MODULE HANDBOOK

MASTER PROGRAM OF BIOLOGY EDUCATION

(MP-BE)

https://fpmipa.upi.edu/program/master_biology_edu

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CURRICULUM OVERVIEW OF MP-BE

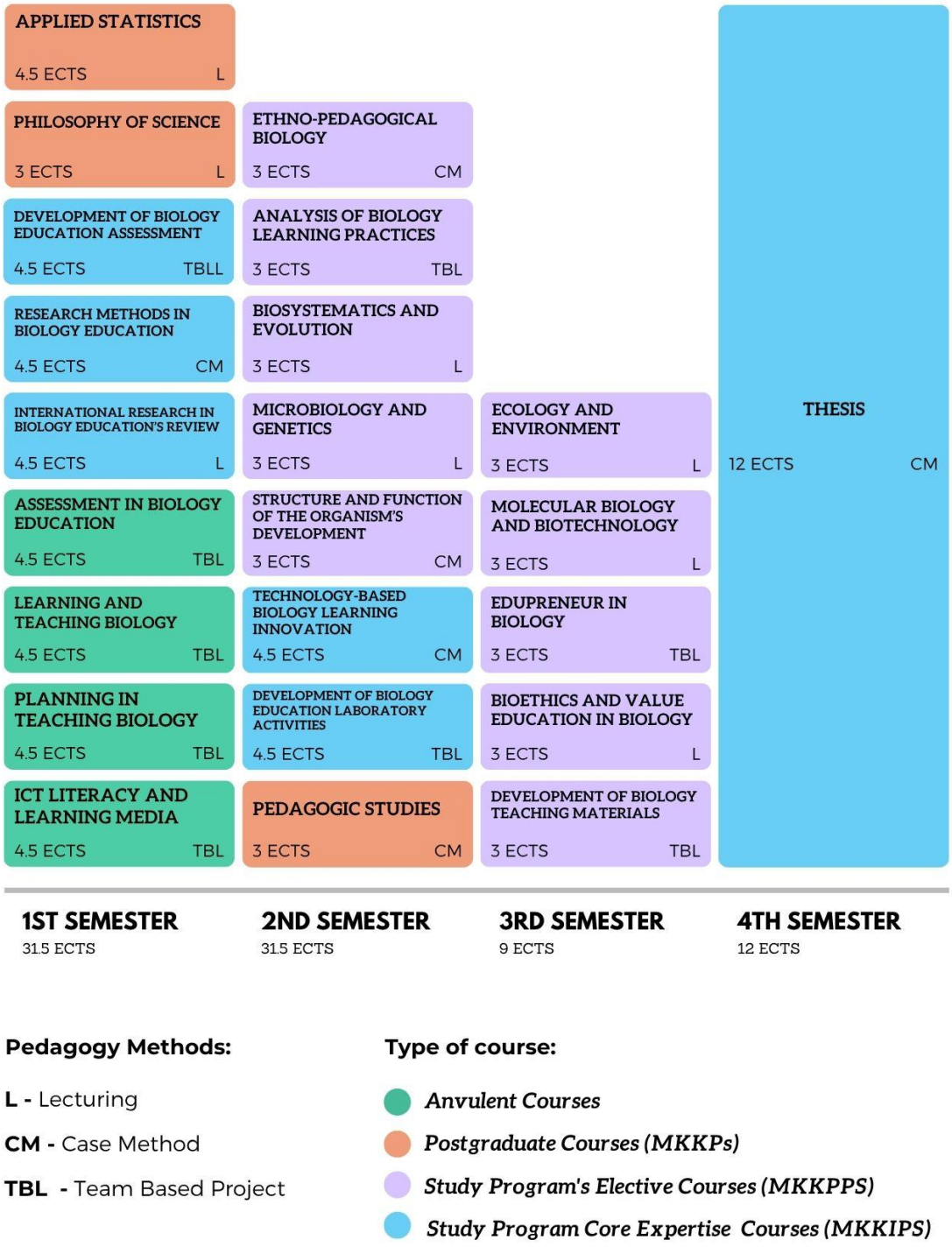

Figure 1. Courses Distribution of Curriculum 2018

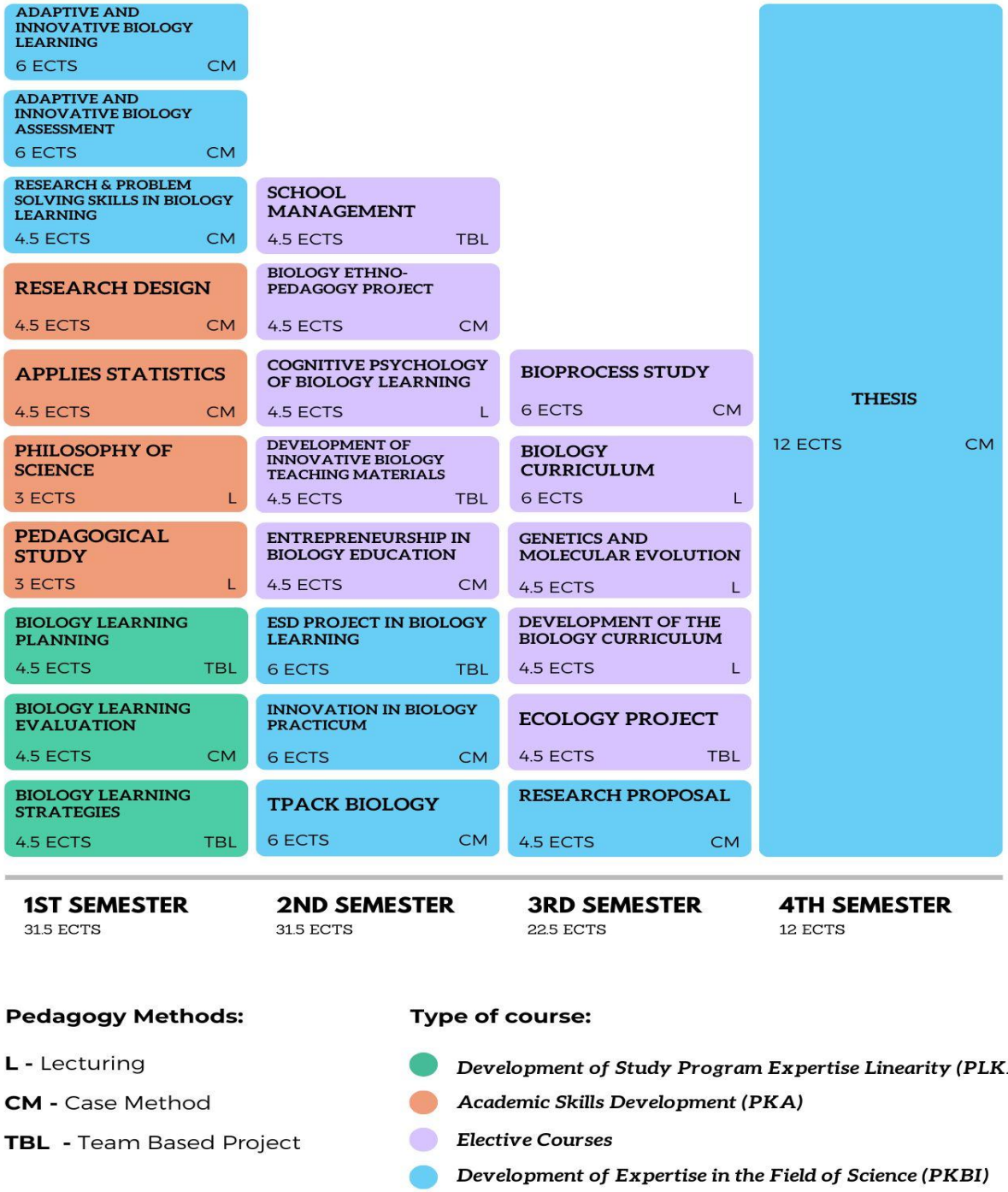

Figure 2. Courses Distribution of Curriculum 2023

Table 1. Distribution Curriculum Structure per Semester in Curriculum 2018 and 2023 of MP-BE

Semester	ECTS Credit Points			
	Students from Same Field		Students from Outside the Field	
	2018	2023	2018	2023
I	21.0	31.5	31.5	31.5
II	21.0	31.5	31.5	31.5
III	4.5	9	4.5	22.5
IV	12.0	12	12.0	12
Total	**58.5**	**84**	**76.5**	**97.5**

MODULE HANDBOOK

Curriculum 2018
MP-BE Courses
1st Semester

Module number PS701	**Module name** Statistics	
Course of study M.Pd. (Master of Education)	**Type of course** SPs Expertise Course	**Semester / Rotation** 1st /Odd Semester
Teaching methods Team-Based Project, Active Learning, Case Method	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workloud in hrs)** 3 **ECTS (+Workload in hrs)** 4,5 (100 contact hours in class+50 hours of self study (together 150 hours)
Module coordinator Prof. Dr. Yayan Sanjaya, M.Si		Semester week hours: 150 minutes
Additional teachers involved Dr. Rini Solihat, M.Si		

Syllabus

Statistics is a course that aims to develop students' abilities to apply their understanding of correct statistical data analysis techniques using descriptive and inferential approaches in accordance with proper statistical procedures. They should be able to utilize these skills in designing data collection, data processing, and interpretation, as well as be proficient in using statistical software/applications in biological education research

The course is conducted through active learning using team based project, active learning, and case method through analysis paper, presentation and discussion, and practice analyze data using application SPSS, Smart PLS, XLSTAT, and Visual PLS. The output of this course are paper with main focus in theory about data processing techniques and its applications in thesis research plan for each students. Assessment is conducted through portfolios, performance assessments, midterm exam, and final exams.

Learning goals and qualifications In this module students learn to:

- Able to design data collection techniques such as process, interpret, and present data in biology education research
- Able to identify and analysis object of their research plan, so it is appropriate when designing data collection such as process, interpret and present data
- Able to develop TPACK in biology education when designing data collection such as process, interpret, and present data
- Able to develop valid laboratory acitivities by using appropriate statistical procedures in biology education research
- Able to communicate results of biology education studies using appropriate statistical procedures

References:

1. **Moore, D. S., McCabe, G. P., & Craig, B. A. (2017).** *Introduction to the practice of statistics* (9th ed.). W. H. Freeman
2. **Newbold, P., Carlson, W. L., & Thorne, B. (2012).** *Statistics for business and economics* (8th ed.). Pearson Education
3. **Snedecor, G. W., & Cochran, W. G. (1989).** *Statistical methods* (8th ed.). Iowa State University Press
4. **Johnson, R. A., & Wichern, D. W. (2007).** *Applied multivariate statistical analysis* (6th ed.). Pearson Prentice Hall.
5. **Walpole, R. E., Myers, R. H., Myers, S. L., & Ye, K. E. (2011).** *Probability and statistics for engineers and scientists* (9th ed.). Pearson Education.
6. Suhendar, S., Widodo, A., Solihat, R., & Riandi, R. (2024). Forecasting Methods in Science Education: A Bibliometric Analysis Using the Scopus Database. KnE Social Sciences, 472-483.

Module number PS702	**Module name** Philosophy of Science	
Course of study M.Pd. (Master of Education)	**Type of course** SPs Expertise Course	**Semester / Rotation** 1st /Odd Semester
Teaching methods Active Learning, Case Method	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workloud in hrs)** 2 (90 hours) **ECTS (+Workload in hrs)** 3 (41.7 contact hours in learning + 48.3 hours of evaluation (together 90 hours))
Module coordinator Dr. Saefudin, M.Si		Semester week hours : 100 minutes
Additional teachers involved		

Syllabus

Philosophy of science is a course that aims to develop students' abilities to identify and discuss knowledge about the main concepts and principles in the philosophy of science through the concepts and principles, laws/rules of biology concerning: plasma membrane; protein synthesis; respiration and respiratory mechanisms in organisms; photosynthesis; cytoskeleton; systems: excretory, nervous, and hormonal; genes, DNA, chromosomes; biodiversity and conservation; habitat, ecological niche, ecosystem, and resources; inheritance and its mechanisms; biotechnology, through a presentation on a philosophy of science topic

The course is conducted through active learning and case method. Lecturer reviewed assignment who was tasked as a presenter, raising a discussion topic on the concepts and principles related to biology's material then students discussed case and reconstructed the essential concepts and built new ones; Under guidance of lecturer, students provided considerations and recommendations for the topic that raised a case. In the end, students and lecturers conducted an evoluation and reflection on the learning process. Synchronous learning is conducted through activities such as discussions and problem solving that stimulate students to analyze concepts and principles of biology materials and its philosophy. Asynchronous learning is conducted through assignments, allowing students to develop ICT literacy, communication skills, and collaboration. Assessment is conducted through portfolios, performance assessments, midterm exam, and final exams.

Learning goals and qualifications In this module students learn to:

- Able to identify course concepts and regulations in accordance with academic standards and the scope of the philosophy of science course
- Able to recognize the nature of the philosophy of science: its meaning, scope, object, and purpose
- Able to analyze the concepts and principles related to the structure and function of the plasma membrane system and its philosophy
- Able to analyze concepts and principles of protein synthesis and its philosophy
- Able to analyze the concept of respiration and respiratory mechanisms in organisms and its philosophy

- Able to analyze the concept of the cytoskeleton, its structure, and function, along with its philosophy
- Able to analyze the philosophical study of the excretory system
- Able to analyze the philosophical study of the nervous and endocrine systems
- Able to analyze the philosophical study of genes, DNA, and chromosomes in relation to inherited traits
- Able to analyze biodiversity and conservation, and their philosophical implications
- Able to analyze the concepts and principles of habitat, niche, ecology, ecosystem, and natural resources, and their philosophy
- Able to analyze the concepts and principles of inheritance and its mechanisms, and their philosophy
- Able to analyze the concepts and principles of biotechnology and its philosophy

References:

1. Mukhtar Latif.2016.*Orientation towards Understanding the Philosophy of Science*. Jakarta: Prenada Media Group
2. Campbell, N.A, J.B. Reece, L A. Urry, M.L. Cain, S.A. Wasserman, P.V. Minorsky, R.B. Jackson.2014.*Campbell biology*. New York: Pearson
3. Saefudin.,Permana, A., Amprasto. 2022. Field trips based on a focused strategy to stimulate the improvement of students' problem-solving skills on ecosystem materials. Jurnal Bioedukatika. doi.org/10.26555/bioedukatika.v10i1.20875

Module number BI761	**Module name** Development of Assessment Biology Education	
Course of study M.Pd. (Master of Education)	**Type of course** SPs Expertise Course	**Semester / Rotation** 1st/Odd Semester
Teaching methods Discussion, Lectures and Problem Solving	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workload in hrs)** 3 **ECTS (+Workload in hrs)** 4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)
Module coordinator Dr. Ana Ratna Wulan, M.Pd.		**Semester week hours:** 150 minutes
Additional teachers involved Dr. Siti Sriyati, M.Si.		

Syllabus

'Development of Assessment Biology Education' is a core study program expertise course with compulsory status. The learning outcomes of this course demonstrate scientific, educational, and religious attitudes and behaviors, that contribute to improving the quality of life in society, nation, and state based on academic norms and ethics in analyzing biology education assessments, evaluating, and synthesizing biology education assessments critically, systematically and sustainably in accordance with the development of science and technology, being able to integrate learning skills and innovate in developing biology education assessments to become lifelong learners, and being able to innovate in developing biology education assessments in accordance with the demands of 21st-century skills and industrial revolution 4.0.

The course material includes an introduction to learning assessment and evaluation, limited response assessments, essay assessment, science process skills assessment, science generic skills, assessment, reasoning assessment, assessment using the revised Bloom's taxonomy, standard tests, and item development, benchmarking PISA assessment and TIMSS, product and process performance assessment, attitude assessment, personal communication assessment, portfolio, and other communication assessment, and Biology learning assessment design.

The course process is carried out synchronously and asynchronously using constructivism, contextual, and problem-solving approaches, with assignment method, presentation, discussion, question and answer method. The assessment of this course is carried out on presentation reports, midterm, and final exams.

Learning goals and qualifications In this module students learn to:

- Able to understand the introduction to biology learning evaluation development courses (nature, principles, and scope).
- Able to analyze limited response assessments and essay assessments.
- Able to Identify and analyze the main characteristics of construction validity and instrument validity of the science process skills test in biology.
- Identify the main characteristics of the test of generic science skills in biology and describe the indicators of generic science process ability in Biology.
- Able to understand and make assessment reasoning.

- Able to understand and make standardized tests and problem-item development.
- Able to analyze PISA and TIMSS benchmarking assessments.
- Able to analyze and make product and process performance assessment.
- Able to analyze attitude assessment.
- Apply the concept and be able to analyze the personal communication assessment in biology teaching.
- Able to analyze portfolio assessments and other communications.

