p> <p style="text-align: center;"><b>Article 12</b></p> <ol style="list-style-type: none"><li>(1) Learning is managed by Study Programs in accordance with the curriculum regulated through Rector's Decision.</li><li>(2) The university and faculties set certain courses and their credits to be written in the study program curriculum as the defining characteristics of the university or faculty.</li><li>(3) The university characterizing courses mentioned in paragraph (2) are community service program (KKN), internship, and entrepreneurship.</li><li>(4) The faculty characterizing courses mentioned in Paragraph (2) are determined by each faculty.</li><li>(5) Each class in the science and technology field must have at least 5 students, while the social sciences and humanities field classes must have at least 10 students, to be recognized as a lecturer workload.</li></ol>
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*In addition, the experts consider comments made by various attendees during the on-site visit, which call for an improvement of the English competences of students. Although the basic English skills are sufficient to describe problems e.g. at schools, the experts think of spoken English in general. They recommend to increase the use of English in the classroom and for discussions to allow the students to gain more experience and practice in English.*

We have several programs to improve students' proficiency in English.

1. In the structure curriculum: we have two courses: English (focus on English for Academic Purposes), English for Science (<https://docs.google.com/document/d/1Z4zIisx8hCsbCbcmKK74Y1I2fDhtKaBtjFfVvWIPASk/edit?usp=sharing>)

2. The Science Education department also has Class C for bilingual Class as we wrote in SAR, Class C will graduate this year, so it could meet the market requirement to have more skillful science teachers graduates.
3. Our faculty also has more international activities organized by the International Office (Summer Schools, International Workshops, Global Challenge etc.).

### **Criterion 2.**

We're delighted to learn that our assessment system has been acknowledged for its transparency and the diverse assessment methods we've implemented. It's enriching to see our efforts being recognized in this manner.

We've carefully noted your suggestion regarding the importance of consistently providing feedback to our students. To address this, we're currently in the process of developing clear guidelines for our teaching staff to ensure that feedback is not only consistent but also delivered in a timely manner. Quality insurance unit in every study program is constantly monitor the feedback of assignment every semester.

Furthermore, we would like to extend our sincere appreciation for recognizing the support we offer to our students, particularly in terms of providing exam schedule information and compiling questions from previous years. Enhancing the overall learning experience for our students remains a top priority for us, and your acknowledgment of our efforts in this area is truly motivating.

### **Criterion 3.**

#### **For all study programs**

We appreciate the recommendations to focus more on international research and teaching collaboration.

#### **Mathematics**

We already did some collaboration some universities abroad, such as Universite de La Rochelle (France), Universiti Malaya (Malaysia), Khalifa University (UAE), Eindhoven University of Technology (The Netherlands), Tilburg University (The Netherlands), Universiti Pendidikan Sultan Idris (Malaysia), National Dong Hwa University (Taiwan), Universitas Nasional Chung Hsing (Taiwan), Asia University (Taiwan), dan National Taiwan University (Taiwan). With the support from UNS, we are confident the number of international

collaboration will increase in the future. Moreover, we are always encourage the new lecturer to study abroad.

### **Mathematics Education**

We have collaborated with several universities abroad, such as Kyushu University (Japan), Yamaguchi University (Japan), Universiti Teknikal Malaysia Melaka (Malaysia), Sultan Idris Education University (Malaysia), University of Brunei Darussalam (Brunei Darussalam), University College London (England), and National Cheng Kung University (Taiwan). With the support of UNS, we continue to strive to increase cooperation, both in the fields of teaching, research, and community service, with other universities / institutions so that it can provide wider benefits.

### **Science Education**

As the study program when establishment has prospected to be international standards, we did international collaborations with universities as well as professional organizations in science: University of Muenster Germany, Kangwon National University - South Korea, Hokkaido University - Japan, National Changhua University of Education Taiwan, Universiti Pendidikan Sultan Idris Malaysia, Deakin University Australias, University Sains Malaysia, Hiroshima University Japan, University of Utrech Netherlands, Thepsatri Rajabhat University, Thailand. Collaboration in the form of research, scholar/student exchange, exchange of external examiner, and joint publication.

