



CURRICULUM BY RESEARCH

**DOCTORAL PROGRAM
CHEMISTRY EDUCATION**

2024





CURRICULUM BY RESEARCH DOCTORAL PROGRAM CHEMISTRY EDUCATION



**DOCTORAL OF CHEMISTRY EDUCATION CURRICULUM
FACULTY OF MATHEMATICS AND NATURAL SCIENCE
UNIVERSITAS NEGERI YOGYAKARTA**

2024

I. VISION DAN MISSION

A. Scientific Vision

"The development of Pedagogical Content Knowledge (PCK) is supported by digital competencies oriented towards Green Chemistry and Responsible Citizen to increase global competitiveness." The meaning of the vision can be explained as follows:

1. Pedagogical Content Knowledge (PCK) means that the Chemistry Education Doctoral Program is committed to developing specific pedagogical knowledge and practices to teach chemistry appropriately through published research so that it has an impact on efforts to improve the quality of chemistry education to answer the challenges of the 21st century.
2. Digital Competence is interpreted as an effort to accommodate the development of globalization and the 4.0 industrial revolution, so the Chemistry Education Doctoral Program is committed to producing research in the field of chemical education that is ready to answer today's challenges.
3. Green Chemistry means that the research developed by the Chemistry Education Doctoral Program is always aimed at utilizing environmentally friendly natural resources to support educational programs for sustainable development.
4. Responsible Citizen means that learning and research in Chemistry Education Doctoral Program strengthens the relevance of chemistry learning, especially in the vocational/professional dimension that supports the concept of science for all in realizing responsible citizens to answer the challenges of the revolution of society 5.0.
5. Global Competitiveness means that research in Chemistry Education Doctoral Program is directed at the latest research trends and paradigms that are developing in the international world, supported by optimizing local wisdom so that they can play a role in improving the quality of chemistry education in a global context.



B. Mission

1. Organizing education at the level of Doctor (S-3) with chemical education expertise that develops competencies in students about pedagogics, social and professional personalities who are reliable at the global level, and have competence in the world of work.
2. Take an active role in developing chemistry education related to theory and practice and research in content knowledge and pedagogy (curriculum, evaluations, learning media, and learning technology).
3. Take an active role in the development of essential competencies in the field of chemistry education based on seven basic categories of competence for professional teachers: subject matter content knowledge, pedagogical content knowledge (PCK), curriculum knowledge, general knowledge of learners, pedagogical knowledge, knowledge of educational contexts and understanding of educational ends.
4. Develop scientific concept communication skills by writing in the form of national and international scientific articles and presenting the results of studies or research to the national and international community.
5. Develop original research that can trigger new knowledge about chemistry education.
6. Cooperating with institutions at home and abroad based on quality to support institutional development.
7. Play an active role in applying chemistry education in the community.

II. Profil of Graduate

Graduates from the Doctoral Program (S-3) Chemistry Education are Doctors who are expected to work in general in the field of science education and specifically in the field of chemistry education.

No.	Profil of Graduate	Profile Description
1	Educators in Higher Education and High School in Chemistry Education	Doctoral of Chemistry Education who: - able to master general concepts and principles in the whole field of chemistry and in-depth in the field of chemistry, which includes structure and bonding, dynamics, energetics, and measurement.



		<ul style="list-style-type: none">- able to design, implement, evaluate and develop chemistry learning in secondary schools and universities with a character-oriented education.- master the basic concepts and principles of pedagogy and innovative chemistry learning methodologies.- able to solve chemistry learning problems through interdisciplinary, multidisciplinary, or transdisciplinary approaches.
2	Chemical Education Researcher	<p>Chemical education researcher who:</p> <ul style="list-style-type: none">- mastering educational research methods for innovation and improvisation of chemistry learning.- able to solve chemistry learning problems through a multidisciplinary approach.- have the ability to research and develop techniques and methods of teaching chemistry so that learning chemistry will be easy and fun.
3	Chemical Education Consultant	<p>Chemical education consultant who:</p> <ul style="list-style-type: none">- have responsibility for learning chemistry at school independently and can be given responsibility for the achievement of the work of an institution or organization by prioritizing the development of potential and character building of students.- have a leadership spirit and be able to apply management principles to manage education- has responsibility for managing parts of the chemical education process or in preparing, handling, and managing chemicals in government



		and private institutions' environmental and manufacturing processes.
4	Chemical Education Analyst and Engineer	<p>Chemical education analyst and engineer who:</p> <ul style="list-style-type: none"> - Ability to analyze education management policies, curriculum, evaluations, and teaching technology related to chemistry learning. - has responsibility for managing parts of the chemical education process or in preparing, handling, and managing chemicals in government and private institutions' environmental and manufacturing processes.