References:

1. Stiggins, R.J. 1994 (2011). Student-Centered Classroom Assessment.
2. Stiggins, R.J. & Chappuis, J. 2012. An Introduction to Student-Involved Assessment for Learning. Boston: Pearson.
3. Suskie, L. 2009. Assessing Student Learning: A Common Sense Guide. San Fransisco: Josses-Bass.
4. Butler, S.M. & McMunn, N.D. 2006. A Teacher's Guide to Classroom Assessment: Understanding and Using Assessment to Improve Student
5. Learning. San Fransisco: Josses-Bass.
6. Popham. 2011. Classroom Assessment: What Teachers Need to Know. Boston: Pearson.
7. Wulan, A.R. (2020). Menggunakan Asesmen Kinerja untuk Pembelajaran Sains dan Penelitian. Bandung: UPI PRESS

Module number BI701	**Module name** Research Method	
Course of study M.Pd. (Master of Education)	**Type of course** SPs Expertise Course	**Semester / Rotation** 1st/Odd Semester
Teaching methods Team-Based Project, Active Learning, Case Method	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workload in hrs)** 3 **ECTS (+Workload in hrs)** 4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)
Module coordinator Prof. Dr. Hj. Nuryani Rustaman, M.Pd.		**Semester week hours:** 150 minutes
Additional teachers involved Dr. Rini Solihat, M.Si		

Syllabus

'Research Method' is a course that which students will identify, study, and discuss knowledge about the basic principles of education-based educational research (especially biology education), both quantitative research, as well as qualitative research and other methods (naturalistic and/ or field); present the result of the study in the form of a comparison of educational research methods, and an example of one method in depth; analyzing a number of educational journal articles of interest as a basis for determining research focus and research methods in preparing pre-proposal

The course explores a wide array of topics encompassing the material: qualitative method, survey, ethnography, experimental method, comparative, correlational, classroom action research, research and development (RND), and mixed-method.

The teaching methods adopted in this course are designed to facilitate a comprehensive and situational understanding. These methods include team-based projects, active learning, and the case method. Team-based projects provide students with the opportunity to collaborate with their group members to discuss various types of educational research methods and to analyze the use of these methods in international articles. Active learning enables students to learn independently to acquire knowledge. The case method provides students with the opportunity to find alternative solutions to problems presented within the scope of educational research methods. Students are evaluated based on student activities, group assignments, individual pre-proposal design assignments, midterm exams, and final exams.

Learning goals and qualifications In this module students learn to:

- Able to analyze problems, the nature and characteristics of educational research, and ethics in research
- Able to examine the role of educational research and types of educational research
- Able to choose research methods, designs, and international study sources that support research plans appropriately.

- Able to choose research methods (experimental, qualitative, survey) design and international study sources that support the research plan appropriately.
- Able to choose research methods (comparative, correlational, historical, and research & development) design and international study sources that support the research plan appropriately.
- Able to choose research methods (ethnography, classroom action research, and mixed-method) design and international study sources that support the research plan appropriately.
- Able to present a draft research plan based on an appropriate study of research methods, designs, and international study sources that support the research plan.
- Present a pre-draft thesis proposal

References:

1. PERATURAN REKTOR UNIVERSITAS PENDIDIKAN INDONESIA NOMOR 7867/UN40/HK/2019 TENTANG PEDOMAN PENULISAN KARYA ILMIAH UPI TAHUN 2019
2. Fraenkel & Wallen, 1990. How to Design and Evaluate Research Education, New York: Mc. Grawhill
3. Creswell, J. W., & Guetterman, T. C. (2019). Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research. New York: Pearson.

Module number BI706	**Module name** Study of International Research Results in Biology Education	
Course of study M.Pd. (Master of Education)	**Type of course** SPs Expertise Course	**Semester / Rotation** 1st/Odd Semester
Teaching methods Active Learning & Student-Centered Learning	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Assignment analysis (30%) Assignment synthesis product (45%)		**SKS (+Workload in hrs)** 3 **ECTS (+Workload in hrs)** 4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)
Module coordinator Prof. Widi Purwianingsih, M.Si.		**Semester week hours:** 150 minutes
Additional teachers involved Prof. Riandi, M.Si.		

Syllabus

'Study of International Research Results in Biology Education' is a course to intended for students to have the ability to access information in the form of a number of articles on biology education research results from international journals with certain themes of interest, analayze these research articles and report the results of their analysis in a nroef form; so that later it can be used as a basis for their thesis research.

The scope of this course includes searching for information in the form of biology education research articles from the latest international journals (the last five years) on the internet, collecting eight articles that support a particular theme, analyzing the articles that have been collected, reporting writing the results of the article analysis for a maximum of two pages and presenting one title of the analysis report so that it is clear to understand the content, strengths and weakness of the research.

The teaching method adapted from this course is centered on active student activities to explore information on the results of global (international) biology education research studies independently. Active learning and student-centered learning methods provide opportunities for students to analyze research findings that are in accordance with the focus of their research interests as the basis for their thesis research. Students are evaluated based on their findings in the analysis assignment, presentation of the main article, and synthesis of the article into a new whole article based on their findings. This evaluation method ensures consistent student understanding and progress throughout the program.

Learning goals and qualifications In this module students learn to:

- Able to search for reputable scientific articles.
- Identify elements of scientific articles that meet scientific criterica that can be justified
- Able to distinguish between library review articles and research articles
- Able to identify the essential parts of an article
- Able to analyze articles and communicate the results of the analysis in written and oral form
- Able to synthesize a number of articles inton one paper by raising a certain theme related to biology education.

References:

1. American Biology Teacher. https://online.ucpress.edu/abt
2. Internataional Journal of Science Education. https://www.tandfonline.com/journals/tsed20
3. Journal of Biology Education.
4. A Reputable international journal with an ISSN that publishes research articles on biology education published in the last five years.
5. Universitas Pendidikan Indonesia. (2019). Pedoman Penyelenggaraan Universitas Pendidikan Indonesia
6. Purwianingsih, D., Rochintaniawati, D., Riandi, Sriyati, S., Widodo, P. A. Pengembangan Pembelajaran berbasis STEM untuk Membangun Keterampilan Rekayasa dan Literasi Teknologi Siswa SMP.
7. Purwianingsih, W. Pembekalan Technological Pedagogical Content Knowledge (TPACK) terintegrasi Education for Sustainable Development (ESD) Bagi Calon Guru Boiologi Melalui Mata Kuliah Kapita Selekta.

Module number BI204	**Module name** Biology Learning Evaluation	
Course of study M.Pd. (Master of Education)	**Type of course** Matriculation Course	**Semester / Rotation** 2nd/Even Semester
Teaching methods Active learning, Collaborative learning, Case method	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workloud in hrs)** 3 **ECTS (+Workload in hrs)** 4,5 (100 contact hours in class+50 hours of self study (together 150 hours)
Module coordinator Dr. Ana Ratna Wulan, M.Pd		Semester week hours: 150 minutes
Additional teachers involved		

Syllabus

'The Biology Learning Evaluation' is a course that aims to develop students' abilities principle understanding of educational evaluation, encompassing: mastery of assessment objectives and functions; the role of evaluation in teaching and learning processes; evaluation procedures and forms; assessed competencies; planning, development, and analysis of test items, test validity and reliability (concepts and process skills); processing assessment results; performance assessment, including portfolios and practical assessment; and classroom-based assessment.

The course is conducted through active learning through analysis, presentation and discussion. Learning activities conducted with student present a real word case about materials relevan with biology learning evolution then lecturer conduct class discussion, student reconstruct essential concepts and build new ones, students provide considerations and recommendations for improving instrument raised as a case, in the end students and lectures conduct evaluation and reflection of learning.The output of this course is several types of assesment instruments to asses biology evaluation in school. Teaching media used include Zoom, LCD, powerpoint. Assessment is conducted through portfolios, performance assessments, and final exams.

Learning goals and qualifications In this module students learn to:

1. Able to understand characteristics and purposes of formative and summative assesment, assesment process models, and measurement procedures
2. Able to understand and create assesment procedures and tools for cognitive domain Bloom taxonomy (C1-C6) that are relevant to learning objectives
3. Able to compare cognitive levels according Bloom's taxonomy and Bloom's revised taxonomy (C1, C5, C6)

4. Able to create test items for specific topics and grade levels: essay and objective
5. Able to process assessment results such as essay or objective, and ranks
6. Able to develop non-test instruments for performance and practical assessment.
7. Able to analyze performance/alternative assessment and process assessment
8. Able to analyze science process assessment (characteristics and types of science process skills)
9. Able to analyze and create assessment of process skills in biology learning.
10. Able to analyze and create portfolio assessment analysis in biology learning practice.
11. Able to analyze and create analysis of item validity and reliability
12. Able to analyze and create analysis of classroom-based assessment, summarizing, and reflection.

References:

1. Anderson, L.W., & Krathwohl, D.R., Eds. (2001). *A Taxonomy for Teaching and Learning: A Revision of Bloom's Taxonomy of Educational Objectives.* New York: Macmillan College Publishing Company. Section II: Chapter 3-5
2. Arikunto, S. (2003). *Dasar-dasar Evaluasi Pendidikan*. Jakarta: Bumi Aksara
3. Rustaman, N.Y. (2009). *Penilaian Pendidikan IPA.* Draf buku Teks Sekolah Pascasarjana UPI. Bandung: Rosda Karya
4. Sudjana, N. (1989). *Penilaian Hasil Proses Belajar Mengajar*. Bandung: Rosda Kary
5. Wulan, A.R. (2008). "*Inovasi Penilaian Kinerja melalui penggunaan Rubrik Sederhana*". Mimbar Pendidikan
6. S S Nurhijah1*, A R Wulan1, and S Diana. 2020. Implementation of formative assessment through oral feedback to develop 21st century critical thinking skills of student on plantae learning. *Journal of Physics: Conference Series* 1521 (2020) 042021 IOP Publishing doi:10.1088/1742-6596/1521/4/04202
7. Harlen, W.1983. *Guide to Assessment*: Science.
8. Zainul, A.2001. *Alternative Assessment*. Jakarta: Pusat Antar Universitas (PAU) Universitas Terbuka

<table>
<tr><td>Module number
BI106</td><td colspan="2">Module name
Learning and Teaching Biology</td></tr>
<tr><td colspan="2">Course of study
M.Pd. (Master of Education)</td><td>Type of course
Aanvullen Course</td><td>Semester / Rotation
1st/Odd Semester</td></tr>
<tr><td colspan="2">Teaching methods
Discussion, Presentation, Problem Solving</td><td>Prerequisites for attendance
None</td><td>Language
Indonesian, English</td></tr>
<tr><td colspan="3">Type of examination (Final Grade Composition)

Students Activity process (25%)
Midterm Exam (25%)
Assignment Product (20%)
Final Exam (30%)</td><td>SKS (+Workloud in hrs)
2 (90 hours)

ECTS (+Workload in hrs)

3 (41.7 contact hours in learning + 48.3 hours of evaluation (together 90 hours))</td></tr>
<tr><td colspan="3">Module coordinator
Dr. Mimin Nurjhani Kusumastuti, M.Pd</td><td>Semester week hours :
100 minutes</td></tr>
<tr><td colspan="4">Additional teachers involved</td></tr>
<tr><td colspan="4">Syllabus

‘Learning and Studying Biology’ is a course that falls under the category of subject-specific learning skills courses, which is mandatory for all undergraduate biology education students. The learning process is designed to equip students with the knowledge and experience necessary to develop biology learning. The course materials cover science education standards (Biology), teacher competencies and duties, 21st-century student characteristics, 21st-century skills, characteristics of 21st-century biology learning/ industry 4.0, epistemology and the nature of biology in biology learning, developments in biology and challenges in biology learning, curriculum and taxonomy of learning objectives (Bloom’s Taxonomy), Principles of pedagogical content knowledge (PCK), analysis of basic competencies and workshops on developing learning objectives/ indicators, learning materials, designing learning experiences, designing learning strategies (determining approaches, methods, models, learning media), science process skills, and developing instruments for assessing learning processes and outcomes. The course is conducted through expository strategies, workshops, presentations, discussions, and case studies. during workshops, students learn and complete tasks individually. Case study learning involves group assignments where students visit high schools to observe the biology learning process in the classroom and conduct interviews on how teachers manage the classroom and/ or biology laboratory activities.

This course employs a pedagogical approach that incorporates discussions, presentations, and problem-solving activities. This allows students to engage in deep discussions about learning and teaching biology, as well as to explore and address educational challenges encountered in real-world teaching contexts.</td></tr>
<tr><td colspan="4">Learning goals and qualifications In this module students learn to:
- Able to create learning plans and develop ideas for creating learning plans for biology learning and teaching courses.
- Able to analyze the characteristics of biology learning</td></tr>
</table>

- Able to analyze characteristics of junior and senior high school students
- Able to analyze the duties of biology teachers
- Able to analyze explanations and discussion about science/ biology curricula for junior and senior high school
- Able to explain and analyze the objectives in biology learning by applying critical and creative thinking
- Able to explain and analyze biology learning materials.
- Able to explain and analyze biology learning experiences by developing creative ideas and concepts
- Able to practice determining and developing learning experiences aligned with learning objectives and the characteristics of biology concepts.
- Able to analyze biology teaching approaches and methods
- Able to analyze lesson plans and learning unit.

References:

1. Departemen Pendidikan Nasional (2003) Kurikulum SMP
2. Departemen Pendidikan Nasional (2003)Kurikulum SMA
3. Nuryani Rustaman (2003), Strategi Belajar Mengajar Technical Cooperation JICA.
4. Grondlund, N.E(1970), Stating Behavioral Objectives for Classroom Instruction, London: Collier-McMillan Ltd Cole,
5. P.G & Chan L.K.S(1994) Teaching Principles and Practice, 2 nd ed. New York Prentice Hall.
6. Warsita, A.N., Kusumastuti, M.N.., Shintawati R. 2018. Hubungan Penguasaan Konsep dengan Kemampuan Menilai Kredibilitas Sumber Informasi Menggunakan Problem Based Learning (PBL) pada Materi Pencemaran Lingkungan. Assimilation: Journal of Biology Education.

Module number BI318	**Module name** Biology Instructional Plan	
Course of study M.Pd. (Master of Education)	**Type of course** Aanvullen Course	**Semester / Rotation** 1st/Odd Semester
Teaching methods Student Centered Learning	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workloud in hrs)** 2 (90 hours) **ECTS (+Workload in hrs)** 3 (41.7 contact hours in learning + 48.3 hours of evaluation (together 90 hours))
Module coordinator Dr. Mimin Nurjhani Kusumastuti, M.Pd.		Semester week hours : 100 minutes
Additional teachers involved Dr. Kusnadi, M.Si		

Syllabus

'Biology Instructional Plan' is a course that is categorized as a subject-specific learning skills course, a mandatory requirement for all undergraduate biology education students. The learning process is designed to equip students with the knowledge and experience necessary to develop and implement biology learning activities. Course materials cover the analysis of basic competencies to formulate learning outcomes, the development of learning materials aligned with learning objectives and based on learning experiences suitable for the characteristics of the material and learning objectives, learning models, classroom management, and laboratory activity management, media, and learning assessment, and the development of instructional plans. The course concludes with reflections on simulated teaching activities and observations of teaching activities conducted in schools to enrich insights and experiences for planning and implementing biology learning that is aligned with the nature of science, realistic, and enjoyable.

Learning goals and qualifications In this module students learn to:

- Able to describe the concepts, principles, and theories of biology instructional plan
- Able to develop detailed and systematic semester and annual programs for the schhol
- Able to develop detailed and systematic semester and annual programs the school and can simulate the design of biology semester/ learning programs into teaching
- Able to understand the characteristics, stages, and requirements of practical/ experimental and inquity-based learning
- Able to understand the characteristics, stages, and requirements of advanced environmental-based learning
- Able to assess instructional plans/ learning modules based on the environment according to the biology curriculum
- Able to analyze and evaluate learning modules based on distance learning
- Able to implement lesson plans in the classroom for the biology teaching

References:

1. Kusnadi, Rustaman N., Redjeki, S., Analisis kemunculan keterampilan spesifik lab mikrobiologi melalui pembelajaran mikrobiologi berbasis proyek inkuiri “mini-riset” mahasiswa biologi. Jurnal Pengajaran MIPA, Volume 17, Nomor 1, April 2012, hlm. 53-59, diakses pada: https://ejournal.upi.edu/index.php/jpmipa/article/view/36052
2. Latfia, S.E., Kusumastuti, M. N., Hamdiyati, Y., 2022. The correlation between critical thinking skills of junior high school students with decision-making on the use of plastic bags. *Assimilation: Indonesian Journal of Biology Education* ISSN 2621-7260 (Online), diakses pada: https://ejournal.upi.edu/index.php/asimilasi
3. Sriyati,S., Widodo, A., Riandi, Purwianingsih, W., Solihat, R., Rochintaniawati, D., dan Eliyawati. Upaya Meningkatkan Kemampuan Guru-guru SMA dalam Mendesain RPP berbasis Education for Sustainable Development (ESD) pada Pembelajaran Biologi Melalui Pelatihan. . J *Pengabdian Isola 2 (2) (2023) Jurnal Pengabdian Isola*, diakses pada: http://ejournal.upi.edu/jpi
4. Warsita, A., N., Kusumastuti, M. N., Shintawati, R. 2018. Hubungan Penguasaan Konsep dengan Kemampuan Menilai Kredibilitas Sumber Informasi Menggunakan Problem Based Learning (PBL) pada Materi Pencemaran Lingkungan. Assimilation: Indonesian Journal of Biology Education 1(1): 1-7. Diakses pada: https://ejournal.upi.edu/index.php/asimilas

Module number BI106	**Module name** Learning and Teaching Biology	
Course of study M.Pd. (Master of Education)	**Type of course** Aanvullen Course	**Semester / Rotation** 1st/Odd Semester
Teaching methods Discussion, Presentation, Problem Solving	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workloud in hrs)** 2 (90 hours) **ECTS (+Workload in hrs)** 3 (41.7 contact hours in learning + 48.3 hours of evaluation (together 90 hours))
Module coordinator Prof. Dr. Riandi, M.Si		Semester week hours : 100 minutes
Additional teachers involved ….		