### **Criterion 4.**

#### **Mathematics**

The Mathematics program constantly updates the module handbook's content almost every year. Still, since the core of mathematics has not changed much over the years, the lecturer usually updates the textbook references if the new book has a better presentation and better explanation for the students.

As the experts suggested in the review, we will improve the content and add the requested information, i.e., the person who is teaching and the last revision of the module handbooks. The module handbook is also available online at our website:

<https://math.mipa.uns.ac.id/list-of-courses-and-module-handbooks/>

## **Mathematics Education**

Mathematics Education program reviews the module handbooks periodically every semester based on the evaluation of every subject created by its lecturer according to the questionnaire which is filled by the students. We have added the last module handbook on our website: <https://math.fkip.uns.ac.id/en/curriculum/>

## **Science Education**

*Peers' comment (page 45)*

*The experts suggest adding information on dates of last revision in order to keep track of changes in the modules. Moreover, the experts suggest keeping the reading list up-to date.*

Lecturers update the module handbook every semester as part of evaluations. The existing module handbooks have covered the lecturers (who teaching the course) and the lecturer as coordinators (who verified the documents). We have revised the module handbooks, including the additional information for the date of creation and updated from the lecturers. The lecturers have also updated the references used in the course and put in the module handbooks.

*Peers' comment (page 46)*

*Therefore, the experts explain the need to improve the current module handbooks. The experts suggest that the module handbook should also contain an overview of the curriculum structure to allow the students to follow the content each semester. The experts further highlight that the module descriptions need to be accessible to all students and staff; a presentation online is advisable.*

Science Education department, since the beginning, we put all information for students on the website and made it accessible for them. <https://ipa.fkip.uns.ac.id/study-curriculum/>

Students could read and learn the curriculum, the flow of the course, and by clicking on the course name, they explore the module handbooks online.

## **Criterion 5.**

Differentiating the terms drop-out and withdrawal is indeed confusing for the expert. Unfortunately, this is regulated by the University. According to the [rector regulation No. 31 of 2020](#) article 10, clause 7, it is stated that dropout is given only for students who can not finish their studies after 14 semesters.

### **List of Appendix**

#### **Science Education**

[Appendix 1. Proof from Lecturers \(Learning Materials and Students Test Sheet\)](#)

[Appendix 2. Matrix of ASIIN SSCs and Integrated Courses](#)

## F Summary: Expert recommendations (04.03.2024)

Taking into account the additional information and the comments given by four of the experts summarize their analysis and **final assessment** for the award of the seals as follows:

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ba Mathematics	Without requirements	30.09.2029	–	-
Ba Mathematics Education	Without requirements	30.09.2029	–	-
Ba Science Education	With requirements for one year	30.09.2029	–	-

### Requirements

#### For Ba Science Education

- A 1. (ASIIN 1.3) The laboratory courses need to contain content exceeding school level.

### Recommendations

#### For all study programs

- E 1. (ASIIN 1.3) It is recommended to improve the English competences of the students.
- E 2. (ASIIN 1.3) It is recommended to continue to encourage students to take part in student exchange programs, especially long-term programs (e.g. one semester).
- E 3. (ASIIN 1.5) It is recommended to widen the range of teaching and learning methods and consider alternatives learning methods to project-based and case-based learning.
- E 4. (ASIIN 3.1) It is recommended to increase the number of publications in international journals.
- E 5. (ASIIN 5) It is recommended to follow international terminology when determining dropout rates (vs. withdraw rates).



**Recommendations**

**For Ba Mathematics**

- E 6. (ASIIN 3.1) It is recommended to increase the emphasis on international research from national science foundations, international science foundation and/or industry collaborations.

**Recommendations**

**For Ba Mathematics Education**

- E 7. (ASIIN 1.3 and 3.1) It is recommended to look for collaboration partners in other countries in Southern or Northern America, in New Zealand or Australia or in Europe. This should also include bilateral exchange programs.

**Recommendations**

**For Ba Science Education**

- E 8. (ASIIN 1.1 and 1.3) It is recommended to create more synergies between the Science Education program and the Faculty of Mathematics and Natural Sciences to strengthen the scientific basics in curriculum.
- E 9. (ASIIN 4.1) It is recommended to adequately present the addressed scientific topics in the module descriptions of each module.

