PROJECT-BASED LEARNING MODEL IN CONTROL OF PLANT DISEASES FIELD SCHOOL (CPDFS) AS AN IMPLEMENTATION OF *MERDEKA BELAJAR KAMPUS MERDEKA*

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I. Background

To produce competent and competitive Agricultural Human Resources, such qualified agricultural higher education system is urgently required. Quality agricultural education system is implemented by paying attention to the time and science and technology development, job market demands, students' needs and stakeholders, and carrying out continuous improvement in every field of education system (Rosmaladewi, 2019).

In accordance with The Minister of Education and Culture's policy in 2020 about *Merdeka Belajar – Kampus Merdeka*, Agricultural higher education must also create a creative and innovative, flexible learning culture that is not curbed and tailored to study program needs. The goal is to encourage students to master various sciences in Agriculture which are useful to enter the world of work. The learning implementation in *Kampus Merdeka* provides challenges and opportunities for the development of creativity, capacity, personality, and students' needs, as well as develop self-reliance in finding knowledge through reality and field dynamics such as ability requirements, real problems, social interaction, collaboration, self-management, performance demands, targets and achievements. (Kemendikbud, 2020).

To implement *Kampus Merdeka -Merdeka Belajar* in Agrotechnology Program, Faculty of Agriculture, the Project-Based Learning model in Control of Plant Diseases Field School (CPDFS) having collaboration with partner institutions is essential to be implemented. This can provide a wide opportunity for students to enrich and improve their insights and competencies in the real world in accordance with the interests and talents.

The focus of Project-Based Learning on CPDFS, which is the implementation of *Merdeka Belajar,* is learning outcomes. As the curriculum in Higher Education in Agricultural world is basically not just a set of courses, but also a design of series educational processes or learning to produce a learning outcomes suited to those have been designed together with partner institutions. It is in line with Kelly's opinion (2009) who states that a curriculum is broadly defined as the totality of student experiences occurred in educational processes.

In this program, students are trained to build their own content knowledge and demonstrate new understandings through various forms of representation. Students conduct exploration, assessment, interpretation, synthesis, and information to produce various forms of learning outcomes. Grant comments (2002) that Project-Based Learning approach creates a constructive learning environment where students build their own knowledge and the educators become facilitators.

Goal

The purpose of Project-Based Learning in Control of Plant Diseases Field School (CPDFS) is to prepare graduates who excel and competitive in the field of agriculture. They are grown in a creative culture and innovative learning as well as competence. Both soft skills and hard skills in terms of better prepared and relevant to the work needs.

II. Discussion

1. Project-Based Learning Model in Control of Plant Diseases Field School (CPDFS)

Project-Based Learning model in CPDFS is a teaching approach built on learning activities that provide challenges for students related to problems in the development of agricultural commodities. Students are trained to analyze the right cultivation method in accordance with Good Agriculture Practices (GAP) and Good Handling Practices (GHP), to analyze plant conditions, to identify Plant Destruction Organisms which become one of the production inhibitors, to analyze environmental factors that affect plant and Plant Disruptive Organisms (PDO)'s growth, to find solution on problems occurred, as well as to provide recommendation, particularly to increase production and PDO controlling. Goodman and Stivers (2010) are in the same state about the project to build learning activities and real tasks that provide challenges for students related to daily life and solved in groups.