Syllabus

'Aanvullen Course' equips prospective teachers and education personnel with the knowledge of information and communication technology (ICT) literacy and biology learning media, with a focus on the following: 1) basic concept of ICT and literacy in education, the urgency and position of ICT in the 21st-century education framework; 2) concepts, principles, and characteristics of biology learning media; 3) computer and internet user security systems, as well as legal, ethical, and social issues related to ICR use; 4) the utilization of ICT In education and trends in 21st-century biology learning media innovation; 5) the procedures for selecting and developing conventional and digital learning media; 6) basic photography techniques; 7) designing learning media and simulating them in learning; and 8) entrepreneurship in the field of learning media. The learning process emphasizes students' activities through discussions, analyses, problem-solving, designing, and simulating learning media. Discussion on issues and feedback on learning media products are conducted collaboratively by lecturers and students, concluding with an elaboration of the course material by the lecturer.

Learning goals and qualifications In this module students learn to:

- Able to analyze the basic principles, definitions, and types of learning media.
- Able to analyze the characteristics and select biology learning media
- Able to analyze the characteristics od junior and senior high school students in relation to media
- Able to analyze the role of learning media in achieving biology learning objectives
- Ab le to design and communicate biology learning media

References:

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2. Seri Pustaka Teknologi pendidikan No.6, C.V Rajawali, Jakarta.
3. Departemen Pendidikan Nasional. (2006). Kurikulum Tingkat Satuan Pendidikan (KTSP) untuk SMP
4. Departemen Pendidikan Nasional. (2006). Kurikulum Tingkat Satuan Pendidikan (KTSP) untuk SMA.
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6. Education Company.
7. Nana Sudjana dan Ahmad Rivai. (2005). Media Pengajaran, Penggunan dan Pembuatannya. Sinar Baru Algensindo, Bandung.
8. Nuryani Y. Rustaman, Soendjojo DS, Suroso AY, Yusnani Achmad, Ruchyi Subekti, Diana R, Mimin NK. (2003). Srategi Belajar
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Curriculum 2018
MP-BE Courses
2nd Semester

Module number BI704	**Module name** Analysis of Biology teaching practices	
Course of study M.Pd. (Master of Education)	**Type of course** Specialized Course within Master Program	**Semester / Rotation** 1st/Odd Semester
Teaching methods Team based Project, Active learning, Case Method	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workload in hrs)** 3 **ECTS (+Workload in hrs)** 4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)
Module coordinator Prof. Dr. Hj. Diana Rochintaniawati, M.Ed		**Semester week hours:** 150 minutes
Additional teachers involved Dr. Mimin Nurjhani Kusumastuti, M.Pd. Dr. Eni Nuraeni, M.Pd		
Syllabus 'The Analysis of Biology Teaching Practices" is a course that aims to develop students' abilities to apply educational theories and principles to review and analyze real-world cases of biology education in secondary schools within their respective environments. Students will identify strengths, weaknesses, limitations, and challenges faced in these cases, and propose strategies to improve the quality of biology education in these schools. This will be achieved through the development of educational theories or principles constructed from field findings. Synchronous learning is conducted through lectures, discussions, and assignment while asynchronous learning involves independent activites such as analyzing various articles on observations and related scope; collaborative acitivities include creating presentations on observation and identifying focus of observation. Output of this course is paper that analyze the results of observation and all of discussion that have been conducted. Students' mastery level is assessed through written tests (mid-term and final exams) and other relevant tests.		
Learning goals and qualifications In this module students learn to: - Students able to analyze trends in biology learning and area of observation - Students able to act as observers and determining the focus of observation - Students able to propose their observational focus after conducting an initial observation of the school or group to be observed - Students able to present their observational focus according to their preferred field of study - Students able to identify problems in the field and formulate them into observational focus - Students able to determine the observational focus based on the problems found in the field.		

- Students able to create an observational focus based on problems found in the field.
- Students able to report the results of observations on the identified problems in the school
- Students able to create a report on the results of observations of learning conducted in high schools based on their focus of study
- Students able to present the results of observations on biology learning problems in schools.
- Students can report results of observations on learning conducted in high school based on their focus of study

References:

1. Babbie,E. (1983). *The Practice of Social Research. Belmount*: Wadsworth Publishing Co. (Chapter 10: Field Research).
2. Yin,R.K. (1984). *Case Study Reseacrh Design and Methods*.London: SAGE Publications. (http://nerve berkeley.edu/abstracts/MDS-263/MDS-FIELD.html (2002). Field Study Methods).
3. McMillan, J.H. and Schumacher, S.(2001). *Research in Education: A Conceptual Introduction*.New York: Addison Wesley Longman

Module number BI713	**Module name** The Biosystematics and Evolution	
Course of study M.Pd. (Master of Education)	**Type of course** Specialized Course within Master Program	**Semester / Rotation** 1st/ Odd Semester
Teaching methods Active Learning, Collaborative Learning	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workload in hrs)** 3 **ECTS (+Workload in hrs)** 4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)
Module coordinator Prof. Topik Hidayat, M.Si., Ph.D.		**Semester week hours:** 150 minutes
Additional teachers involved -		

Syllabus

'The Biosystematics and Evolution' is a course that aims to develop students' abilities to have an overview, understanding, and reasoning ability about the diversity of tropical organisms and their relationships (evolution). Students' understanding and reasoning abilities are developed through discussions, presentations, and assignments. The course is conducted with student presents a case study on the diversity of tropical organisms, lecture and students elaborate the concept, lecturer and students evaluate and reflect on the session. The output of this course is a paper that analyse urgency of studying topics related to biodiversity and evolution and how to teach effectively these subjects. Students' mastery level is assessed through written tests (mid-term and final exams) and other relevant tests.

Learning goals and qualifications In this module students learn to:

- Able to apply concepts of introduction and explanation of biosystematics and taxonomy
- Able to apply concepts of tropical organism diversity
- Able to apply concepts and principles of systematic biology, taxonomy, and evolution.
- Able to apply concepts of tropical organism diversity
- Able to apply concepts of tropical organism diversity in relation to mutation and genetic variation
- Able to apply concepts and principles of systematic biology, taxonomy, and evolution
- Able to analyze the concept of parthenogenesis and evolution
- Able to analyze the concepts of homology and homoplasy
- Able to analyze the concepts of ontogeny and phylogeny
- Able to analyze concepts and principles of molecular systematics or phylogenetics.
- Able to analyze concepts and principles of numerical taxonomy
- Able to identify and classify organisms through phenetic and cladistic/phylogenetic analysis and

interpret the results.
- Able to analyze bioinformatics and DNA barcoding

References:

1. Claverie, JM and Notredame, C (2003) Bioinformatics for dummies. New York: Wiley Publishing Inc
2. Hidayat, T dan Pancoro, A (2006) Biosistematika molekuler. Bandung: ITB
3. Hidayat, T (2005) Systematics study of subtribe Aeridinae (Orchidaceae). Tokyo: The University of Tokyo
4. Hidayat, T (2017) Supplemen Taksonomi Numerik. Bandung: Departemen Pendidikan Biologi UPI
5. King, M (1995) Species evolution. Cambridge University Press
6. Li, AH and Graur, D (1991) Fundamentals of molecular evolution. Massachusetts: Sinauer Associates Inc
7. Panchen, AL (1994) Classification evolution and the nature of biology. Cambridge University Pres
8. Stacey, CA (1989) Plant taxonomy and biosystematics. London: Edward Arnold

Module number BI763	**Module name** The Biology Education Laboratory Activity Development	
Course of study M.Pd. (Master of Education)	**Type of course** Core Expertise Course of Study Program	**Semester / Rotation** 2nd/Even Semester
Teaching methods Team-Based Project, Active Learning, Case Method	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workload in hrs)** 3 **ECTS (+Workload in hrs)** 4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)
Module coordinator Dr. Bambang Supriatno, M.Si		**Semester week hours:** 150 minutes

Additional teachers involved

Prof. Dr. Hj. Widi Purwianingsih, M.Si

Dr. Kusnadi, M.Si

Dr. Amprasto, M.Si

Syllabus

'The Biology Education Laboratory Activity Development' is a course that aims to develop students' abilities in laboratory management, particularly in practical work and experimentation, especially for the study of school biology concepts. The course material includes; 1) practical work and reconstruction of laboratory activities; 2) the creation of laboratory activity designs; 3) the optimization and development of laboratory practical equipment; 4) the development of field trip activites; and 5) laboratory safety.

The course is conducted through active learning using inquiry and constructivist approaches through analysis, presentation and discussion, practical work, experiments and investigation, and field trip. The output of this course are the design of reconstructed laboratory activities and new laboratory activities development of specific competencies that can be published. Teaching media used include Zoom, LCD, live/ preserved specimens, etc. Assessment is conducted through portfolios, performance assessments, and final exams.

Learning goals and qualifications In this module students learn to:

- Able to understand the general picture of school laboratory practicums, the meaning and purpose of practicums, and the scope of the biology education laboratory activity development course.
- Able to analyze the quality of practical activities based on trial results and synthesize the quality of field/ school practical activities based on the analysis results.
- Able to make decisions and provide solutions based on decisions made regarding practical errors in laboratory activity design.
- Able to master the minds-on process through TPACK in practical activites and the ability to make joint decisions based on minds-on errors in practicums.
- Able to develop instruments for the analysis of laboratory activity design.

- Able to understand Bloom's taxonomy through concept analysis and analysis of laboratory design practices.
- Produces a laboratory design research instrument based on the Vee Diagram
- Produces a laboratory activity design instrumen based on the results of Novak and Gowin's knowledge construction
- Communicates the results of the analysis on the sampled Laboratory Activity Design.
- Writes and published scientific articles based on the results of the sampled Laboratory Acitvity Design.
- Communicates the results of the sampled Laboratory Activity Design research both orally and in writing. Writes scientific publications based on the results of the sampled and reconstructed Laboratory Activity Design.

References:

1. Kwan L.P., Eric Y.K. Lam, Chritine.Y.P.Lee. 2007. Biology Matters Practical Book. Marshal Cavendish Education. Singapore.
2. Leslie R., Dawn Gleeson, Jane McCodey, Marjory Martin, Judith Kinnear.2006. Nature of Biology. Activity Manual. 3th ed . John Wiley & Son Australia Ltd. Milton
3. Millar et al, 2004. The role of practicalwork in the teaching and learning of science. Washington, DC : National Academy of Sciences
4. Novak, Joseph,D. &D. Bob. Gowin .1984. Learning How to Learn.Cambridge UK : Cambridge University Press.
5. Stephen M. Rybczynski. Elisabeth E. Schussler, 2007. Effects of Instructional Model on Student Attitude in an Introductory Biology Laboratory.

Module number BI714	**Module name** Ethno-pedagogy of Biology	
Course of study M.Pd. (Master of Education)	**Type of course** Specialized Course within Master Program	**Semester / Rotation** 1st/ Odd Semester 2nd/Even semester
Teaching methods Active learning, Collaborative learning, Field lecture, problem solving	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workload in hrs)** 3 **ECTS (+Workload in hrs)** 4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)
Module coordinator Dr.Hj. Siti Sriyati, M.Si		**Semester week hours:** 150 minutes
Additional teachers involved: -		

Syllabus

'The Ethnopedagogy of Biology' is a course that provides a foundational understanding of ethnopedagogy, encompassing the mastery of its concepts and framework, the role of ethnopedagogy in biology education and research, ethnobiology (ethnobotany and ethnozology), indigenous science and local wisdom, science literacy in specific cultural contexts, design of learning materials based on local wisdom and science literacy, and the design of science literacy assessments based on spesific cultural contexts. The lecture begins with the lecturer conducting an aperception of the lesson. The lecturer then checks the assignments. Students will search for literature on indigenous science and local wisdom in specific cultures, students assigned as the presenter will communicate a case related to indigenous science and local wisdom, students and lecturer will elaborate on the concept, then students and lecturer will conduct an evaluation and reflection. The output of this course are a paper about indigineous knowledge and the relevance to biology materials that exist in student's region. Teaching media used include Zoom, LCD, PPT, etc. Assessment is conducted through student activity process, midterm exam, and assignment product.

Learning goals and qualifications In this module students learn to:

- Able to explain the scope of ethnopedagogy
- Able to describe the extent and boundaries of ethnopedagogy
- Able to explain and provide examples of the role of ethnopedagogy in biology education
- Able to anlyze phenomena related to indigenous science and local wisdom in spesific cultures
- Able to synthesize phenomena related to indigenous science and local wisdom in spesific cultures
- Able to summarize core values of education based on indigenous science and local wisdom
- Able to communicate phenomena related to indigenous science and local wisdom
- Able to compare concepts of ethnobotany and ethnozoology and provide examples of ethnobiology in education

- Able to analyze scientific aspects of their field trip to Kampung Naga
- Able to analyze how to observed scientific knowledge can be applied in teaching using the 2013 Curriculum or the Merdeka Curriculum
- Able to communicate the findings of their field trip to Kampung Naga and analyze the scientific aspect

References:

1. Achyani, (2010). Penyusunan Bahan Ajar berbasis Kearifan Lokal dalam Ekosistem. Disertasi Doktor Kependidikan Program Studi Pendidikan IPA, Sekolah Pascasarjana UPI
2. Alwasilah, A.C., Suryadi, K., & Karyono, T. (2009). Etnopedagogi: Landasan Pokok Pendidikan dan Pendidikan Guru. Bandung: Kiblat dan UPI Press.
3. Alwasilah, A.C., Suryadi, K. & Karyono, T. (2010). Ethnopedagogy bagi Indonesia yang Multicultural: Suara Hati. Makalah disajikan pada Seminar International ethnopedagogi di Bandung
4. Djulia, E. (2005). Peran Budaya Lokal dalam Pembentukan Sains: Studi Naturalistik Pembentukan Sains Siswa Kelompok Budaya Sunda tentang Fotosintesis dan Respirasi Tumbuhan dalam Konteks Sekolah dan Lingkungan Pertanian. Disertasi Doktor Kependidikan Program Studi Pendidikan IPA, Program Pascasarjana UPI.
5. Phenix, P.H. (1986). Realm of Meaning: A Philosophy of the Curriculum for General Education. Ventura County Superintendent of Schools Office
6. Sudiatmika, A.A.I. (2010). Alat Ukur Literasi Sains dalam Konteks Budaya Bali untuk siswa SMP. Disertasi Doktor Kependidikan Program Studi pendidikan IPA, Sekolah Pascasarjana UPI
7. Suratno, T. (2010). Memaknai Etnopedagogi sebagai Landasan Pendidikan Guru. Paper presented at International on Teacher Education, Indonesia University of Education in Bandung
8. Rustaman, N.Y., (1990). Kemampuan Klasifikasi Logis Anak: Studi tentang Kemampuan Abstraksi Anak SD dari Kelompok Budaya Sunda. Disertasi Doktor Kependidikan Program Studi Pendidikan IPA, Fakultas Pascasarjana IKIP B
9. Fadilah, S.I., Sriyati S., Tirawan Tb., 2023. Kajian Dieng Culture Festival sebagai Implementasi Etnopedagogi Materi Biologi pada Kurikulum Merdeka. Biodk: Jurnal Ilmiah Pendidikan Biologi ISSN 2580-0922 (online), ISSN 2460-2612 (print) Volume 09, Nomor 04, Tahun 2023, Hal. 80-94

Module number BI712	**Module name** Microbiology and Genetics	
Course of study M.Pd. (Master of Education)	**Type of course** Specialized Courses within Master Program	**Semester / Rotation** 1st/Odd Semester
Teaching methods Discussion, Discovery Learning	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workload in hrs)** 3 **ECTS (+Workload in hrs)** 4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)
Module coordinator Prof. Dr. H. Riandi, M.Si		**Semester week hours:** 150 minutes
Additional teachers involved Dr. Yanti Hamdiyanti, M.Si		

Syllabus

'Microbiology and Genetics' is a course that aims to provide a foundational understanding of microorganisms and their applications in various aspects of life. It covers the substance of heredity and genetic information transfer, chromosomal and gene mutations, bacterial and viral genetics, DNA manipulation, and population genetics as an introduction to evolution. The course is delivered through lectures, discussions, problem-solving, and assignments and includes the examination of research findings from relevant journals, as well as the creation of animated media or written papers related to the course material.