## G Comment of the Technical Committees

### Technical Committee 09 – Chemistry, Pharmacy (12.03.2024)

*Assessment and analysis for the award of the ASIIN seal:*

The Technical Committee confirms that it makes sense for students to acquire skills and competences in the laboratory courses that go beyond those required in a school. Requirement A1 is therefore supported and the recommendations are also approved.

The Technical Committee 09 – Chemistry, Pharmacy recommends the award of the seals as follows:

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ba Science Education	With requirements for one year	30.09.2029	–	-

#### Requirements

##### For Ba Science Education

A 1. (ASIIN 1.3) The laboratory courses need to contain content exceeding school level.

#### Recommendations

##### For all study programs

- E 1. (ASIIN 1.3) It is recommended to improve the English competences of the students.
- E 2. (ASIIN 1.3) It is recommended to continue to encourage students to take part in student exchange programs, especially long-term programs (e.g. one semester).
- E 3. (ASIIN 1.5) It is recommended to widen the range of teaching and learning methods and consider alternatives learning methods to project-based and case-based learning.
- E 4. (ASIIN 3.1) It is recommended to increase the number of publications in international journals.

## G Comment of the Technical Committees

- E 5. (ASIIN 5) It is recommended to follow international terminology when determining drop-out rates (vs. withdraw rates).

### Recommendations

#### For Ba Science Education

- E 8. (ASIIN 1.1 and 1.3) It is recommended to create more synergies between the Science Education program and the Faculty of Mathematics and Natural Sciences to strengthen the scientific basics in curriculum.
- E 9. (ASIIN 4.1) It is recommended to adequately present the addressed scientific topics in the module descriptions of each module.

## Technical Committee 10 – Life Sciences (14.03.2024)

### *Assessment and analysis for the award of the ASIIN seal:*

The Technical Committee confirms that it makes sense for students to acquire skills and competences in the laboratory courses that go beyond those required in a school. Requirement A1 is therefore supported and the recommendations are also approved. Minor grammatical corrections are only made to recommendation E3.

The Technical Committee 10 – Life Sciences recommends the award of the seals as follows:

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ba Science Education	With requirements for one year	30.09.2029	–	-

### Requirements

#### For Ba Science Education

- A 1. (ASIIN 1.3) The laboratory courses need to contain content exceeding school level.

### **Recommendations**

#### **For all study programs**

- E 1. (ASIIN 1.3) It is recommended to improve the English competences of the students.
- E 2. (ASIIN 1.3) It is recommended to continue to encourage students to take part in student exchange programs, especially long-term programs (e.g. one semester).
- E 3. (ASIIN 1.5) It is recommended to widen the range of teaching and learning methods and consider alternatives learning methods like project-based and case-based learning.
- E 4. (ASIIN 3.1) It is recommended to increase the number of publications in international journals.
- E 5. (ASIIN 5) It is recommended to follow international terminology when determining drop-out rates (vs. withdraw rates).

### **Recommendations**

#### **For Ba Science Education**

- E 8. (ASIIN 1.1 and 1.3) It is recommended to create more synergies between the Science Education program and the Faculty of Mathematics and Natural Sciences to strengthen the scientific basics in curriculum.
- E 9. (ASIIN 4.1) It is recommended to adequately present the addressed scientific topics in the module descriptions of each module.

## **Technical Committee 12 – Mathematics (06.03.2024)**

### *Assessment and analysis for the award of the ASIIN seal:*

Concerning the Ba Mathematics and Ba Mathematics Education, the Technical Committee supports the accreditation without requirements. Nevertheless, the Technical Committee discusses especially the recommendation E6 for the bachelor program Mathematics; it decides to change the wording to clarify the intention. The Technical Committee furthermore questions the reasons behind the recommendation E1 and accepts it without changes after receiving additional information. It decides to follow the suggestion of the remaining experts' recommendations.