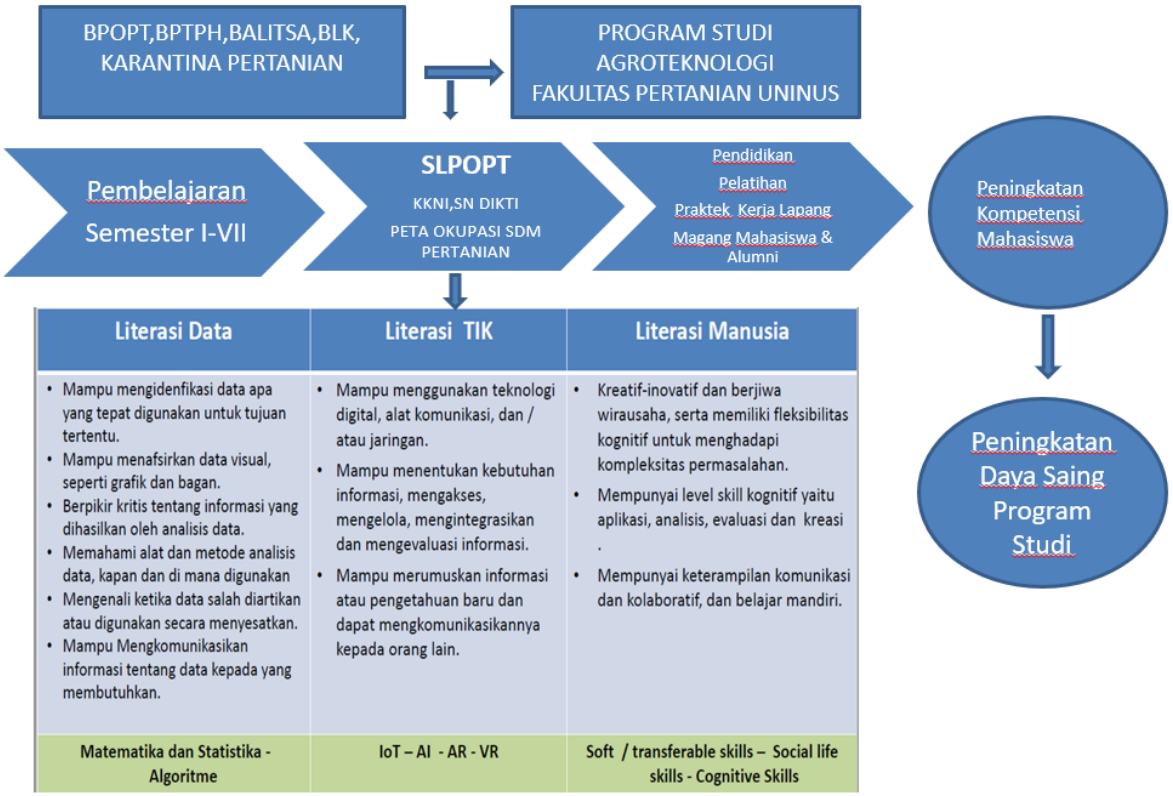

Figure 1. Project-Based Learning Model in Control of Plant Diseases Field School (CPDFS)

The Project-Based Learning model of CPDFS is implemented by the Agrotechnology Program, Faculty of Agriculture UNINUS in collaboration with partner institutions, such as The Center for Plant Destruction Organisms Observers, The Research Center for Food Crops and Horticultural Protection (BPTPH) West Java Province, The Training Center of Agricultural Work, and Bandung Agricultural Quarantine Station.

The study program seeks and selects partner institutions that can collaborate with the established competency standards. The collaboration is carried out in curriculum creation and development, facilities provision for field work practices (internships) and if possible there will be job placements after students graduate.

The curriculum implemented in CPDFS is a curriculum development based on KKNI-SN DIKTI and Occupational Map of The Agricultural Ministry through Project-Based Learning model. The forms of field work practices (PKL) and research is a means of learning by improving data literacy, ICT literacy, and human literacy to achieve knowledge, skills and attitudes competence so that it has advantages and improves graduates competitiveness in Agrotechnology program, Faculty of Agriculture UNINUS.

Project-Based Learning model in CPDFS is a learning model centered on learners to carry out an in-depth investigation of agricultural commodity development problems and to find the solutions which are crop conditions analysis, proper cultivation with GAP and GHP, and environmental factors that affect plant growth and Plant Pest organism. It is also to carry out identification of PDO and attack rate, as well as to solve problems faced in crop production improvement and PDO controlling.

Implementation of Project-Based Learning conducted in CPDFS provides a wide opportunity for students to enrich and improve their insights and competencies in the real world suited to their interests and talents. In this program, students are trained to build their own content knowledge and demonstrate new understanding through various forms of representation. Students conduct exploration, assessment, interpretation, synthesis, and information to produce various forms of learning outcomes.

Implementing Project-Based Learning in CPDFS gives students the opportunity to organize projects that suit their interests. Project organization is done by designing the work process ranging from finding and managing information, and conducting the project work process to evaluate the results. In each stage of internship activities and research conducted in collaboration with partner institutions, the students are guided by field supervisors from the partners and campus supervisors.

2. The Implementation of Project-Based Learning in CPDFS

CPDFS is an effort to improve Agricultural education quality by implementing a comprehensive agricultural education system improvement based on the active participation of stakeholders with partnership principles. Curriculum developed based on KKNI-SN Dikti and Human Resources Competency Standards under The Agricultural Ministry is intended to prepare competent and competitive Agricultural Human Resources.

Partnership with stakeholders for implementing CPDFS is in the integration of education programs, training and field practice, expertise cooperation, and resource contribution from each institution, so that it can play a role in line with its functions.