Learning goals and qualifications In this module students learn to:

- Able to analyze the concepts of the cell cycle, mitosis, and meiosis.
- Able to analyze the concepts of heredity, monohybrid, and dihybrid crosses.
- Able to analyze the concepts of multiple alleles and multiple genes, linkage, and gene mapping.
- Able to analyze the concept of protein synthesis
- Able to analyze the concepts of the structure, genome, and reproduction of viruses.
- Able to analyze the concepts of the types and structure of plasmids.
- Able to analyze the concepts of bacterial cell structure and bacterial staining techniques
- Able to analyze the concepts of nutrition, culture, and metabolic diversity in microorganisms.
- Able to analyze the concept of gene expression control in prokaryotes and eukaryotes.
- Able to analyze the concepts of PCR, sequencing, and restriction enzyme mapping
- Able to analyze the concept of recombinant DNA technology

References:

1. Campbell, N.A; Reece, J.B. and Mitchell, L.G. (2000). Biologi jilid 2. Jakarta: Penerbit Erlangga.
2. Cappuccino, James G., Welsh, Chad. (2018). Microbiology: a laboratory manual. Boston: Pearson.
3. Madigan, MT., Mantinko, J.M., Bender, K.S, Buckley, D.H., & Stahl, D.A. 2015. Brock Biology of Microorganisms. Fourteenth ed. New
4. Jersey: Prentice-Hall International, Inc.

5. Stansfield, William D. (1991). Schaum's ouiline of theory and problems of genetics. Third Edition. California: The McGraw-HiM Companies
6. Wasilah, Fitri., Syulasmi, Ammi., Hamdiyati, Yanti. Pengaruh Ekstrak Rimpang Kunyit (Curcuma Domestica Val) Terhadap Pertumbuhan
7. Jamur Fusarium Oxysporum Schlect Secara In Vitro. (2007). Jurnal Pendidikan Biologi FPMIPA.
8. Weaver, Robert F. (2008). Molecular biology: Fifth edition. New York: The Mcgraw-hill Companies.

Module number PS703	**Module name** Study of Pedagogic	
Course of study M.Pd. (Master of Education)	**Type of course** SPs Expertise Course	**Semester / Rotation** 2nd/Even Semester
Teaching methods Active Learning and Case Method	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workloud in hrs)** 2 (90 hours) **ECTS (+Workload in hrs)** 3 (41.7 contact hours in learning + 48.3 hours of evaluation (together 90 hours))
Module coordinator Dr. Kusnadi, M.Si		Semester week hours : 100 minutes

Additional teachers involved

Prof. Dr. Riandi, M.Si

Dr. rer. Nat. Adi Rahmat, M.Si

Dr. Taufik Rahman, M.Si

Syllabus

'The Study of Pedagogic" is a course that aims to develop students' abilities in pedagogical knowledge and understanding. The scope of the course includes theoretical studies and research results in biology education, consisting of biological content knowledge, general pedagogical theories and curriculum, biology subject pedagogy, student characteristics, the context of biology education, learning objectives, and a review of the latest research on biology pedagogy and its implementation.

The course is conducted through active learning using contextual and constructivist approaches through analysis, presentation, and discussion. The output of this course are paper about analysis context, content, pedagogy, and its implementation in biology material. Teaching media used include Zoom, LCD, Power point. Assessment is conducted through portfolios, midterm exams, performance assessments, and final exams.

Learning goals and qualifications In this module students learn to:

- Able to analyze application of appropriate pedagogical theories to develop biology education
- Able to analyze introduction the philosophy of science through lectures and discussions
- Able to analyze knowledge about biology content: nature of science, epistemology of biology, and scope of biological science
- Able to analyze learning theories and cognitive learning
- Able to design biology learning curriculum components based on PCK and TPACK in accordance with the development of biology education
- Able to analyze curriculum components and create learning objectives

- Able to create online learning and learning media systems
- Able to analyze curriculum components to innovate biology education
- Able to analyze the results of context, content, pedagogy, and its implementation in the material of animal structure and function
- Able to analyze the results of the analysis and present pedagogical content for the school curriculum on biomolecules and biotechnology
- Able to design biology learning curriculum components based on TPACK in accordance with the development of biology education

References:

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2. Anderson, L.W., Krathwohl, D.R., Airasian, P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R., Raths, J. and Wittrock, M.C., 2001, A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of EducationalObjectives, New York: Longman.
3. Arends, R.I., 2012. Learning to Teach, 9th Edition, New York: McGraw-Hill
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6. Dahar, R. W. (1989). Teori-teori Belajar Jakarta: Erlangga
7. Fleming, N., and Baume, D. (2006) Learning Styles Again: VARKing up the right tree!, Educational Developments, SEDA Ltd, Issue 7.4, Nov. 2006, p4-7

Module number BI711	**Module name** Structure, and Function of Development	
Course of study M.Pd. (Master of Education)	**Type of course** Specialized Courses within Master Program	**Semester / Rotation** 1st/Odd Semester
Teaching methods Team-based project, Presentation, Discussion	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		SKS (+Workload in hrs) 3 ECTS (+Workload in hrs) 4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)
Module coordinator Dr. rer. nat. Adi Rahmat, M.Si		**Semester week hours:** 150 minutes
Additional teachers involved Dr. Kusnadi, M.Si		

Syllabus

The 'Structure and Function of Development' course delves into the analysis of morphology and anatomy, as well as the developmental processes from the cellular level to adult organisms in both animals and plants. Students will learn microscopic observation techniques, conduct physiological experiments, and gain a comprehensive understanding of and comparison between the biological systems of these two group organisms. The course is divided into two parts. The first part discusses aspects related to plant development, such as structure, basic developmental patterns, and plant developmental physiology. The second part provides an overview of animal development, including patterns of sexual and asexual reproduction in animals, developmental patterns in animals, fate maps, cell interactions during organ formation, and environmental regulation of animal development. The course is complemented by discussions and presentations. The course is conducted by presenting the assigned topics in groups and facilitating class discussions. Evaluation is based on assignments, presentations, midterm exams, and final exams.

Learning goals and qualifications In this module students learn to:

- Able to study the cytological characteristics of plant cells.
- Able to study the structure of plant cells.
- Able to study and analyze the structure, function, and development of plant tissues.
- Able to study and analyze the fundamental concepts of plant development
- Able to study the processes of alternation of generations and reproduction in bryophytes (mosses) and angiosperms.
- Able to study the processes of alternation of generations and reproduction in ferns and gymnosperms.
- Able to study and analyze developmental control mechanisms, including signal transduction, the roles of light and photoperiodism, and the roles of temperature and vernalization.
- Able to study developmental control mechanisms, including genetic, and epigenetic control.

- Able to study the characteristics of cell division, factors affecting cell division, characteristics of blastula, types of blastula, fate maps, and mechanisms of blastulation.
- Able to study the functions or purposes of gastrulation, types of gastrulation (in two examples of vertebrate classes), characteristics of neurula, mechanisms of neurulation, and the prospective fates of neurulations.
- Able to study the mechanisms of limb bud formation, eye formation, and lung formation.
- Able to study the causes, mechanisms, and examples of developmental abnormalities, as well as preventive measures against developmental abnormalities

References:

1. Bell, A.D. (1991). *Plant Form: An Illustrated Guide to Flowering Plant Morphology.* New York: Oxford University Press.
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<table>
<tr><td>Module number
BI762</td><td colspan="2">Module name
Technology-Based Learning Innovation</td></tr>
<tr><td colspan="2">Course of study
M.Pd. (Master of Education)</td><td>Type of course
SPs Expertise Course</td><td>Semester / Rotation
2nd/Even Semester</td></tr>
<tr><td colspan="2">Teaching methods
Team-Based Project</td><td>Prerequisites for attendance
None</td><td>Language
Indonesian, English</td></tr>
<tr><td colspan="3">Type of examination (Final Grade Composition)

Students Activity process (25%)
Midterm Exam (25%)
Assignment Product (20%)
Final Exam (30%)</td><td>SKS (+Workload in hrs)
3

ECTS (+Workload in hrs)
4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)</td></tr>
<tr><td colspan="3">Module coordinator
Prof. Phil.Dr. Ari. Widodo, M.Ed</td><td>Semester week hours:
150 minutes</td></tr>
<tr><td colspan="4">Additional teachers involved
-</td></tr>
<tr><td colspan="4">Syllabus

‘Technology-Based Learning Innovation’ is a compulsory course designed to equip students with the fundamental principles of learning, innovation, and technology. Mastery of these three areas is the foundation for developing technology-based learning innovations. In this course, innovation is focused on four main areas: innovation in learning approaches, innovation in learning methods, innovation in learning media, and innovation in learning models. The course is conducted in a variety of ways, involving lectures, discussions, presentations, and assignments. Assignments are carried out in groups to build teamwork and communication skills.

The course employs a team-based project approach, providing students with the opportunity to collaborate with their peers in designing and developing innovative technology-based biology learning experiences based on various biology learning approaches, methods, models, and media.</td></tr>
<tr><td colspan="4">Learning goals and qualifications In this module students learn to:
- Able to analyze the principles of learning innovation
- Able to analyze the fundamental principles and philosophy of learning
- Able to identify technologies that can be applied in learning
- Able to design innovative technology-based biology learning approaches
- Able to develop innovative biology teaching methods
- Able to design innovative technology-based science learning: Student-designed innovations
- Able to develop innovative biology teaching methods
- Able able to develop innovative technology-based biology learning models
- Able to develop innovative biology learning media.</td></tr>
</table>

References:

1. Dick, W., Carey, L. and Carey J.O.. (2005). The Systematics Design of Instruction: 6th edition, Boston: Pearson.
2. Hannafin, M.J. and Peck, K.L. The Design, Development, and Evaluation of Instructional Software, New York: MacMillan Publishing Co. Holmes, B. and Gardner J. (2006). e-Learning: concept and practice, London: Sage Publication.
3. Ibrahim, R. (2002). Pengembangan Inovasi Pendidikan melalui Research & Development. Bandung: PSS UPI
4. Lehmann, H. (1990). The Systems Approach to Education. Manila: Innotech Publication

MODULE HANDBOOK

Curriculum 2018
MP-BE Courses
3rd Semester

Module number BI710	**Module name** Ecology and Environment	
Course of study M.Pd. (Master of Education)	**Type of course** Specialized Courses within Master Program	**Semester / Rotation** 1st/Odd Semester
Teaching methods Project-Based Learning, Case-Based Learning, Discussion	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workload in hrs)** 3 **ECTS (+Workload in hrs)** 4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)
Module coordinator Prof. Dr. Hj. RR. Hertien Koosbandiah S., M.ScES		**Semester week hours:** 150 minutes
Additional teachers involved: -		

Syllabus

'Ecology and Environmental' is an interdisciplinary course that draws from various branches of biology to address environmental problems. It provides knowledge and insights into ecosystems and the functions of environmental media (air, water, and soil). A foundational understanding of these environmental media is essential for comprehending the degradation of air, water, and soil. The course will delve into environmental issues in Indonesia caused by human activities that disregard environmental carrying capacity. To preserve the environmental damage and promote sustainable development. The course will incorporate independent field observations and class discussions to enhance understanding and foster environmental awareness. Both in-person and online learning modalities will be employed, especially during pandemics. The course will utilize project-based learning in approximately five sessions and case-based learning in sessions 14-15.

The teaching method of this course is a project-based learning method, which provides students with the opportunity to analyze their own environment regarding the degradation of ecosystem media such as air, water, and soil, caused by human activities. As a result of their project-based learning observations, students will produce scientific articles for publication. Evaluation in this course is based on student activity, project outcomes, midterm exams, and final exams.

Learning goals and qualifications In this module students learn to:

- Able to analyze and synthesize various biological concepts, principles, theories, laws, and processes, and their applications to support a career in biology, in a critical and systematic manner.
- Able to analyze various biological concepts, principles, and theories in biology learning by applying the principles of technological pedagogical content knowledge to the concept of sustainable development goals (SDGs).
- Able to analyze various biological concepts, principles, and theories in biology learning by applying the principles of technological pedagogical content knowledge to the concept of river ecosystems.
- Able tic induct independent observations related to environmental degradation in their surroundings.
- Able to conduct a literature review on plankton and prepare a summary of the analyzed literature

- Able to analyze the scope of coastal ecosystems
- Able to explain the concepts of plant and animal biodiversity
- Able to conduct a literature review on global temperature rise and climate change, and prepare a summary of the analyzed literature.
- Able to design experiments o research that will be used in field observation
- Able to present the results of observations conducted in the previos meeting.

References:

1. Kamaludin S., Surtikanti, H.K., Surakusumah W. Studi Kelayakan Perairan Situ Bagendit sebagai Sumber Belajar pada Mata Kuliah Biologi Air Tawar. J. Ind. Bio. Teachers 1 (2), 53-61; Juli, 2018. diakses pada: https://ejournal.unri.ac.id/index.php/IBT/
2. Utami, K. dan Surtikanti, H.K. Munawaroh, H. 2021. *Enrichment of toxicology laboratory in the new era of covid-19 Preliminary qualitative test of preservatives in processed food.* Moroccan Journal of Chemistry. 10.48317/

Module number BI712	**Module name** Microbiology and Genetics	
Course of study M.Pd. (Master of Education)	**Type of course** Specialized Courses within Master Program	**Semester / Rotation** 1st/Odd Semester
Teaching methods Discussion, Discovery Learning	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workload in hrs)** 3 **ECTS (+Workload in hrs)** 4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)
Module coordinator Prof. Dr. H. Riandi, M.Si		**Semester week hours:** 150 minutes
Additional teachers involved Dr. Yanti Hamdiyanti, M.Si		

Syllabus

'Microbiology and Genetics' is a course that aims to provide a foundational understanding of microorganisms and their applications in various aspects of life. It covers the substance of heredity and genetic information transfer, chromosomal and gene mutations, bacterial and viral genetics, DNA manipulation, and population genetics as an introduction to evolution. The course is delivered through lectures, discussions, problem-solving, and assignments and includes the examination of research findings from relevant journals, as well as the creation of animated media or written papers related to the course material.

Learning goals and qualifications In this module students learn to:

- Able to analyze the concepts of the cell cycle, mitosis, and meiosis.
- Able to analyze the concepts of heredity, monohybrid, and dihybrid crosses.
- Able to analyze the concepts of multiple alleles and multiple genes, linkage, and gene mapping.
- Able to analyze the concept of protein synthesis
- Able to analyze the concepts of the structure, genome, and reproduction of viruses.
- Able to analyze the concepts of the types and structure of plasmids.
- Able to analyze the concepts of bacterial cell structure and bacterial staining techniques
- Able to analyze the concepts of nutrition, culture, and metabolic diversity in microorganisms.
- Able to analyze the concept of gene expression control in prokaryotes and eukaryotes.
- Able to analyze the concepts of PCR, sequencing, and restriction enzyme mapping
- Able to analyze the concept of recombinant DNA technology

References:

1. Campbell, N.A; Reece, J.B. and Mitchell, L.G. (2000). Biologi jilid 2. Jakarta: Penerbit Erlangga.
2. Cappuccino, James G., Welsh, Chad. (2018). Microbiology: a laboratory manual. Boston: Pearson.
3. Madigan, MT., Mantinko, J.M., Bender, K.S, Buckley, D.H., & Stahl, D.A. 2015. Brock Biology of Microorganisms. Fourteenth ed. New
4. Jersey: Prentice-Hall International, Inc.

5. Stansfield, William D. (1991). Schaum's ouiline of theory and problems of genetics. Third Edition. California: The McGraw-HiM Companies
6. Wasilah, Fitri., Syulasmi, Ammi., Hamdiyati, Yanti. Pengaruh Ekstrak Rimpang Kunyit (Curcuma Domestica Val) Terhadap Pertumbuhan
7. Jamur Fusarium Oxysporum Schlect Secara In Vitro. (2007). Jurnal Pendidikan Biologi FPMIPA.
8. Weaver, Robert F. (2008). Molecular biology: Fifth edition. New York: The Mcgraw-hill Companies.