The Technical Committee 12 – Mathematics recommends the award of the seals as follows:

<b>Degree Programme</b>	<b>ASIIN Seal</b>	<b>Maximum duration of accreditation</b>	<b>Subject-specific label</b>	<b>Maximum duration of accreditation</b>
Ba Mathematics	Without requirements	30.09.2029	–	-
Ba Mathematics Education	Without requirements	30.09.2029	–	-

### **Recommendations**

#### **For all study programs**

- E 1. (ASIIN 1.3) It is recommended to improve the English competences of the students.
- E 2. (ASIIN 1.3) It is recommended to continue to encourage students to take part in student exchange programs, especially long-term programs (e.g. one semester).
- E 3. (ASIIN 1.5) It is recommended to widen the range of teaching and learning methods and consider alternatives learning methods to project-based and case-based learning.
- E 4. (ASIIN 3.1) It is recommended to increase the number of publications in international journals.
- E 5. (ASIIN 5) It is recommended to follow international terminology when determining drop-out rates (vs. withdraw rates).

### **Recommendations**

#### **For Ba Mathematics**

- E 6. (ASIIN 3.1) It is recommended to focus on (international) research collaborations. This may include internationally funded research projects or collaboration projects with industry.

### **Recommendations**

#### **For Ba Mathematics Education**

- E 7. (ASIIN 1.3 and 3.1) It is recommended to look for collaboration partners in other countries in Southern or Northern America, in New Zealand or Australia or in Europe. This should also include bilateral exchange programs.

## **Technical Committee 13 – Physics (12.03.2024)**

*Assessment and analysis for the award of the ASIIN seal:*

The Technical Committee discusses the procedures. The members proposed to clarify requirement A1, emphasizing that it concerned the appropriate level of a bachelor's degree course. In addition, with regard to recommendation E5, the TC considered that the use of specific nomenclatures should not be prescribed if it is clearly explained what is meant. Therefore, the TC did not agree with this recommendation and proposed to delete it. In addition, the specification "international" is added to E2 (changes highlighted in yellow).

The Technical Committee 13 – Physics recommends the award of the seals as follows:

<b>Degree Programme</b>	<b>ASIIN Seal</b>	<b>Maximum duration of accreditation</b>	<b>Subject-specific label</b>	<b>Maximum duration of accreditation</b>
Ba Science Education	With requirements for one year	30.09.2029	–	-

### **Requirements**

#### **For Ba Science Education**

- A 1. (ASIIN 1.3) The learning outcomes of the laboratory courses need to be consistent with the Bachelor level (EQF Level 6).

### **Recommendations**

#### **For all study programs**

- E 1. (ASIIN 1.3) It is recommended to improve the English competences of the students.
- E 2. (ASIIN 1.3) It is recommended to continue to encourage students to take part in international student exchange programs, especially long-term programs (e.g. one semester).

G Comment of **the Technical Committees**

- E 3. (ASIIN 1.5) It is recommended to widen the range of teaching and learning methods and consider alternatives learning methods to project-based and case-based learning.
- E 4. (ASIIN 3.1) It is recommended to increase the number of publications in international journals.

**Recommendations**

**For Ba Science Education**

- E 8. (ASIIN 1.1 and 1.3) It is recommended to create more synergies between the Science Education program and the Faculty of Mathematics and Natural Sciences to strengthen the scientific basics in curriculum.
- E 9. (ASIIN 4.1) It is recommended to adequately present the addressed scientific topics in the module descriptions of each module.

## H Decision of the Accreditation Commission (22.03.2023)

*Assessment and analysis for the award of the subject-specific ASIIN seal:*

The Accreditation Commission discusses the procedures and follows the decision of the experts. Regarding the requirement A1, the accreditation follows the suggestions of the Technical Committee 13 to rephrase the requirement focusing on the adequate EQF level for clarification. In addition, it follows the suggestions in the recommendations E2 and E6 based on the comments by the Technical Committees 12 and 13. After discussion with the project manager involved, the Accreditation Committee rephrases the recommendation E5 to define the motivation of the experts in a clear manner. In addition, it also rephrases the recommendation E4 to focus on general research output instead of publications.

The Accreditation Commission decides to award the following seals:

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ba Mathematics	Without requirements	30.09.2029	–	-
Ba Mathematics Education	Without requirements	30.09.2029	–	-
Ba Science Education	With requirements for one year	30.09.2029	–	-

### Requirements

#### For Ba Science Education

- A 1. (ASIIN 1.3) The learning outcomes of the laboratory courses need to be consistent with the Bachelor level (EQF Level 6).