Project-Based Learning in CPDFS is a learning method which uses problems to increase Agricultural commodities production, especially problems in controlling PDO as an initial step for collecting and integrating students' knowledge and competencies based on their experience in the field. Project-Based Learning in CPDFS emphasizes contextual problem occurred in the field and experienced by students directly. Therefore, the students are trained to think critically, be able to analyze PDO's problem over a plant commodity, be able to develop their creativity, and be able to solve problems in the control of PDO. The final result of the project is a product in form of written or oral reports, plans and results presentation, as well as recommendations of controlling agricultural commodity PDO.

A. Competency Standards of CPDFS Graduates In Agrotechnology Program Faculty of Agriculture UNINUS

CPDFS is an effort realized by Agrotechnology Program, Faculty of Agriculture UNINUS to improve the standard of graduates competency which is a minimum criteria about graduate ability qualification including attitudes, knowledge, and skills stated in the graduate learning achievement formulation. (Rosmaladewi, 2019).

The National Standard of Higher Education in 2020 elaborates attitudes in Project-Based Learning of CPDFS implemented by the programs are correct and cultured behaviors as a result of values and norms internalization and actualization reflected in spiritual and social life through the learning process, work experience, research and/or community service related to learning.

Knowledge is a systematic mastery of concepts, theories, methods, and/or philosophies of certain fields of science obtained through reasoning in the learning process, work experience, research and/or community service related to learning. Besides, skills concerning general and special are the ability to perform using concepts, theories, methods, materials, and/or instruments, obtained through learning, work experience, research and/or community service.

Graduate competency standards that have been set in Agrotechnology programs are stated in the graduate learning achievement formulation and used as the main reference for to develop the standards of learning content, learning process, learning assessment, lecturers and educational personnel, learning facilities and infrastructure, learning management, and financing learning.

The formulation of CPDFS learning achievements in Agrotechnology program refers to graduate learning achievement suited to KKNI, which has equality with the qualification level. It also refers to the standardized map and function of Agricultural human resource competency as a reference in drafting the standards of KKNI in the Agricultural Sector.

B. The Content Standards of Project-Based Learning CPDFS

The content standard of Project-Based Learning in CPDFS is a minimum criterion of depth and breadth level in learning materials. The depth and breadth is formulated by referring to the description of graduate learning achievement from KKNI-SN DIKTI and Agricultural human resources competency standards. The depth and breadth of learning materials in CPDFS is cumulative and/or integrative. It is stated in study materials structured in form of Field Work Practices (PKL) and conducted in partner institutions.

c. The Process Standards of CPDFS Learning

The process standard of Project-Based Learning in CPDFS is a minimum criterion within learning implementation in Agrotechnology program to obtain graduate learning achievement involving:

1) Characteristics of Learning Process in CPDFS

The characteristics of the Project-Based Learning process implemented in CPDFS are interactive, holistic, integrative, scientific, contextual, thematic, effective, collaborative, and student-centered.

2) Planning The Learning Process

The process planning of Project-Based Learning is organized jointly in expertise groups in a field of science and/or technology as well as partner institutions for each stage of CPDFS presented in the implementation plan

3) Implementation of Project-Based Learning Process in CPDFS

The implementation of Project-Based Learning process in CPDFS takes place in form of interaction between lecturers, students, field supervisors and learning resources in partner institutions. The learning process and field implementation are carried out based on CPDFS implementation plan which refers to KKNI-SN DIKTI and Agricultural Human Resources Competency Standards

A. The learning process of CPDFS through curricular activities must be conducted systematically and structured through various courses and with measurable learning burdens.
B. Project-Based Learning process in CPDFS with partner institutions has to get through curricular activities and to use effective learning methods also field implementation in line with the course characteristics aimed at achieving certain abilities in the series of graduate learning achievement fulfillment.

In Project-Based Learning process in CPDFS implementation, students are trained to be able to develop an environmentally friendly agricultural system suited to GAP, GHP and PDO controlling in an integrated manner using ecological and economic approaches, so that the understanding Biology and Ecology of Pests and Diseases becomes very important. In addition, students must have certain competences in implementing:

a) Cultivation of healthy plants in accordance with GAP and GHP

Healthy cultivation of plants suited to GAP and GHP is an important part of integrated CPD program. Healthy plants will be able to withstand pest and disease attacks and have a faster tolerance to overcome damage from pest and disease attacks. Therefore, every effort in the cultivation of healthy crops, such as seeds selection which are superior resistant to the PDO attack, seeding, planting, planting distance, planting patterns, crop maintenance to handling crops need to be considered, in order to obtain a healthy, strong, productive crops with high yields and do not pollute the environment.

b) Natural enemies utilization

Biological control by utilizing potential natural enemies is the principle of CPDFS implementation. Students are trained to look for natural enemies capable of suppressing the PDO population. By using natural enemies, it is expected to balance the population between PDO and its natural enemies in Agroecosystem, so that the population of PDO does not exceed the tolerance threshold of plants.

c) Regular observation or monitoring

Agroecosystem is dynamic, for many factors in them affect each other. To be able to follow the development of pest population and their natural enemies, also to know the plants condition, students must carry out regular observation. The information obtained is used as the basis for taken control measures.

d) Students as PDO controller experts

The PDO control implementation must be adapted to the state of local ecosystem. Recommendation for PDO control implementation is developed by students. So that students are able to apply and propose appropriate ways of controlling PDO to farmers.