Module number BI708	**Module name** Educational Entrepreneur in Biology	
Course of study M.Pd. (Master of Education)	**Type of course** Specialized Courses within Master Program	**Semester / Rotation** 1st/Odd Semester
Teaching methods Team-based project, active learning, case method	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workload in hrs)** 3 **ECTS (+Workload in hrs)** 4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)
Module coordinator Dr. Bambang Supriatno, M.Si		**Semester week hours:** 150 minutes
Additional teachers involved: -		

Syllabus

'Educational Entrepreneur in Biology' is a course designed to cultivate higher-order thinking skills (critical, analytical, and creative), as well as the competencies and attitudes of an entrepreneur. It aims to equip students with the ability to identify and seize opportunities to establish or develop businesses producing goods or services based on biological education. Students will select a specific topic, such as cryptogamic botany, Phanerogamae/ herbarium, applied biology, biotechnology, etc., and develop a research paper or project proposal. The goal is to encourage the expansion of employment opportunities, increase income and the standard of living, and foster economic growth through a systems approach, group activities, discussions, and presentations on biology-based entrepreneurship.

Learning goals and qualifications In this module students learn to:

- Able to describe the background, definition, and opportunities for establishing biology-based entrepreneurship.
- Able to analyze the system approach in initiating biology-based entrepreneurship
- Able to describe the development of personal attributes as an entrepreneur and the basic functions of a business
- Able to analyze the relationship between enterprises and economic growth, as well as business systems.
- Able to analyze management functions and strategic management models.
- Able to design and determine the selection of location, layout, capital structure, and employee wage systems In a biology-based entrepreneurial production.
- Able to describe the four elements of marketing management and determine the pricing policy for a product.
- Able to design a network of relationships for business development based on SWOT analysis
- Able to design a business for the production of mushrooms or botanical education media based on cryptogamic botany using SWOT analysis or probability analysis based on a system approach.
- Able to design a business for the production of mushrooms or botanical education media based on cryptogamic botany using SWOT analysis or probability analysis based on a system approach.

- Able to design a business for the production of art and boutiques based on phanerogamic botanical herbarium using SWOT analysis and deterministic probability based on a systems approach, and also its marketing management
- Able to design a business for the production of art and boutiques based on phanerogamic botanical herbarium using SWOR analysis and deterministic probability based on a systems approach, and also its marketing management.

References:

1. Buchari Alma. 1998*. Pengantar Bisnis*. Bandung: CV.Alfabeta
2. Hani Handoko.1993. *Dasar-Dasar Manajemen Produksi dan Operasi*. Yogyakarta:BPFE
3. Hughes, Robert,J., Jack R. Kapoor. 1985. *Business*. Houhton Mifflin. Coy
4. Winardi. 1980. *Teori Sistem dan Analisa Sistem*. Jakarta: PT. Karya Nusantara.
5. Suroso AY, 2008. Manajemen Alam Sumber Pendidikan Nilai, Bandung: PT Mughni Sejahtera

Module number BI707	**Module name** Bioethics and Values Education in Biology	
Course of study M.Pd. (Master of Education)	**Type of course** Specialized Courses within Master Program	**Semester / Rotation** 1st/Odd Semester
Teaching methods Team-based project, active learning	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workload in hrs)** 3 **ECTS (+Workload in hrs)** 4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)
Module coordinator Prof. Dr. Yayan Sanjaya, M.Si		**Semester week hours:** **150 minutes**
Additional teachers involved Prof. Dr. Hj. Nuryani Rustaman, M.Pd		

Syllabus

'Bioethics and values education in biology' is a course that delves into and develops higher-order thinking skills (critical, analytical, lateral, and creative), as well as a curious attitude to explore, instill, and appreciate the values embedded in biological concepts, principles, theories, and laws. It does so by exploring and developing their practical, religious, intellectual, socio-political, and educational values through explanations, and discussions involving cognitive, affective, spiritual, volitional, and physical activity.

In this course, based on relevant learning theories (meaningful learning, learning cycle, thinking instruction, bandura's social cognitive theory, role-playing, and the nature of science-biology as a system of values or divine signs), and aligned with the national education goals, the course is supplemented with assignments and paper presentations relevant to the field. These are designed to foster the development of students' character in accordance with the noble values of Indonesian culture an d religious norms within the framework of the prevailing legal system, ultimately contributing to the achievement of the National Education Goals.

Learning goals and qualifications In this module students learn to:

- Able to describe the background and importance of science (integrated biology, chemistry, and physics(education with embedded values.
- Able to describe the nature of science learning and the relationship between the goals of science-biology learning and national education goals.
- Students are able to analyze information about the concepts, aspects, foundations, and theories supporting value/ character education in science-biology.
- Able to apply values and morals (practical, intellectual, religious, socio-political, and educational values) in science-biology learning, along with their limitations and examples in science-biology models.

- Able to analyze information about concepts, principles, theories, laws, and biological processes and their applications to support professions in the field of biology.
- Able to apply educational values in science-biology for the exploration and development of science, technology, engineering, and art.
- Able to apply socio-political value education in science-biology as a guide and lesson for Indonesian people's lives in strengthening the unity and integrity of the unitary state of the Republic of Indonesia. Apply the integration of 18 character values in the 2013 and Merdeka Curriculum to biology practical activities and material discussions as a guide and lesson for human life

References:

1. Costa. 1985. Development of Mind. A Resource Book for Teaching Thinking.Alexandria: ASCD.
2. Kniker,CR. 1977. You and Values Education. Columbia, Ohio: A Bell & Howel Company
3. Mulyana,R.2004. Mengartikulasikan Pendidikan Nilai. Bandung: Alfabeta
4. Nickerson,RS.1985. The Teaching of Thinking. New Jersey: Lawrence Erlbaum
5. Straughan,R. & Wrigley,J. 1980.Value and Evaluation in Education. London: Harper & Row.Ltd.
6. Suroso AY.2010. Manajemen Alam Sumber Pendidikan Nilai. Bandung: Mughni Sejahtera.
7. Suroso AY.2016. Kajian Asmaul Husna Dalam Bioogi. Bandung: SPS UPI Sains-Biologi. Bandung. SPS UPI
8. Suroso AY.2018. Pendidikan Nilai Sosial Politik Dalam Pembelajaran Biologi. Bandung, SPS UPI
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10. Suroso AY.2011. Dimensi Pendidikan Karakter/Nilai Dalam Model Sains-Biologi Untuk Pembelajaran Manusia Sebagai Upaya Mengatasi Krisis Nilai dan Moral Bangsa. Orasi Ilmiah Pengukuhan Guru Besar. Bandung. Universitas Pendidikan Indonesia.
11. Suroso AY.2013-2015. Pendidikan Karakter dan Budaya Bangsa Dalam Pembelajaran Biologi. Makalah Diklat Kepala Laboratorium dan Guru Biologi se-Indonesia Angfkatan I-X. Bandung. Departemen Pendidikan Biologi FPMIPA UPI.
12. Suroso AY.2015. Implementasi Pendidikan Karakter/Nilai Dalam Pembelajaran Biologi. Makalah Seminar Nasional. Palembang. Departemen Pendidikan Biologi FKIP –UNSRI
13. Suroso AY.2018. Teori Belajar Bagan BDK/BPK Untuk Menguasai Konsep Sains. Bandung. SPS UPI 14. Yahya,H.2001. Keruntuhan Teori Evolusi, Membongkar Manipulasi Ilmiah di Belakang Teori Evolusi Darwin dan Motif Ideologinya. Bandung: Dzikra.

Module number BI703	**Module name** The Development of teaching materials	
Course of study M.Pd. (Master of Education)	**Type of course** Specialized Course within Master Program	**Semester / Rotation** 1st/ Odd Semester 2nd/Even semester
Teaching methods Discovery Learning	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workload in hrs)** 3 **ECTS (+Workload in hrs)** 4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)
Module coordinator Prof. Dr. phil. H. Ari Widodo, M.Ed		**Semester week hours:** 150 minutes
Additional teachers involved Dr. Amprasto, M.Si		

Syllabus

'The Development of teaching materials' is a course that aims to develop students' abilities to have an ability to develop a biology teaching materials. This course discusses methods for developing instructional materials based on constructivist theory. Therefore, the instructional materials development model is based on students' prior knowledge and refers to the scientific concepts found in reference books as suggested in didactic reconstruction. The course is conducted by combining theoretical studies and practical applications. Learning is facilitated through discovery learning, where students will present their assignment results. The lecturer will then provide feedback and engage in discussions with their classmates.The assessment of students' learning outcomes is based on the teaching materials products developed by the students.

Learning goals and qualifications In this module students learn to:

- Able to master various theories of pedagogy and biology pedagogy to develop biology education
- Able to master the curriculum to innovate in the development of biology education
- Able to identified teaching materials used in schools and analyze reference concepts
- Able to identify propositions from reference books
- Able to develop instruments to measure students' prior knowledge
- Able to identify concepts that need to be explored for prior knowledge
- Able to identify main propositions that need to be explored for students' prior knowledge
- Able to conduct empirical study of student' prior knowledge
- Able to analyze students' prior knowledge
- Able to design the structure of teaching materials product
- Able to write and develop teaching materials product

References:

1. Bleichroth, v. W. (1991). Elementarisierung das Kernstuek der Unterrichtsvorbereitung. Naturwissenschaften im Unterricht-Physik, 2(6), 4-11.
2. Duit, R., Gropengiesser, H., & Kattmann, U. (2005). Toward Science Education research that is Relevant for Improving Practice: The Model of Educational Reconstruction. In H. E. Fischer (Ed). Developing Standards in Research on Science Education, (pp. 1-9). London: Taylor dan Francis
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8. Azzahra, W., Gusti, U. A., & Widodo, A. (2023). Inovasi Model Discovery Learning Berbasis Multi Teknologi Pada Materi Perubahan Lingkungan. Jurnal Bioedukasi, 6(2), 293-298
9. Gusti, U. A., Azzahra, W., & Widodo, A. (2023). INOVASI MEDIA PEMBELAJARAN BERBASIS ADOBE FLASH CS6 DAN BINSCAN PADA MATERI PERUBAHAN LINGKUNGAN. Borneo Journal of Biology Education (BJBE), 5(2), 87-95
10. Zumira, A., Nurzeha, F., Luthfi, R. M., Riandi, R., & Widodo, A. (2022). Augmented Reality-Based Flipbook sebagai Inovasi Media Pembelajaran Biologi:(Augmented Reality-Based Flipbook as Biology Learning Media Innovation). BIODIK, 8(4), 102-108.

MODULE HANDBOOK

Curriculum 2018
MP-BE Courses
4th Semester

Module number BI798	**Module name** Thesis	
Course of study M.Pd. (Master of Education)	**Type of course** Specialized Course within Master Program	**Semester / Rotation** 4th/Even semester
Teaching methods Case method	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Final Exam (100%)		**SKS (+Workloud in hrs)** 8 **ECTS (+Workload in hrs)** 12 (166,8 contact hours in class+193,2 hours of self study (together 360 hours)
Module coordinator Dr. Siti Sriyati, M.Si		**Semester week hours:** **360 minutes**
Additional teachers involved Prof.Dr.Hj. Widi Purwianingsih, M.Si.		

Syllabus

The thesis course, as a form of final assignment for master's degree students, equips students with the necessary skills to compose their theses. A thesis is an original research paper that makes a significant contribution to the field of biology education. This work is developed using scientific methods and is based on a profound understanding of the subject matter. A thesis demonstrates in-depth analysis and exhibits greater complexity in its methodology and interpretation of results. Emphasis is placed on originality and the depth of analysis. The primary focus of the study is to advance knowledge, specifically aiming to provide a tangible contribution to the development of biology education. To achieve this, the course will provide students with the ability to structure the introduction (background, problem formulation, research objectives and benefits, and research limitations in Chapter 1), formulate the literature review in Chapter 2, determine appropriate methodologies in Chapter 3, present research findings in Chapter 4, discuss research results in Chapter 5, and provide conclusions, suggestions, and research implications in Chapter 6.

Learning goals and qualifications In this module students learn to:

- Able to understand the introduction such background, problem formulation, research objectives and benefits, and research limitations in Chapter 1
- Able to understand formulate the literature review in Chapter 2
- Able to determine appropriate methodologies in Chapter 3
- Able to determine research findings in Chapter 4
- Able to discuss research results in Chapter 5
- Able to understand research implications in Chapter 6

References:

Creswell, J. W., & Guetterman, T. C. (2019). Educational Research : Planning, Conducting, and Evaluating Quantitative and Qualitative Research. In *Sustainability (Switzerland)* (Vol. 11, Issue 1).

Curriculum 2023
MP-BE Courses
1st Semester

Module number BI715	**Module name** Adaptive and innovative biology learning	
Course of study M.Pd. (Master of Education)	**Type of course** Development of Field Expertise Science	**Semester / Rotation** 2nd/Even Semester
Teaching methods Team-Based Project, Case Method.	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) ● Students Activity process (25%) ● Midterm Exam (25%) ● Assignment Product (20%) ● Final Exam (30%)		**SKS (+Workload in hrs)** 4 ECTS (+Workload in hrs) 6 (150 contact hours in class + 50 hours of self-study (together 200hrs)
Module coordinator Dr. Bambang Supriatno, M.Si		**Semester week hours:** 150 minutes
Additional teachers involved Dr. Kusnadi, M.Si Dr. Amprasto, M.Si		

Syllabus

This course aims to provide mastery of various adaptive and innovative learning approaches and strategies in the context of Biology education. The materials discussed in the lecture include theories of learning psychology, principles of instructional design, and applications of the latest educational technology in improving the effectiveness of Biology learning. Learning takes the form of discussions and problem solving in designing, implementing, and evaluating learning strategies that are responsive to students' learning needs, and are able to face challenges and opportunities in teaching Biology in the digital era.

Learning goals and qualifications. In this module, students learn to:

- Understand the basic concepts of adaptive and innovative learning and their relevance in the context of Biology education.
- Master various theories of learning psychology that underlie the development of adaptive Biology learning strategies.
- Able to design and implement various Biology learning strategies that are responsive to students' learning needs, including the use of educational technology.
- Able to evaluate the effectiveness of Biology learning strategies that have been implemented in improving students' understanding and skills.
- Demonstrate a responsible attitude towards work in their field of expertise independently

References:

1. Dick, W., Carey, L. and Carey JO (2005), The Systematic Design of Instruction: 6th edition, Boston: Pearson.
2. Hannafin, MJ and Peck, KL, …, The Design, Development, and Evaluation of Instructional Software, New York: MacMillan Publishing Co. Holmes, B. and Gardner J., 2006, e-Learning: concept and practice, London: Sage Publication
3. 3. Ibrahim, R. (2002). Development of Educational Innovation through Research & Development. Bandung: PSS UPI
4. Lehmann, H. (1990). The Systems Approach to Education. Manila: Innotech Publications.

5. Bybee, R. W. (2014). The BSCS 5E instructional model: Creating teachable moments. NSTA Press.
6. Campbell, T., Zhang, D., & Neilson, D. (2011). Model based inquiry in the high school physics classroom: An exploratory study of implementation and outcomes. *Journal of Science Education and Technology*, 20(3), 258–269. https://doi.org/10.1007/s10956-010-9251-6.
7. Reigeluth, C. M., & An, Y. J. (2021). Instructional theory and technology for the new paradigm of education. Routledge.
8. Saavedra, A. R., & Opfer, V. D. (2012). Learning 21st-century skills requires 21st-century teaching. Phi Delta Kappan, 94(2), 8–13. https://doi.org/10.1177/003172171209400203

Module number BI764	**Module name** Adaptive and Innovative Biology Assessment	
Course of study M.Pd. (Master of Education)	**Type of course** Development of Field Expertise Science	**Semester / Rotation** 2nd/Even Semester
Teaching methods Team-Based Project, Case Method.	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) ● Students Activity process (25%) ● Midterm Exam (25%) ● Assignment Product (20%) ● Final Exam (30%)		**SKS (+Workload in hrs)** 4 ECTS (+Workload in hrs) 6 (150 contact hours in class + 50 hours of self-study (together 200hrs)
Module coordinator Dr. Siti Sriyati, M.Si		**Semester week hours:** 200 minutes
Additional teachers involved: -		

Syllabus

This course explores the theory, methodology, and practical applications of assessment in biology education, with a focus on adaptive and innovative approaches. Students will explore assessment techniques that meet the diverse needs of learners and leverage innovative technologies to enhance assessment practices. Emphasis will be placed on designing assessments that provide meaningful feedback, encourage student engagement, and support the development of critical thinking skills in biology education.

Learning goals and qualifications. In this module, students learn to:

- Understand the basic concepts of assessment in Biology education.
- Master various adaptive and innovative assessment approaches and techniques.
- Able to design Biology assessment instruments that are responsive to students' learning needs.
- Able to design Biology assessment instruments that are responsive to students' learning needs.
- Able to apply educational technology in the Biology assessment process.
- Able to evaluate the quality of assessment instruments and assessment results in the context of improving Biology learning.
- Demonstrate a responsible attitude towards work in their field of expertise independently.