### Recommendations

#### For all study programs

- E 1. (ASIIN 1.3) It is recommended to improve the English competences of the students.



- E 2. (ASIIN 1.3) It is recommended to continue to encourage students to take part in international student exchange programs, especially long-term programs (e.g. one semester).
- E 3. (ASIIN 1.5) It is recommended to widen the range of teaching and learning methods and consider alternatives learning methods to project-based and case-based learning.
- E 4. (ASIIN 3.1) It is recommended to increase the research output of the staff members on an international level-
- E 5. (ASIIN 5) In statistical data, it is recommended to distinguish between drop-out and withdrawal rates.

**Recommendations  
For Ba Mathematics**

- E 6. (ASIIN 3.1) It is recommended to focus on (international) research collaborations. This may include internationally funded research projects or collaboration projects with industry.

**Recommendations  
For Ba Mathematics Education**

- E 7. (ASIIN 1.3 and 3.1) It is recommended to look for collaboration partners in other countries in Southern or Northern America, in New Zealand or Australia or in Europe. This should also include bilateral exchange programs.

**Recommendations  
For Ba Science Education**

- E 8. (ASIIN 1.1 and 1.3) It is recommended to create more synergies between the Science Education program and the Faculty of Mathematics and Natural Sciences to strengthen the scientific basics in curriculum.
- E 9. (ASIIN 4.1) It is recommended to adequately present the addressed scientific topics in the module descriptions of each module.

## Appendix: Programme Learning Outcomes and Curricula

According to self-assessment report the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the bachelor program Mathematics:

Program educational objective

PEO 1	<b>Mathematical knowledge.</b> Students should demonstrate an understanding of the foundations of calculus and linear algebra as well as the ability to think logically and critically.
PEO 2	<b>Problem solving skills.</b> Students should formulate, analyze, and solve problems through analytical and computational techniques and apply them to other disciplines when appropriate.
PEO 3	<b>Employment skills.</b> Students should attain the needed written and oral communication skills to translate their degree into a viable career path.

Program learning outcomes

PLO 1	Mastering theoretical concepts and basic principles in mathematics including exploration, logical reasoning, generalization, abstraction, and formal evidence
PLO 2	Mastering the principles and applications of mathematics, computing, and

0 Appendix: Programme Learning Outcomes and Curricula

	its technology (such as software)
PLO 3	Mastering the principles of data processing, methods/techniques, and experimentation
PLO 4	Mastering knowledge of technology computation and software in solving mathematical problems
PLO 5	Able to identify real problems, formulate, and design them mathematically and analyze the results
PLO 6	Able to observe, recognize, collect and utilize data, as well as calculate, estimate, interpret, and other standard technical skills related to each course with and without the help of software
PLO 7	Able to analyze various alternative solutions existing in real problems with mathematics and conclude them for the right decision making
PLO 8	Able to solve non routine problem solving and conduct a job/task and develop something relatively new, either independently or in a team/group of mathematicians or across expertise
PLO 9	Able to disseminate the results of studies orally and in the form of reports or paper works based on international scientific standard by utilizing Information and Communication Technology
PLO 10	Able to adapt to technological changes, develop themselves independently and sustainably. Communicate and be a good team worker and be re-

0 Appendix: Programme Learning Outcomes and Curricula

	responsive to contemporary issues
PLO 11	Able to behave as a mathematician with good learning behavior, work ethic, attitude and personality, including curiosity, perseverance, tenacity, accuracy, creativity, honesty and self-confidence as well as understanding professional ethics
PLO 12	Able to learn endlessly and equip themselves with the most up-to-date knowledge and information

The following **curriculum** is presented:

0 Appendix: Programme Learning Outcomes and Curricula

SCTRUCTURE OF CURRICULUM														Credits	
VIII	MAT380601 Thesis													6	
VII	MAT370201 Community Service Program												Elective Courses 5 Credits	2	
VI	MAT361201 Student Internship Activity					MAT361202 Discrete Mathematics					MAT361303 Real Analysis II	MAT361205 Mathematical Modelling	MAT361204 Epidemiolog Modelling	Elective Courses 5-7 Credits	11
V	0900012005 Entrepreneurship			MAT351201 Basic Social and Culture Knowledge		MAT351203 Introduction to Discrete Mathematics	MAT361206 Game Theory		MAT351306 Ring Theory	MAT351204 Introduction to Stochastic Processes	MAT351307 Real Analysis I	MAT351305 Simulation Techniques		Elective Courses 5-6 Credits	18
IV	MAT341201 Research Method and Mathematical Scientific Writing					MAT340302 Numerical Mathematics	MAT340306 Deterministic Operation Research	MAT340305 Complex Functions	MAT340204 Group Theory	MAT340303 Mathematical Statistics			MAT340307 Boundary Condition Problems	Elective Courses 3-5 Credits	19
III				0900012003 Pancasila		MAT330303 Introduction to Numerical Mathematics	MAT330202 Introduction to Graph Theory		MAT330304 Multivariate Calculus	MAT332202 Fuzzy Sets and Fuzzy Logic	MAT330306 Theory and Calculation of Probability	MAT330308 Advance Programming with Python	MAT330307 Ordinary Differential Equation	Elective Courses 3 Credits	21
II	0900012004 Indonesian Language	0900012001 Religion		0900012002 Civic Education		MAT320306 Linear Algebra		MAT320304 Integral Calculus		MAT320307 Statistical Analysis	MAT320305 Analytical Geometry	MAT320308 Basic Programming and Algorithm with Python			21
I	MAT310201 English	MAT310202 General Biology	MAT310203 Basic Physic		MAT31020 4 Basic Chemistry	MAT310205 Matrix and Vector Space		MAT310306 Differential Calculus	MAT310308 Mathematical Logic and Sets	MAT310308 Explorative Data Analysis					20
														26	118

According to self-assessment report the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the bachelor program Mathematics Education:

Program educational objectives

0 Appendix: Programme Learning Outcomes and Curricula

PEO 1	Develop knowledge, skills, and develop attitudes as professional mathematics educators.
PEO 2	Creative and innovative in applying knowledge and skills to solve mathematics education problems through research and community service.
PEO 3	Have a spirit of leadership and independence to strengthen the entrepreneurial mindset.

Program learning outcomes

<b>Specific knowledge and skills</b>	PLO 1	Mastering the scientific concepts of mathematics which include: algebra, analysis, geometry, statistics, and applied mathematics, as a provision for pursuing further studies and carrying out mathematics learning in primary and secondary education.
	PLO 2	Mastering didactic-pedagogical and mathematical scientific principles to plan, implement, and conduct innovative learning assessments in primary and secondary education.
	PLO 3	Able to design and implement innovative mathematics learning in primary and secondary education based on didactic-pedagogic and mathematical scientific principles.
	PLO 4	Able to study and apply scientific concepts of mathematics in the development of knowledge and problem-solving life skills orientation.

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	PLO 5	Able to apply the use of information and communication technology to solve problems related to science and learning mathematics.
	PLO 6	Able to design and carry out research studies related to problems in the field of mathematics education and publish them.
General attitudes and skills	PLO 7	Presenting oneself as a person who fears God Almighty, has a spirit of nationalism, has noble character, and sets an example for the surrounding community.
	PLO 8	Able to apply leadership principles by displaying an independent, responsible person and a high work ethic to strengthen the entrepreneurial spirit.
	PLO 9	Able to communicate verbally and non-verbally effectively in the context of various languages and cultures through logical, analytical, systematic, critical and creative thinking processes.

The following **curriculum** is presented on the webpage:

Semester 1

Code	Course	Credits
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Code	Course	Credits
2083142017	English for Mathematics	2
2083112010	Indonesian Language	2
2083132003	Pedagogical Science	2
2083132004	Development of Learners	2
2083143005	Elementary Statistics	3
2083143006	Differential Calculus	3
2083143007	Foundation of Mathematics	3
2083142008	Number Theory	2
2083142009	Plane Geometry	2
2083120010	English for Academic Purpose	0

Semester 2

Code	Course	Credits
2083212009	Pancasila	2



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Code	Course	Credits
2083242012	Matrix Algebra	2
2083232013	Guidance and Counseling	2
2083243014	Integral Calculus	3
2083242015	Review the School Mathematics Curriculum	2
2083242016	Solid Geometry	2
2083212003	Religious Education	2
2083243018	Data Analysis Technique	3
2083242019	Plane Analytical Geometry	2
2083242020	Selected Topics on Mathematics for Junior High School	2