III. Learning Outcomes

The Doctoral Program (S-3) has a level 9 qualification based on the KKNI. Parameter description and learning outcomes (Doctoral Program (S-3) Chemistry Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Yogyakarta:

PARAMETER DESCRIPTION	LEARNING OUTCOME
ATTITUDE AND VALUES	<ol style="list-style-type: none"> 1. Be devoted to God Almighty and have good morals, ethics, and personality in completing their duties. 2. To act as proud citizens who love their homeland and support world peace. 3. Ability to work together, have high social sensitivity and concern for society and the environment, and appreciate the diversity of cultures, views, beliefs, religions, and other people's original opinions/findings. 4. Uphold law enforcement and have the spirit of putting the nation's and society's interests first. 5. Able to internalize correct academic values and norms related to honesty, ethics, attribution, copyright, confidentiality, and data ownership.



<p>SPECIAL ABILITY (Able to develop knowledge, technology, and or art in the field of science or professional practice through research, to produce innovative and tested works).</p>	<p>6. Able to internalize the entrepreneurial spirit</p> <ol style="list-style-type: none">1. Apply and develop knowledge and technology in the field of chemistry education through reasoning and scientific research based on logical, critical, systematic, and creative thinking.2. Develop chemistry education through scientific research, or produce scientific works and study concepts based on scientific principles compiled in the form of a dissertation.3. Publish the results of research in the field of chemistry education in reputable international scientific journals and proceedings.4. Increase the capacity for independent learning.5. Have structured learning skills for self-development, scholarship, and career sustainability.6. Able to think critically, make appropriate decisions, and communicate effectively, academically, and ethically.
<p>KNOWLEDGE (Able to solve problems of science, technology, and or art in the field of science through an inter or multidisciplinary approach).</p>	<ol style="list-style-type: none">1. Documenting, managing, storing, auditing, and securing data on research results in the field of chemistry education for different research purposes under his responsibility.2. Able to compile chemical education research, with an interdisciplinary, multidisciplinary, or transdisciplinary approach, including theoretical studies and experiments in the fields of science, technology, art, and innovation as outlined in the form of dissertations, and papers published in reputable international journals.3. Carry out chemical education research based on research maps with an interdisciplinary, multidisciplinary, or transdisciplinary approach independently or in collaboration with other institutions.



	<p>4. Able to choose research in the field of chemical education that is appropriate, current, advanced, and provides benefits to humanity through an interdisciplinary, multidisciplinary, or transdisciplinary approach, to develop and produce problem-solving in the fields of science, technology, and society, based on the results of the study regarding the availability of internal and external resources.</p> <p>5. Able to develop a research roadmap in chemistry education with an interdisciplinary, multidisciplinary, or transdisciplinary approach, based on a study of the leading research objectives and their constellation on a broader target.</p>
<p>GENERAL ABILITY (Able to manage research and development that benefits society and science and can gain national and international recognition).</p>	<p>1. Develop and maintain a network with colleagues, peers within the institution, and the research community in the broader field of chemistry education (outside the institution).</p> <p>2. Able to formulate scientific, technological, or artistic arguments and solutions in chemistry education based on a critical view of facts, concepts, principles, or theories that can be accounted for scientifically and academically and communicate them through the mass media or directly to the public.</p> <p>3. Able to demonstrate academic leadership in managing the development and development of resources and organizations under their responsibility.</p>



IV. Study Material

Starting from the 2020/2021 academic year, the Doctoral Program for Chemistry Education Study Program accepts students with a curriculum type by research. The study load of the Doctor by Research Program is **50 credits**. The study load is scheduled to be completed within **2.5 (two and a half)** years or can be taken for a maximum of 7 (seven) years. Students of this program are required to focus and work hard in taking and completing their education. Therefore, students must carry out the educational process systematically, measurably, and independently.

1. Courses

The courses that must be taken and completed by Doctor by Research Program participants consist of:

- 1). **Dissertation Preproposal**
- 2). **Preliminary Studies**
- 3). Dissertation Proposal
- 4). **Independent Project**
- 5). Data Collection and Analysis
- 6). Research Results in Seminar
- 7). **International Publication of Research Result**
- 8). Dissertation

Implementing the curriculum in learning during the study period is designed and distributed in the following structure.

No.	Course Code	Course Name	Credits	Semesters
1.	DOK 90401	Dissertation Preproposal	4	I
2.	DOK 90402	Preliminary Studies	4	
3.	DOK 90403	Dissertation Proposal	4	II
4.	DOK 90404	Independent Project	4	
5.	DOK 90405	Data Collection and Analysis	6	III
6.	DOK 90406	Research Results in Seminar	8	IV
7.	DOK 90407	International Publication of Research Result	8	
8.	DOK 91208	Dissertation	12	V
Total Credits			50	



2. Description of Courses

a. Dissertation Preproposal (DOK 90401)