References:

1. Stiggins, R.J. (1994). Student-Centered Classroom Assessment. New York: Macmillan College Publishing Company.
2. Stiggins, R.J. & Chappuis, J. 2012. An Introduction to Student-Involved Assessment for Learning. Boston: Pearson.
3. Suskie, L. 2009. Assessing Student Learning: a common sense guide. San Fransisco: Josses-Bass.
4. Butler, S.M. & McMunn, N.D. 2006. A Teacher's Guide to Classroom Assessment: Understanding and Using Assessment to Improve Student Learning. San Fransisco: Josses-Bass.
5. Popham. 2011. Classroom Assessment: What Teachers Need to Know. Boston: Pearson.
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7. Jurnal-2 nasional & internasional yang relevan dengan tema Projek asesmen adaptif & inovatif yang diusung mahasiswa
8. OECD (2022) PISA (Programme for International Student Assessment) Report
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11. Novak, J.D. & Gowin, (1985). Learning How to Learn. New York: Cambridge University Press.
12. Marzano, R.J. & Kendall, J.S. (2008). Designing & Assessing Educational Objectives: Applying New Taxonomy. London: Corwin Press.

Module number BI716	**Module name** Research and Problem Solving Skills in Biology Learning	
Course of study M.Pd. (Master of Education)	**Type of course** Skill Development Field of Science (PKBI)	**Semester / Rotation** 1st/Odd Semester
Teaching methods Team-Based Project, Active Learning, Case Method	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Participation and Engagement (25%) Portfolio Assignments; Article reviews, case study reports (30%) Observation and Analysis Tasks (20%) Final Case Study Project (25%)		**SKS (+Workload in hrs)** 3 **ECTS (+Workload in hrs)** 4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)
Module coordinator Dr. Kusnadi, M.Sc.		**Semester week hours:** 150 minutes
Additional teachers involved -		

Syllabus

'Research and Problem Solving Skills in Biology Learning' is a course that designed to develop students' competencies in identifying, analyzing, and solving complex educational problems in biology learning through research-based approaches. Emphasis is placed on integrating research skills with creative problem-solving strategies in real-life educational settings. Students will explore biology education research articles, analyze current problems in biology classrooms, and design research-informed solutions through case studies and field observations.

The course explores a wide array of topics encompassing the material: Scope of research and problem-solving in biology learning, Problem identification and formulation in biology education, Design of observation and data collection tools, Case studies in biology classrooms, Techniques and strategies for solving problems in biology learning, Analysis and interpretation of qualitative and quantitative research data, Reporting and reflecting on case study results.

The teaching methods adopted in this course are designed to facilitate a comprehensive and situational understanding. These methods include team-based projects, active learning, and the case method. Team-based projects provide collaboratively analyze biology education problems and design research-informed solutions. Active learning for individual and group tasks focusing on critical reading of journal articles and data interpretation. Case method provide students in-depth case studies from biology learning contexts in schools to reflect real field problems. Students are evaluated based on student participation, portofolio assignments, observation and analysis tasks, and final case study project.

Learning goals and qualifications in this module students learn to:

- Able to apply educational research methodologies relevant to biology learning.
- Able to identify and formulate problems in biology learning based on journal analysis and field observations.
- Able to design and implement research-based solutions to biology education problems.

- Able to analyze and interpret data from biology learning research.
- Able to communicate findings effectively in oral and written forms.
- Able to demonstrate scientific, educational, and ethical behavior in educational research practices.

References:

1. Zhou, C. (2016). *The Handbook of Research on Creative Problem-Solving Skill Development in Higher Education.* IGI Global.
2. Willison, J. (Ed.). (2024). *Research Thinking for Responsive Teaching: Research Skill Development with In-Service and Pre-Service Educators.* Springer.

Module number KA705	**Module name** Research Design	
Course of study M.Pd. (Master of Education)	**Type of course** Academic Skills Development (PKA)	**Semester / Rotation** 1st/Odd Semester
Teaching methods Team-Based Project, Blended Learning, Case Method	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Student Activity Process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (25%)		**SKS (+Workload in hrs)** 3 **ECTS (+Workload in hrs)** 4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)
Module coordinator Dr. H. Saefudin, M.Si.		**Semester week hours:** 150 minutes
Additional teachers involved -		

Syllabus

'Research Design' is a course that equips students to carry out their final thesis research. It discusses the philosophy of positivism and phenomenology research (quantitative, qualitative, and mixed methods), the philosophy of educational research, aspects of educational research, various research approaches, and educational research design. The course includes presentations and discussions based on students' thesis research. The final output is a research proposal. The course uses blended learning and emphasizes the case method. Assessment includes participation in synchronous and asynchronous sessions, assignments, and tests.

The course explores a wide array of topics encompassing the material: Introduction, course contracts, assignments, and assessment methods, research problems in education, types of research, nature and characteristics of educational research, research ethics, characteristics of quantitative and qualitative research and examples, educational research methods: experimental, correlational, causal-comparative, ethnographic, etc., R&D, historical, comparative, mixed methods in biology education, writing a thesis research pre-proposal, analysis of selected research articles.

The teaching methods adopted in this course are designed to facilitate a comprehensive and situational understanding. These methods include team-based projects, blended learning, and the case method. Team-based projects to foster collaboration, critical thinking, and interdisciplinary inquiry. Students are grouped into small teams and assigned projects related to current issues in biology education. Blended learning for lectures, discussions, and case presentations via Zoom or in-person. Case method is used to expose students to real-world research scenarios in biology education. Students are presented with authentic case studies. Students are evaluated based on student participation, assignments product, and midterm and final exam.

Learning goals and qualifications in this module students learn to:

- Able to understand and justify the research philosophy used in students' final thesis research.
- Able to identify research aspects and various approaches in educational research.

- Able to generate novelty in education research using positivism and phenomenology approaches
- Able to apply scientific theories/concepts/ideas and contribute to the development of educational science.

References:

1. Ali, M. (2011). Understanding Behavioral and Social Research
2. Cresswell, J.W. (2019). Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research
3. Fraenkel, J.P., Wallen, N.E., & Hyun, H.H. (2012). How to Design and Evaluate Research in Education
4. Gall, M.D. et al. (2010). Applying Educational Research
5. Lincoln & Guba (1985). Naturalistic Inquiry
6. Miles & Huberman (1989). Qualitative Data Analysis
7. Sastradipoera, K. (2005). Finding Meaning behind Thesis and Dissertation Writing
8. Tuckman, B.W. (1984). Conducting Educational Research

<table>
<tr><td>Module number
KA701</td><td colspan="3">Module name
Pedagogical Study</td></tr>
<tr><td colspan="2">Course of study
M.Pd. (Master of Education)</td><td>Type of course
Academic Skills Development</td><td>Semester / Rotation
1st/Odd Semester</td></tr>
<tr><td colspan="2">Teaching methods
Case Method</td><td>Prerequisites for attendance
None</td><td>Language
Indonesian, English</td></tr>
<tr><td colspan="3">Type of examination (Final Grade Composition)

Students Activity process (25%)
Midterm Exam (25%)
Assignment Product (20%)
Final Exam (30%)</td><td>SKS (+Workload in hrs)
2 (90 hours)

ECTS (+Workload in hrs)
3 (41.7 contact hours in learning + 48.3 hours of evaluation (together 90 hours))</td></tr>
<tr><td colspan="3">Module coordinator
Prof. Dr. rer. nat. Adi Rahmat, M.Si.</td><td>Semester week hours:
100 minutes</td></tr>
<tr><td colspan="4">Additional teachers involved
Dr. Kusnadi, M.Si.</td></tr>
<tr><td colspan="4">Syllabus

The pedagogical studies course aims to build a new paradigm of learning in the era of education 4.0 so that it has a competitive edge in learning that is in line with developments in science, technology, and global challenges. This course covers various theoretical and practical studies in educational science, the essence of new pedagogical orientations, the history of new pedagogical orientations, the foundations of transdisciplinary educational science, the characteristics of learners, educational environments, the basics of learning and teaching theories, curriculum development, developing learners' potential, communicating with learners, and conducting learning evaluations. Learning utilizes blended learning and prioritizes case-based methods. Assessment components for student activities include student participation during both synchronous and asynchronous sessions, assignments, and tests.</td></tr>
<tr><td colspan="4">Learning goals and qualifications. In this module, students learn to:

- Able to identify the characteristics of Generation Z and Alpha students in terms of physical, intellectual, social, emotional, moral, and socio-cultural aspects.
- Able to determine and elaborate on learning theories and educational principles relevant to student characteristics.
- Able to design an implementable curriculum to plan learning that is appropriate to the content of the teaching material, approach, and technology (TPACK).
- Able to demonstrate their ability to communicate educational learning through a variety of diversified learning approaches.
- Demonstrate a sense of responsibility for developing a learning system to improve the quality of education.</td></tr>
</table>

References:

1. Anderson, J. R., 2015, Cognitive Psychology and Its Implications, 8th Ed., New York: Worth Publisher
2. Anderson, L.W., Krathwohl, D.R., Airasian, P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R., Raths, J. and Wittrock, M.C., 2001, A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives, New York: Longman.
3. Arends, R.I., 2012. Learning to Teach, 9th Edition, New York: McGraw-Hill.
4. Bloom, Benjamin S., etc. 1956. Taxonomy of Educational Objectives: The Classification of Educational Goals, Handbook I Cognitive Domain. New York: Longmans, Green and Co
5. Costa, Arthur L. (1991). Developing Minds: Programs for Teaching Thinking (Rev.Ed). Volume 2. Alexandria: ASCD.
6. Dahar, R. W. (1989). Teori-teori Belajar Jakarta: Erlangga.
7. Fleming, N., and Baume, D. (2006) Learning Styles Again: VARKing up the right tree!, Educational Developments, SEDA Ltd, Issue 7.4, Nov. 2006, p4-7.
8. Joyce B., Weil, M., and Calhoun E., 2000, Models of Theaching. 6th Edition. Boston: Allyn and Bacon
9. Koehler, M., & Mishra, P. (2009). What is technological pedagogical content knowledge (TPACK)?. Contemporary issues in technology and teacher education, 9(1), 60-70
10. Loughran, J., Berry, A., & Mulhall, P. (2012). Understanding and Developing ScienceTeachers' Pedagogical Content Knowledge (Vol. 12). Springer Science & Business Media
11. Mayer, R. A. (2009), Multimedia Learning, Cambridge: Cambridge University Press
12. Marzano, R. J., & Kendall, J. S. (2007). The New Taxonomy of Educational Objectives. In Corwin Press (2nd ed.). Corwin Press
13. Othman, N., & Amiruddin, M. H. (2010). Different perspectives of learning styles from VARK model. Procedia-Social and Behavioral Sciences, 7, 652-660
14. Pedró, F. (OECD Centre for Educational Research and Innovation Paris, France). 2007, The new millennium learners: Challenging our Views on Digital Technologies and Learning, Digital Kompetanse. Vol. 2: 244–264
15. Reece J, Urry L. A., Minorsky P. V., Cain M. L., Wasserman S. A. (2016), Campbell Biology, 11th Ed, Pearson
16. Rustaman, N. et. al. 2003. Strategi Belajar Mengajar Biologi. Bandung: FPMIPA-UPI
17. Shulman, L. S. (1987). Knowledge and Teaching: Foundations of the New Reform. Harvard Educational Review, 57, 1-22.; http://dx.doi.org/10.17763/haer.57.1.j463w79r56455411
18. Sternberg R. J. and Sternberg, K., 2012, Cognitive Psychology, 6th Ed., Belmont USA: Wadsworth
19. Rose C. & Nicoll M. J. (1997). Accelerated Learning for the 21ST Century, New York: Delacorte Press

<table>
<tr><td>Module number
BI3018</td><td colspan="2">Module name
Biology Learning Planning</td></tr>
<tr><td colspan="2">Course of study
M.Pd. (Master of Education)</td><td>Type of course
Development of Study Program Expertise Linearity</td><td>Semester / Rotation
1st/Odd Semester</td></tr>
<tr><td colspan="2">Teaching methods
Others</td><td>Prerequisites for attendance
None</td><td>Language
Indonesian, English</td></tr>
<tr><td colspan="3">Type of examination (Final Grade Composition)

Students Activity process (25%)
Midterm Exam (25%)
Assignment Product (20%)
Final Exam (30%)</td><td>SKS (+Workload in hrs)
3

ECTS (+Workload in hrs)
4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)</td></tr>
<tr><td colspan="3">Module coordinator
Dr. Mimin Nurjhani Kusumastuti, M.Pd.</td><td>Semester week hours:
150 minutes</td></tr>
<tr><td colspan="4">Additional teachers involved
Dr. Eni Nuraeni, M.Pd.</td></tr>
<tr><td colspan="4">Syllabus

This course is aimed at providing knowledge and experience in developing biology teaching materials. The content of this course includes analysis of basic competencies to formulate learning outcome indicators, developing teaching materials according to learning objectives and based on the principles of pedagogical content knowledge (PCK), determining and designing learning experiences appropriate to the characteristics of the material and learning objectives, determining approaches and methods according to the characteristics of the material and learning objectives, learning models, classroom management and laboratory activity management, media, and learning assessment, and developing lesson plans. The lectures are conducted by asking students to present the designs of 4 (four) teaching devices, which include non-laboratory teaching devices, laboratory practices, field activities, and distance learning (online). These are reviewed for the compatibility between components, concluded with a limited simulation and reflection on the learning simulation activities and the observation results of the teaching activities carried out in schools to enrich insights and experiences in planning and implementing biology instruction that aligns with the essence of science, realistic, and enjoyable.</td></tr>
<tr><td colspan="4">Learning goals and qualifications. In this module, students learn to:

- Using the concepts, principles, components, and characteristics of the biology curriculum to explain biological education issues concerning essential biology content in order to prepare teaching materials according to their characteristics.
- Using knowledge about essential biology content to prepare teaching materials according to their characteristics.
- Choosing methods, approaches, and models of biological education based on competencies.
- Selecting media that are appropriate for the characteristics of biological content and students.</td></tr>
</table>

- Using assessment methods that are suitable for biology learning settings.
- Applying assessment ethics in biology learning.
- Designing and using technology to enhance the effectiveness of biology learning.
- Being able to apply logical, critical, systematic, and innovative thinking in the context of developing or implementing biological sciences while considering and applying humanitarian values relevant to their field of expertise.
- Applying TPCK in the learning process using appropriate technology.
- Demonstrating a responsible attitude towards work in their field of expertise independently.

References:

1. Pusat Kurikulum Kemdikbudristek. 2020. Sistem Informasi Kurikulum Nasional. Pengembangan Kurikulum untuk Mewujudkan Tujun Pendidikan Indonesia. Pengembangan Kurikulum | Sistem Informasi Kurikulum Nasional (kemdikbud.go.id)
2. Pusat Kurikulum Kemdikbudristek. 2020. Sistem Informasi Kurikulum Nasional. Kurikulum Merdeka: Keleluasaan Pendidik dan Pembelajaran Berkualitas. Beranda | Kurikulum Merdeka (kemdikbud.go.id)
3. Pusat Kurikulum Kemdikbudristek. 2020. Sistem Informasi Kurikulum Nasional. Capaian Pembelajaran. Capaian Pembelajaran | Kurikulum Merdeka (kemdikbud.go.id)
4. Pusat Kurikulum Kemdikbudristek. 2020. Sistem Informasi Kurikulum Nasional. Regulasi Standar Nasional Pendidikan. Rujukan | Kurikulum Merdeka (kemdikbud.go.id)
5. Anderson, L.W., Krathwohl, D.R., Airasian, P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R., Raths, J. and Wittrock, M.C., 2001, A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of EducationalObjectives, New York: Longman.

<table>
<tr><td>Module number
DK306</td><td colspan="2">Module name
Biology Learning Strategies</td></tr>
<tr><td colspan="2">Course of study
M.Pd. (Master of Education)</td><td>Type of course
Development of Study Program Expertise Linearity (PLKP)</td><td>Semester / Rotation
1st/Odd Semester</td></tr>
<tr><td colspan="2">Teaching methods
Discussion and Presentation</td><td>Prerequisites for attendance
Learning Theories; Philosophy of Science</td><td>Language
Indonesian, English</td></tr>
<tr><td colspan="3">Type of examination (Final Grade Composition)

Group Assignment (25%)
Individual Assignment (25%)
Students Participation (20%)
Midterm Exam (10%)
Final Exam (20%)</td><td>SKS (+Workload in hrs)
3

ECTS (+Workload in hrs)
4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)</td></tr>
<tr><td colspan="3">Module coordinator
Dr. Mimin Nurjhani Kusumastuti, M.Pd.</td><td>Semester week hours:
150 minutes</td></tr>
<tr><td colspan="4">Additional teachers involved
….</td></tr>
<tr><td colspan="4">Syllabus

The Learning Strategies course is designed to develop students' competencies in the field of education, particularly in designing and implementing effective instructional strategies. This course aims to equip students with both theoretical understanding and practical skills that are essential for planning meaningful and effective learning experiences.