Semester 3

Code	Course	Credits
2083112008	Civic Education	2
2083142022	Selected Topics on Mathematics for Senior High School	2

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Code	Course	Credits
2083142023	Mathematics Learning Assessment	2
2083142024	Mathematics Learning Strategy	2
2083142025	Vector Algebra	2
2083142026	Solid Analytical Geometry	2
2083132027	Inclusion Education	2
2083142028	Algorithms and Programming	2
2083143029	Probability Theory	3
2083143030	Multivariable Calculus	3

Semester 4

Code	Course	Credits
2083242031	Quantitative Research Methods	2
2083242032	Mathematics Learning Media	2
2083242033	Planning of Mathematics Learning	2

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<b>Code</b>	<b>Course</b>	<b>Credits</b>
2083243034	Discrete Mathematics	3
2083243035	Differential Equation	3
2083242036	Group Theory	2
2083232037	Digital Classroom Management	2
2083243038	Real Analysis	3
2083243039	Mathematical Statistics	3

Semester 5

<b>Code</b>	<b>Course</b>	<b>Credits</b>
2083142040	Innovative Mathematics Learning	2
2083142041	Micro Teaching	2
2083143042	Numerical Method	3
2083142043	Ring Theory	2
2083143044	Linear Programming	3

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Code	Course	Credits
2083142045	Advance Real Analysis	2
2083143046	Complex Analysis	3
2083142047	Qualitative Research Methods	2
2083142048	Geometry Transformation	2

Semester 6

Code	Course	Credits
2083222003	Entrepreneurship	2
2083242050	Advanced Mathematics Study	2
	Elective Course 1	2
	Elective Course 2	2
	Elective Course 3	2
	Elective Course 4	2
	Elective Course 5	2

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Code	Course	Credits
	Elective Course 6	2
	Elective Course 7	2
	Elective Course 8	2

Semester 7

Code	Course	Credits
2083122001	Community Service Program (Real Work Lecture / KKN)	2
2083126002	An Introduction to Schooling Fields (Ministry of Health/Internship/PLP)	4
	Elective Course 9	2
	Elective Course 10	2

Semester 8

Code	Course	Credits
2083226004	Thesis	6

0 Appendix: Programme Learning Outcomes and Curricula

According to self-assessment report the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the bachelor program Science Education:

Program educational objectives

PEO 1	have competent to implement knowledge and skill in integrated science for solving global problems,
PEO 2	have integrity, work ethics, leadership, independent, collaborative, life-long learning,
PEO 3	be professional that have the ability to communicate effectively, adaptive, and innovative.

Program learning outcomes

Specialist competences	PLO 1	Demonstrate comprehensive knowledge of core concept in physics, biology, chemistry, and earth science
	PLO 2	Demonstrate integrated knowledge of natural sciences
	PLO 3	Demonstrate pedagogical knowledge of designing, implementing, evaluating learning
	PLO 4	Demonstrate knowledge about the functions and benefits of technology, especially information and communication technology for developing the quality of science education

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	PLO 5	Demonstrate knowledge related to science education research
<b>Specific skills</b>	PLO 6	Design, implement, and evaluate science learning using ICT
	PLO 7	Analyze and solve problems in science education through research with correct methodology and disseminate the results.
	PLO 8	Plan and manage resources in organizing classes, schools and educational institutions which are their responsibility, and comprehensively evaluate their activities
<b>Social Competencies: General skills and attitudes</b>	PLO 9	Are able to identify problems and apply logical and critical thinking in the context of science and technology
	PLO 10	Are able to communicate both oral and written effectively in scientific community
	PLO 11	Are able to be responsible for the achievement of independent and group work results
	PLO 12	Are able to organize data and information in science education-based entrepreneurship

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	PLO 13	Demonstrate human, cultural values and attitudes in professional-related task
	PLO 14	promote the quality improvement of life in society, nation, and state, and internalizing academic values, ethics, and entrepreneurship

The following **curriculum** is presented on the webpage:



0 Appendix: Programme Learning Outcomes and Curricula

**COURSE FLOW OF BACHELOR SCIENCE EDUCATION**