The dissertation preproposal is prepared according to scientific principles with the following elements: (1) an Introduction containing the background and objectives, (2) Literature Review, and (3) Research Methods. The dissertation proposal is designed and prepared with intensive guidance from the Advisory Team following the Dissertation Writing Guidelines for the Faculty of Mathematics and Natural Sciences of Universitas Negeri Yogyakarta Research Pathways 2020. The resulting proposal will be tested for feasibility at the Dissertation Proposal Feasibility Seminar to obtain approval to conduct research

b. Preliminary Studies (DOK 90402)

The presentation of the literature review thoughts on the topic of the problem is adjusted to the interests of the study that have been submitted to the study program. The literature used as study material is the latest publications (books, proceedings, journal articles, dissertations, and official reports from scientific/professional organizations) at national and international levels, which are assessed critically, systematically, and thoroughly based on the quality of theoretical approaches, analysis of results and relevant policy implications. With efforts to develop Indonesian education now and in the future. The study emphasizes the problems that will be studied in research to produce an original, complete, and in-depth literature review. It can be part of a dissertation (Chapter II) **accepted at least in a recognized international conference or in an accredited national journal (Sinta 1 or Sinta 2).**

c. Dissertation Proposal (DOK 90403)

The dissertation proposal assessment is intended to assess the feasibility of the research submitted at the doctoral level. Aspects of the evaluation of the dissertation proposal include the state-of-the-art problem to be studied, the relevance and up-to-date theories used as the basis for determining the research problem, research objectives, the accuracy of the approaches and methods applied to answer research problems, and the up-to-date literature referred to as a reference. The Internal and External Examiner Teams conduct the assessment to determine whether the research proposal is accepted (with or



without improvement) or rejected. The revision of the dissertation proposal must be completed no later than 3 (three) months. If the proposal is declared to be subject to significant revision and the examination needs to be repeated, the student is allowed to take part in the second assessment with a deadline of not later than 6 (six) months after the first assessment. If the time limit is exceeded or the proposed dissertation proposal in the second assessment is declared not to meet the standards, the student is said to have failed to meet the criteria qualification as a Doctor by Research candidate.

d. Independent Project (DOK 90404)

This course is designed to (1) provide practical experience for doctoral candidates in preparing and writing papers (for proceedings) on the results of literature reviews or preliminary research and (2) improve abilities, skills, and experience in preparing presentation materials, presenting papers and actively participate in organized scientific discussions. The study results are written as literature review articles or preliminary research presented orally in international seminars/conferences by the scientific field and organized by professional associations, universities, or credible research institutions on a national/global scale. Students are declared to have passed this course if the articles produced have at least the status of accepted for selection in **the international indexed proceedings or journal or can be replaced with the accredited national journal (Sinta 1 or Sinta 2) or paten.**

e. Data Collection and Analysis (DOK 90405)

Doctoral students prepared the instrument under the direction of the Promoter Team before being validated by a team of instrument validators appointed by the Faculty of Mathematics and Natural Sciences of Universitas Negeri Yogyakarta. Research can be carried out on and off campus, obtaining permission from the competent authority, and obtaining clearance from the Research Ethics Committee for research with human or animal research subjects. The study is carried out with scientific procedures and methods specified in the proposal that has passed the exam and been revised based on input from the examiner board.

f. Research Results in Seminar (DOK 90406)

Analysis of research data which is a continuation of the data collection stage, is carried out with a systematic presentation and discussion based on the relevant theoretical



basis. Students carry out this process under the guidance of the Promoter Team to complete the final stages of dissertation research so that students can report/write down the results of their study as part of their dissertation. The seminar on research results was assessed by an internal Examiner Team appointed by the Faculty of Mathematics and Natural Sciences manager, Yogyakarta State University.

g. International Publication of Research Result (DOK 90407)

Publication of the results of data analysis is an essential step for doctoral candidates. Therefore, doctoral candidates must compile manuscripts of their research results together with the Promoter Team. This collaborative work is expected to develop doctoral candidates' abilities, skills, and experience in preparing manuscripts according to international publication standards. Manuscripts of research articles that have been designed must be published by credible institutions (educational institutions, research institutes, professional associations, or publishers) **in Scopus indexed international journal (minimum 1 article Scopus Q2 or 2 article in Scopus Q3 or 3 article in Scopus Q4).**

h. Dissertation (DOK 91208)

A dissertation is an official scientific paper (in Indonesian or English) as a student's responsibility to complete a doctoral program. The dissertation proves a student's ability to research discoveries in his chosen field of science and is an original, tested, and recognized work nationally and internationally. The dissertation must contain the novelty of the research results or the development of new theories from existing theories. The Doctor by Research program offers two types of dissertations: (1) a dissertation by chapters/monograph consisting of 80,000-100,000 words and (2) a dissertation that combines the results of a revised proposal with the publication of an article. This type of combination dissertation must include three or four publications of articles in indexed international journals (one of which must be indexed by Scopus) instead of results and discussion, which concludes with conclusions (concluding remarks). The final result of the dissertation is tested through an open trial.