The course content is divided into two main components: general materials and subject-specific materials. The general materials include the theoretical foundations that underlie learning strategies, various types of strategies based on specific instructional approaches, and methods for measuring the effectiveness of a given model or strategy in achieving learning objectives.

Meanwhile, the subject-specific component focuses on the application of those learning strategy theories to the development of instructional designs relevant to each student's field of study. Students are expected to analyse, design, and implement strategies that align with the unique characteristics of their discipline.

This course employs a blended learning approach, combining synchronous and asynchronous sessions. It emphasizes active learning, especially during the implementation phase of subject-specific strategies. Students are encouraged to engage actively in discussions, collaborative projects, and problem-solving activities. Assessment components include student participation in both synchronous and asynchronous activities, completion of assignments, quizzes, and tests. The overall evaluation reflects students' engagement, understanding of the material, and their ability to apply learning strategies effectively within their specific fields.</td></tr>
</table>

Learning goals and qualifications. In this module students learn to:

- Distinguish between the theories and applications of behaviorist, cognitive, humanistic, and constructivist learning theories that underpin instructional strategies, in order to develop appropriate strategies within their field of study.
- Demonstrate the ability to formulate various instructional strategies based on learning approaches that align with the characteristics of their subject area.
- Develop instructional strategies relevant to their field of study in various formats, in accordance with applicable policies and curriculum standards.
- Evaluate the effectiveness of a learning model or approach in achieving learning objectives, based on the specific characteristics of the subject area.
- Assess instructional strategies developed by others in their field of study, identifying strengths and weaknesses to provide constructive feedback and improvements.

References:

1. Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A., Mayer, R. E., Pintrich, P. R., Raths, J., & Wittrock, M. C. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives.* New York, NY: Longman.
2. Arends, R. I. (2012). *Learning to teach* (9th ed.). New York, NY: McGraw-Hill.
3. Campbell, N. A., Reece, J. B., Urry, L. A., Cain, M. L., Wasserman, S. A., Minorsky, P. V., & Jackson, R. B. (2010). *Biology.* San Francisco, CA: Pearson Benjamin Cummings.
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5. Harlen, W. (1988). *The teaching of science.* London: David Fulton Publishers.
6. Joyce, B., Weil, M., & Calhoun, E. (2000). *Models of teaching* (6th ed.). Boston, MA: Allyn and Bacon.
7. Loughran, J., Berry, A., & Mulhall, P. (2006). *Understanding and developing science teachers' pedagogical content knowledge.* Rotterdam: Sense Publishers.
8. Sembiring, D. A. E. P., Sudrajat, A., & Wahyuni, N. S. (2024). Differentiated instruction in biology learning: Meta-analysis. *Journal of Biology Education Research, 15*(1), 45–58. https://doi.org/10.12345/jber.v15i1.4567

Module number PS701	**Module name** Statistics	
Course of study M.Pd. (Master of Education)	**Type of course** SPs Expertise Course	**Semester / Rotation** 1st /Odd Semester
Teaching methods Team-Based Project, Active Learning, Case Method	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workloud in hrs)** 3 **ECTS (+Workload in hrs)** 4,5 (100 contact hours in class+50 hours of self study (together 150 hours)
Module coordinator Prof. Dr. Yayan Sanjaya, M.Si		Semester week hours: 150 minutes
Additional teachers involved Dr. Rini Solihat, M.Si		

Syllabus

Statistics is a course that aims to develop students' abilities to apply their understanding of correct statistical data analysis techniques using descriptive and inferential approaches in accordance with proper statistical procedures. They should be able to utilize these skills in designing data collection, data processing, and interpretation, as well as be proficient in using statistical software/applications in biological education research

The course is conducted through active learning using team based project, active learning, and case method through analysis paper, presentation and discussion, and practice analyze data using application SPSS, Smart PLS, XLSTAT, and Visual PLS. The output of this course are paper with main focus in theory about data processing techniques and its applications in thesis research plan for each students. Assessment is conducted through portfolios, performance assessments, midterm exam, and final exams.

Learning goals and qualifications In this module students learn to:

- Able to design data collection techniques such as process, interpret, and present data in biology education research
- Able to identify and analysis object of their research plan, so it is appropriate when designing data collection such as process, interpret and present data
- Able to develop TPACK in biology education when designing data collection such as process, interpret, and present data
- Able to develop valid laboratory acitivities by using appropriate statistical procedures in biology education research
- Able to communicate results of biology education studies using appropriate statistical procedures

References:

1. **Moore, D. S., McCabe, G. P., & Craig, B. A. (2017).** *Introduction to the practice of statistics* (9th ed.). W. H. Freeman
2. **Newbold, P., Carlson, W. L., & Thorne, B. (2012).** *Statistics for business and economics* (8th ed.). Pearson Education
3. **Snedecor, G. W., & Cochran, W. G. (1989).** *Statistical methods* (8th ed.). Iowa State University Press
4. **Johnson, R. A., & Wichern, D. W. (2007).** *Applied multivariate statistical analysis* (6th ed.). Pearson Prentice Hall.
5. **Walpole, R. E., Myers, R. H., Myers, S. L., & Ye, K. E. (2011).** *Probability and statistics for engineers and scientists* (9th ed.). Pearson Education.
6. Suhendar, S., Widodo, A., Solihat, R., & Riandi, R. (2024). Forecasting Methods in Science Education: A Bibliometric Analysis Using the Scopus Database. KnE Social Sciences, 472-483.

Module number PS702	**Module name** Philosophy of Science	
Course of study M.Pd. (Master of Education)	**Type of course** SPs Expertise Course	**Semester / Rotation** 1st /Odd Semester
Teaching methods Active Learning, Case Method	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workloud in hrs)** 2 (90 hours) **ECTS (+Workload in hrs)** 3 (41.7 contact hours in learning + 48.3 hours of evaluation (together 90 hours))
Module coordinator Dr. Saefudin, M.Si		Semester week hours : 100 minutes
Additional teachers involved		

Syllabus

Philosophy of science is a course that aims to develop students' abilities to identify and discuss knowledge about the main concepts and principles in the philosophy of science through the concepts and principles, laws/rules of biology concerning: plasma membrane; protein synthesis; respiration and respiratory mechanisms in organisms; photosynthesis; cytoskeleton; systems: excretory, nervous, and hormonal; genes, DNA, chromosomes; biodiversity and conservation; habitat, ecological niche, ecosystem, and resources; inheritance and its mechanisms; biotechnology, through a presentation on a philosophy of science topic

The course is conducted through active learning and case method. Lecturer reviewed assignment who was tasked as a presenter, raising a discussion topic on the concepts and principles related to biology's material then students discussed case and reconstructed the essential concepts and built new ones; Under guidance of lecturer, students provided considerations and recommendations for the topic that raised a case. In the end, students and lecturers conducted an evoluation and reflection on the learning process. Synchronous learning is conducted through activities such as discussions and problem solving that stimulate students to analyze concepts and principles of biology materials and its philosophy. Asynchronous learning is conducted through assignments, allowing students to develop ICT literacy, communication skills, and collaboration. Assessment is conducted through portfolios, performance assessments, midterm exam, and final exams.

Learning goals and qualifications In this module students learn to:

- Able to identify course concepts and regulations in accordance with academic standards and the scope of the philosophy of science course
- Able to recognize the nature of the philosophy of science: its meaning, scope, object, and purpose
- Able to analyze the concepts and principles related to the structure and function of the plasma membrane system and its philosophy
- Able to analyze concepts and principles of protein synthesis and its philosophy
- Able to analyze the concept of respiration and respiratory mechanisms in organisms and its philosophy

- Able to analyze the concept of the cytoskeleton, its structure, and function, along with its philosophy
- Able to analyze the philosophical study of the excretory system
- Able to analyze the philosophical study of the nervous and endocrine systems
- Able to analyze the philosophical study of genes, DNA, and chromosomes in relation to inherited traits
- Able to analyze biodiversity and conservation, and their philosophical implications
- Able to analyze the concepts and principles of habitat, niche, ecology, ecosystem, and natural resources, and their philosophy
- Able to analyze the concepts and principles of inheritance and its mechanisms, and their philosophy
- Able to analyze the concepts and principles of biotechnology and its philosophy

References:

1. Mukhtar Latif.2016.*Orientation towards Understanding the Philosophy of Science*. Jakarta: Prenada Media Group
2. Campbell, N.A, J.B. Reece, L A. Urry, M.L. Cain, S.A. Wasserman, P.V. Minorsky, R.B. Jackson.2014.*Campbell biology*. New York: Pearson
3. Saefudin.,Permana, A., Amprasto. 2022. Field trips based on a focused strategy to stimulate the improvement of students' problem-solving skills on ecosystem materials. Jurnal Bioedukatika. doi.org/10.26555/bioedukatika.v10i1.20875

Curriculum 2023
MP-BE Courses
2nd Semester

Module number BI766	**Module name** Development of Teaching Materials Innovative Biology	
Course of study M.Pd. (Master of Education)	**Type of course** Development of Field Expertise Science (PKBI)	**Semester / Rotation** 1st/Even Semester
Teaching methods Student Centered Learning	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workload in hrs)** 3 **ECTS (+Workload in hrs)** 4.5 (100 contact hours in class + 50 hours of self-study (together 150 hrs)
Module coordinator Dr. Amprasto, M.Sc.		**Semester week hours:** 150 minutes

Additional teachers involved

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Syllabus

'Biology Instructional Plan' is an elective course in the Biology Education Masters Study Program. This course discusses methods for developing teaching materials that based on constructivism theory. Therefore, the teaching material development model is based on students' prior knowledge and refers to scientific concepts contained in reference books as suggested in didactic reconstruction (didactic reconstruction). Lectures are conducted with combining theoretical and practical studies. Assessment of student learning outcomes is based on teaching material products developed by students.

Students analyze reference books, create macro structures of reference books, create initial knowledge instruments, measure and analyze the results. initial knowledge, compiling new macro structures, and writing teaching materials

Learning goals and qualifications in this module students learn to:

- Able to analyze the application of appropriate theories to develop biology teaching materials.
- Able to analyze biological concepts, principles, and theories to develop biology teaching materials.
- Able to creating biology teaching materials products based on research results in accordance with developments in biology education.
- Able to demonstrate a responsible attitude towards work in their field of expertise

References:

1. Bleichroth, v. W. (1991). Elementarisierung das Kernstuek der Unterrichtsvorbereitung. Naturwissenschaften im Unterricht-Physik, 2(6), 4-11.
2. Money, R. (2004). Fachdidaktiken als Forschungsgebiete und als Berufwissenschaften der Lehrkraefte – das Beispiel Didaktik der Naturwissenschaften. Education. (in print).
3. Duit, R., Gropengiesser, H., & Kattmann, U. (2005). Toward Science Education research that is Relevant for Improving Practice: The Model of Educational Reconstruction. In HE Fischer (Ed). Developing Standards in Research on Science Education, (pp. 1-9). London: Taylor and Francis.

4. Fensham, P. J. (2004). Defining an Identity: The Evolution of Science Education as a Field of Research. Dordrecht: Kluweer Academic Publishers.
5. Gundem, B.B. (1995). Historical roots and contemporary foundations. In S. Hopmann & K. Riquarts (Eds.), Didactics and/or Curriculum. Kiel: IPN.
6. Kattmann, Money, Gropengiesser and Komorek. (1997). Das Modell der Didaktischen Rekonstruktion – Ein Rahmen fuer naturwissenschaftsdidaktische Forschung und Entwicklung. Zeitschrift fuer Didaktik der Naturwissenschaften, 3(3), 3-18.
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8. Westbury, I. (1995). Didactics and curriculum theory: Are they two sides of the same coin? In S. Hopmann & K. Riquarts (Eds.), Didactics and/or Curriculum. Kiel: IPN

<table>
<tr><td>Module number
BI765</td><td colspan="3">Module name
Entrepreneurship in Biology Education</td></tr>
<tr><td colspan="2">Course of study
M.Pd. (Master of Education)</td><td>Type of course
Elective Courses</td><td>Semester / Rotation
2nd/Even Semester</td></tr>
<tr><td colspan="2">Teaching methods
Case Method</td><td>Prerequisites for attendance
None</td><td>Language
Indonesian, English</td></tr>
<tr><td colspan="3">Type of examination (Final Grade Composition)

1. Students Activity process (25%)
2. Assignment Product (75%)</td><td>SKS (+Workload in hrs)
3

ECTS-LP (+Workload in hrs)

4,5 (100 contact hours in class + 50 hours of self-study) (together 150 hrs)</td></tr>
<tr><td colspan="3">Module coordinator
Dr. Bambang Supriatno, M.Si.</td><td>Semester Week Hours:
150 minutes</td></tr>
<tr><td colspan="4">Additional teachers involved
Dr. Sariwulan Diana, M.Si.</td></tr>
<tr><td colspan="4">Syllabus

This course develops higher-order thinking skills (critical, analytical, and creative), skills, and attitudes as someone with an entrepreneurial spirit in creating opportunities to establish/build a business in production and services based on Biology education (Optional topics: Botany Cryptogamae, Phanerogamae/Herbarium, Biotherapy, Biotechnology, etc.) in the form of a paper/proposal for a project aimed at encouraging job expansion, increasing income and living standards of the community, as well as other economic growth through a systems approach and group activities, discussions, and presentations on a field of entrepreneurship based on Biology.</td></tr>
<tr><td colspan="4">Learning goals and qualifications. In this module, students learn to:

- Communicate ideas and investigation results of business opportunities in a scientific presentation setting.
- Create educational products based on research in accordance with the developments in biological education.
- Be able to collaborate.
- Have social sensitivity and concern for the community and the environment.
- Internalize the spirit of independence.
- Internalize the spirit of struggle.
- Analyze concepts, principles, and theories of biology for entrepreneurship in biological education.
- Internalize the spirit of independence, struggle, and entrepreneurship.</td></tr>
</table>

References:

1. Allen, K. (2010). Entrepreneurship for Scientists and Enginers. New Jersey: Pearson Education International.
2. Fahmi, I. (2013). Etika Bisnis. Bandung: Alfabeta
3. Osterwalder, A & Pigneur, Y. (2009). Busines Model Generation. New Jersey: John Wiley and Sons, Inc.
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5. Ramdan, A. (2013). Etika Bisnis dalam Islam. Jakarta: Bee Media Indonesia.
6. Supriatno, B., Suwandi, T., Kusumawaty, D., & Ahyani, A. (2020). Bioentrepreneurship: Pengantar Teori dan Praktik Membangun Usaha. Bandar Lampung: Pusaka Media.
7. Wardoyo, V. (2014). Fun Leader, Funtastic Result. Gramedia, Jakarta.

Module number BI768	**Module name** **ESD project in biology learning**	
Course of study M.Pd. (Master of Education)	**Type of course** Development of Expertise in The Field of Science	**Semester / Rotation** 2nd/Even Semester
Teaching methods Discussion, Presentation, Problem Solving	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) Students Activity process (25%) Midterm Exam (25%) Assignment Product (20%) Final Exam (30%)		**SKS (+Workload in hrs)** 4 **ECTS (+Workload in hrs)** 6 (150 contact hours in class + 50 hours of self-study (together 200hrs)
Module coordinator		**Semester week hours:** **200 minutes**
Additional teachers involved ….		

Syllabus

The Biology Education for Sustainable Development (ESD) course is an elective course for undergraduate students of Biology Education. The course facilitates the development of three main domains that it has, namely cognitive, socio-emotional, and behavioral which include systems thinking skills, anticipation skills, normative skills, strategic skills, collaborative skills, critical thinking skills, reflection skills, and the ability to solve problems integratively in diverse situations and contexts so that they can become sustainability citizens. This course is interdisciplinary. Discussion on issues and feedback on learning media products are conducted collaboratively by lecturers and students, concluding with an elaboration of the course material by the lecturer.

Learning goals and qualifications In this module students learn to:

- Able to participate in achieving SDGs through educational activities
- Able to care about the condition of society and the environment
- Able to utilize the latest technology wisely in solving problems
- Able to apply the knowledge gained in biology, biology education, and ESD in achieving the SDGs
- Able to use the competencies needed as an ESD teacher
- Able to develop ESD programs in schools both in curricular and extracurricular forms
- Able to work together and having social sensitivity and concern for society and the environment

References:

1. Capra, F., & Luisi, P. L. (2014). *The systems view of life: A unified vision*. Cambridge University Press.
2. McKeown, R. (Ed.). (2002). *Education for sustainable development toolkit*. UNESCO.
3. Orr, D. W. (1992). *Ecological literacy: Education and the transition to a postmodern world*. State University of New York Press.
4. Orr, D. W. (1994). *Earth in mind: On education, environment, and the human prospect*. Island Press.
5. Palmer, J. A. (2007). *Fifty key thinkers on environmental education*. Routledge.
6. Sterling, S. (2001). *Sustainable education: Revisioning learning and change*. Green Books
7. Sterling, S. (2010). The future is learning: The power of place and the urgency of pedagogy. *Journal of Environmental Education*, *41*(4), 231-240. (Perkiraan jurnal, jika ada artikel spesifik bisa dicantumkan)

8. Tilbury, D. (2011). *Education for sustainable development: An expert review of processes and learning*. UNESCO. (Meskipun ini laporan, seringkali dirujuk seperti artikel atau publikasi khusus)

Module number BI717	**Module name** **TPACK Biology**	
Course of study M.Pd. (Master of Education)	**Type of course** Development of Expertise in The Field of Science	**Semester / Rotation** 2nd/Even Semester
Teaching methods Discussion, Presentation, Problem Solving	**Prerequisites for attendance** None	**Language** Indonesian, English
Type of examination (Final Grade Composition) ● Students Activity process (25%) ● Midterm Exam (25%) ● Assignment Product (20%) ● Final Exam (30%)		**SKS (+Workload in hrs)** 4 **ECTS (+Workload in hrs)** 6 (150 contact hours in class + 50 hours of self-study (together 200hrs)
Module coordinator Prof. Dr. Hj. Widi Purwianingsih, M.Si.		**Semester week hours:** **200 minutes**
Additional teachers involved -		

Syllabus

This **specialized course** is designed exclusively for students of the **Master's in Biology Education** program. It focuses on equipping you with a deep understanding and practical skills to integrate **Technological Pedagogical Content Knowledge (TPACK)** within the context of modern biology education. You'll explore how to synergistically combine your knowledge of **biology content** (what to teach), **pedagogy** (how to teach), and **technology** (the tools and resources to use). The aim is to design and implement biology learning experiences that are not only engaging and innovative but also relevant, meaningful, and highly effective in developing students' understanding and skills for the 21st century. This course will empower you to become an adaptive and visionary biology educator, ready to navigate the challenges and opportunities of the digital age.

Learning goals and qualifications In this module students learn to:

- Able to understand and agree to the rights and obligations related to the TPACK course which includes study materials, learning systems, types of assignments and assessment systems.
- Able to know Technological Knowledge (TK) how to use technology as a learning tool
- Able to now Pedagogy Knowledge, is how teachers teach learning materials, the use of appropriate and creative models and methods can make the learning process more effective.
- Able to apply pedagogical content knowledge (Pedagogy Content Knowledge) in teaching learning materials, the use of appropriate and creative models and methods can make the learning process more effective.
- Able to develop learning device products that apply pedagogical content knowledge (Pedagogy Content Knowledge)
- Able to apply Technological Pedagogical Knowledge (TPK) by applying technology that can facilitate effective learning
- Able to demonstrate a responsible attitude towards work in his/her field of expertise independently

References:

1. Angeli, C. M., & Valanides, N. (2015). Epistemological and Methodological Issues for the Conceptualization, Development, and Assessment of TPACK: A Critical Review. In P. Bello, M. N. B. S. J. C. A. M. J. M. B. V. N. (Eds.), *Handbook of Research on Pedagogical Models for Learning and Instruction* (pp. 165–182). IGI Global.
2. Chai, C. S., Koh, J. H. L., Ho, C. L., & Tan, L. (2016). Modeling preservice teachers' Technological Pedagogical Content Knowledge (TPACK) for responsible citizenry: A structural equation modeling approach. *Educational Technology Research and Development*, *64*(6), 1105–1127. (Meskipun tidak spesifik biologi, kerangka TPACK fundamentalnya relevan).
3. Harris, J. B., & Hofer, M. J. (2017). TPACK in action: Transforming classrooms with technology, pedagogy, and content. In *Educational technology, teacher knowledge, and classroom impact* (pp. 95–112). Routledge.
4. Koehler, M. J., & Mishra, P. (2017). TPACK: A Framework for Teacher Knowledge. In J. M. Spector, M. D. Merrill, J. Elen, & M. J. Bishop (Eds.), *Handbook of Research on Educational Communications and Technology* (pp. 101–112). Springer.
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6. Niess, M. L. (2015). TPACK: The next generation—Becoming more focused, more rigorous, and more impactful. *Journal of Digital Learning in Teacher Education*, *31*(1), 21–25.
7. Pantić, N., & Wubbolts, K. (2020). Teacher agency for learning with technology: A situated perspective on TPACK. *Computers & Education*, *150*, 103831.

Curriculum 2023
MP-BE Courses
3rd Semester

<table>
<tr><td>Module number
BI773</td><td colspan="2">Module name
Bioprocess Study</td></tr>
<tr><td>Course of study
M.Pd. (Master of Education)</td><td>Type of course
Development of Study Program Expertise Linearity (PLKP)</td><td>Semester / Rotation
3rd/Odd Semester</td></tr>
<tr><td>Teaching methods
Case Methods</td><td>Prerequisites for attendance
None</td><td>Language
Indonesian, English</td></tr>
<tr><td colspan="2">Type of examination (Final Grade Composition)
Project Activity (40%)
Students Activity Process (30%)
Midterm Exam (10%)
Assignment (10%)
Final Exam (10%)</td><td>SKS (+Workload in hrs)
3
ECTS (+Workload in hrs)
4.5 (100 contact hours in class + 50 hours of self-study (together 150 hrs)</td></tr>
<tr><td colspan="2">Module coordinator
Dr. Kusnadi, M.Si.</td><td>Semester week hours:
150 minutes</td></tr>
<tr><td colspan="3">Additional teachers involved
….</td></tr>
<tr><td colspan="3">Syllabus
This course provides an advanced understanding of the principles and applications of bioprocesses in biological systems, including microbial metabolism, fermentation, enzyme technology, and bioreactor operations. It connects biological processes with real-world applications such as biofuel, food technology, and waste treatment. Emphasis is placed on how bioprocess knowledge can be integrated into science teaching and curriculum development for secondary and pre-university levels. The teaching methods include discussions, analysis paper assignments, expository lectures, presentations, and projects. Course assessment is conducted through performance assessments (assignments, discussions, and presentations) and written tests (Midterm Exam and Final Exam). The learning process is carried out both synchronously and asynchronously. Synchronous meetings are conducted via Zoom for discussions, presentations, and content reviews. Asynchronous learning is facilitated through spada.upi.edu, which provides access to learning materials and supports the learning process (assignment submission and review, discussions, and assessments).</td></tr>
<tr><td colspan="3">Learning goals and qualifications. In this module students learn to:
● Explain fundamental principles of microbial growth, metabolism, and product formation.</td></tr>
</table>

- Analyze the stages of bioprocess development from upstream to downstream.
- Apply concepts of bioprocessing in industrial and environmental contexts.
- Evaluate educational strategies to teach bioprocess topics effectively in schools.
- Design educational models or modules integrating bioprocess-based learning.

References:

1. Doran, P. M. (2012). *Bioprocess Engineering Principles* (2nd ed.). Academic Press.
2. Kusnadi, A. P., Hamdiyati, Y., Peristiwati, Fitriani, A., Pratiwi, P., & Husni, F. (2021). Profile of biology teachers' ability in microbiology practicum trials based on local materials during the Covid-19 pandemic in senior high school. *Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran*, *7*(4), 994–1002.
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4. Sanjaya, Y., Fitriani, A., & Firdausa, A. M. (2022). Bioinsecticide activity of silver nanoparticles product of biosynthesis using entomopathogen against the beet caterpillar *Spodoptera exigua*. *Journal of Biopesticides*, *15*(1), 26–30. Crop Protection Research Centre.
5. Shuler, M. L., & Kargi, F. (2017). *Bioprocess Engineering: Basic Concepts* (3rd ed.). Pearson.
6. Tresnawati, C., Rahmat, A., Rahman, T., & Kusnadi, K. (2024). The potential interactive digital teaching material on cell metabolism as a bridge of cognitive processes toward student learning achievement. *Jurnal Penelitian Pendidikan IPA*, *10*(3), 1322–1330.

<table>
<tr><td>Module number
BI304</td><td colspan="2">Module name
Biology Curriculum</td></tr>
<tr><td>Course of study
M.Pd. (Master of Education)</td><td>Type of course
Development of Study Program Expertise Linearity (PLKP)</td><td>Semester / Rotation
3rd/Odd Semester</td></tr>
<tr><td>Teaching methods
Case Methods</td><td>Prerequisites for attendance
None</td><td>Language
Indonesian, English</td></tr>
<tr><td colspan="2">Type of examination (Final Grade Composition)
Project Activity (40%)
Students Activity Process (30%)
Midterm Exam (10%)
Assignment (10%)
Final Exam (10%)</td><td>SKS (+Workload in hrs)
3
ECTS (+Workload in hrs)
4.5 (100 contact hours in class + 50 hours of self-study (together 150hrs)</td></tr>
<tr><td colspan="2">Module coordinator
Dr. Kusnadi, M.Si.</td><td>Semester week hours:
150 minutes</td></tr>
<tr><td colspan="3">Additional teachers involved
-</td></tr>
<tr><td colspan="3">Syllabus
This course focuses on the critical analysis of biology content within school curricula from national and international perspectives. Emphasis will be placed on evaluating how biological concepts are selected, organized, and presented to meet the learning needs of students and societal challenges such as sustainability, biotechnology, and digital learning. Students will explore how to align content with competency-based curricula, scientific literacy, and future skills. The teaching methods include discussions, analysis paper assignments, expository lectures, presentations, and projects. Course assessment is conducted through performance assessments (assignments, discussions, and presentations) and written tests (Midterm Exam and Final Exam). The learning process is carried out both synchronously and asynchronously. Synchronous meetings are conducted via Zoom for discussions, presentations, and content reviews. Asynchronous learning is facilitated through spada.upi.edu, which provides access to learning materials and supports the learning process (assignment submission and review, discussions, and assessments).</td></tr>
<tr><td colspan="3">Learning goals and qualifications. In this module students learn to:
1. Analyze the scope and sequence of biology content in national and international curricula
2. Evaluate the relevance of biology content in addressing future global challenges (e.g., climate change, health crises, biodiversity loss)</td></tr>
</table>

3. Critically review biology textbook and teaching materials for pedagogical and conceptual accuracy
4. Recommend improvements to biology curriculum content based on scientific, pedagogical, and technological trends
5. Design and present a school biology content map with contemporary educational goals

References:

1. Bybee, R. W. (2015). *The BSCS 5E instructional model: Creating teachable moments*. NSTA Press.
2. Yulisman, H., Widodo, A., Riandi, R., & Nurina, C. I. E. (2019). Moderated effect of teachers' attitudes to the contribution of technology competencies on TPACK. *Jurnal Pendidikan Biologi Indonesia, 5*(2), 185–196.
3. International Baccalaureate Organization. (2019). *IB Diploma Programme biology guide: First assessment 2023*. https://www.ibo.org/
4. Rochintaniawati, D., Riandi, R., Kestianty, J., Kindy, N., & Rukayadi, Y. (Year). The analysis of biology teachers' technological pedagogical content knowledge development in lesson study in West Java, Indonesia. *Jurnal Pendidikan IPA Indonesia, 8*(2), 201-210.
5. Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi. (2022). *Kurikulum Merdeka: Struktur dan capaian pembelajaran SMP/SMA bidang IPA*. https://kurikulum.kemdikbud.go.id/
6. National Research Council. (2015). *Guide to implementing the Next Generation Science Standards*. National Academies Press.
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8. OECD. (2021). *Future of education and skills 2030: Curriculum analysis for science education*. Organisation for Economic Co-operation and Development. https://www.oecd.org/education/2030-project/
9. Kampourakis, K., & Reiss, M. (Eds.). (2018). *Teaching biology in schools: Global research, issues, and trends* (1st ed.). Routledge.
10. Sjöström, J., & Eilks, I. (2018). Reconsidering different visions of scientific literacy and science education based on the concept of *Bildung*. In Y. J. Dori, Z. R. Mevarech, & D. R. Baker (Eds.), *Cognition, metacognition, and culture in STEM education* (Vol. 24, pp. 65–88). Springer.
11. UNESCO. (2020). *Education for sustainable development: A roadmap*. United Nations Educational, Scientific and Cultural Organization. https://unesdoc.unesco.org/ark:/48223/pf0000374802
12. Linn, M. C., Gerard, L., Matuk, C., & McElhaney, K. W. (2016). Science Education: From Separation to Integration. *Review of Research in Education*, *40*(1), 529-587.
13. Cambridge Assessment International Education. (2021). *Cambridge IGCSE and A-level biology curriculum framework*. https://www.cambridgeinternational.org/

<table>
<tr><td>Module number
BI772</td><td colspan="2">Module name
Genetics and Molecular Evolution</td></tr>
<tr><td>Course of study
M.Pd. (Master of Education)</td><td>Type of course
Development of Study Program Expertise Linearity (PLKP)</td><td>Semester / Rotation
3rd/Odd Semester</td></tr>
<tr><td>Teaching methods
Case Methods</td><td>Prerequisites for attendance
None</td><td>Language
Indonesian, English</td></tr>
<tr><td colspan="2">Type of examination (Final Grade Composition)
Project Activity (40%)
Students Activity Process (30%)
Midterm Exam (10%)
Assignment (10%)
Final Exam (10%)</td><td>SKS (+Workload in hrs)
3
ECTS (+Workload in hrs)
4.5 (100 contact hours in class + 50 hours of self-study (together 150 hrs)</td></tr>
<tr><td colspan="2">Module coordinator
Prof. Dr. Riandi, M.Si.</td><td>Semester week hours:
150 minutes</td></tr>
<tr><td colspan="3">Additional teachers involved
….</td></tr>
<tr><td colspan="3">Syllabus
This course provides an in-depth understanding of the principles of genetics and the molecular basis of evolutionary processes. It explores gene structure and function, genetic variation, population genetics, and molecular phylogenetics. The course integrates evolutionary theory with recent discoveries in genomics, bioinformatics, and molecular biology, while also focusing on how these concepts can be effectively taught in secondary and tertiary education settings. The teaching methods include discussions, analysis paper assignments, expository lectures, presentations, and projects. Course assessment is conducted through performance assessments (assignments, discussions, and presentations) and written tests (Midterm Exam and Final Exam). The learning process is carried out both synchronously and asynchronously. Synchronous meetings are conducted via Zoom for discussions, presentations, and content reviews. Asynchronous learning is facilitated through spada.upi.edu, which provides access to learning materials and supports the learning process (assignment submission and review, discussions, and assessments).</td></tr>
<tr><td colspan="3">Learning goals and qualifications. In this module students learn to:
● Analyze the structure, function, and regulation of genes and genomes.
● Evaluate mechanisms of genetic mutation, recombination, and natural selection.</td></tr>
</table>

- Interpret molecular data to understand evolutionary relationships.
- Develop educational strategies for teaching complex genetic and evolutionary concepts.
- Reflect critically on the role of genetics and evolution in biodiversity and human health.

References:

1. Aripin, I., Hidayat, T., Rustaman, N., & Riandi, R. (2021). Monitoring biodiversitas kupu-kupu di perkebunan jeruk limau (*Citrus amblycarpa*) berbasis citizen science. *Gunung Djati Conference Series*, *6*, 111–121.
2. Aripin, I., Hidayat, T., Rustaman, N. Y., & Riandi, R. (2021). Monitoring of insect pollinators of mango (*Mangifera indica* L.) inflorescence based on citizen science. *Biogenesis: Jurnal Ilmiah Biologi*, *9*(2), 156–162.
3. Griffiths, A. J. F., Doebley, J., Peichel, C., & Wassarman, D. A. (2015). *Introduction to genetic analysis* (11th ed.). W. H. Freeman.
4. Futuyma, D. J., & Kirkpatrick, M. (2017). *Evolution* (4th ed.). Sinauer Associates.
5. Freeman, S., & Herron, J. C. (2020). *Evolutionary Analysis* (5th ed.). Pearson.
6. Maryuningsih, Y., Hidayat, T., Riandi, R., & Rustaman, N. Y. (2022). Application of genetic problem-based online discussion to improve genetic literacy of prospective teachers. *Jurnal Pendidikan Biologi Indonesia*, *8*(1), 65–76.
7. Ridley, M. (2004). *Evolution* (3rd ed.). Blackwell Publishing.
8. Suryanti, E., Fitriani, A., Redjeki, S., & Riandi, R. (2020, July 30). The effectiveness of modified free inquiry strategies to enhance mastery of molecular biology concepts. In *Proceedings of the 7th Mathematics, Science, and Computer Science Education International Seminar (MSCEIS 2019)*

Curriculum 2023
MP-BE Courses
4th Semester

Curriculum 2023
MP-BE Courses
4th Semester