Several ways to control PDO that can be implemented with the concept of IPM are:

1. Control by using resistant varieties: It is meant to reduce or suppress the PDO population, attack and damage crop level by planting resistant varieties.
2. Technical cultural control: PDO control culturally engineered through the system or way of farming. Several actions can reduce or suppress the population and PDO attacks are as follows.
   - Physical control: an effort in utilizing or changing physical environmental factors so as to decrease PDO. Physical control of PDO can be done in several ways: heating, combustion, cooling, wetting, drying, trap lights, infrared radiation, sound waves and barriers/fences/barriers.
   - Mechanical control: The control is done manually by humans. Mechanical control can be done in a simple way, requires a lot of labor and a long time, low effectiveness and efficiency, but does not negatively affect the environment.
   - Biological control: By utilizing biological agents (natural enemies) like predators, parasitoids, and pest pathogens.
   - Statutory/regulatory control: Control with law and regulation, in form of spread prevention and PDO transmission through the legal policy set by the government. The legal basis for prevention with regulations is as follows: 1). Law No. 16 Year 1992 on Quarantine of Animals, Fish and Plants; 2). PP No. 6 Th 1995 on Crop Protection; 3). PP No. 14 Th 2000 on Plant Quarantine.
   - Chemical control: Using synthetic pesticides is the last alternative if other means are unable to cope with PDO population increase. The purpose of pesticide use is a

correction to lower PDO population to limit of balance. The pesticide use must also be on target, on dose, and on time.

a. Project-Based Learning Method in CPDFS

Project-Based Learning method in CPDFS include: group discussion, simulation, case studies, collaborative learning, cooperative learning, problem-based learning, practice in the field as well as other learning methods, which can effectively facilitate the fulfillment of graduate learning achievement.

b. Study load of students of CPDFS Agrotechnology Program Faculty of Agriculture

Student learning burden in CPDFS is an implementation form of *Merdeka Belajar Kampus Merdeka* collaborated with in partner institutions based on existing problems in the field todetermine the needs in learning achievements.

As stated in the guidelines, student learning load is a structured form to the curriculum taken by students. The number of credits taken is stated in the form of equality with courses offered and the competence is in line with students activities in CPDFS.

c. Learning Assessment Standards in CPDFS

The standard of Project-Based Learning assessment in CPDFS is in line with assessment standards of PERMENDIKBUD No. 3 of 2020 which is a minimum criterion on the assessment of student learning processes and outcomes to fulfill graduate learning achievement. Assessment process and student learning outcomes include:

1) Assessment principle in CPDFS: It includes educational, authentic, objective, accountable, and transparent principles carried out in an integrated manner.
2) Techniques and assessment instruments in CPDFS: Project-Based Learning assessment techniques in CPDFS consist of observation, participation, performance, written tests, oral tests, and questionnaires. CPDFS assessment instrument consists of process assessment in form of rubrics and/or results either portfolios or design works. Attitude assessment in CPDFS can use observation assessment techniques. Assessment of knowledge mastery, general skills, and specific skills in CPDFS is done by selecting one or a combination of sharing assessment techniques and instruments. The final result is the integration between various techniques and assessment instruments used.
3) Assessment mechanisms and procedures in CPDFS: Assessment mechanisms and procedures in the implementation of project learning consist of:
    a) To develop, convey, agree on stages-techniques-instruments-criteria-indicators-assessment weights between assessors and those assessed in accordance with the learning plan and field practice.
    b) To carry out the assessment process with the stages-techniques-instruments-criteria-indicators-assessment weights containing the assessment principles.
    c) To provide feedback and opportunities in questioning assessment results of students; and
    d) To document student learning processes assessment and outcomes in an accountable and transparent manner.

d. Implementation of assessment in CPDFS

The assessment in CPDFS is conducted by:

1) Lecturers or teams of lecturers
2) Field supervisors appointed by partner institutions to do planning stage, assignment or questioning activities, performance observation, observation results, and final score.

e. Reporting assessments in CPDFS

Assessment reporting covers student success qualification for executing Project-Based Learningin CPDFS based on criteria and reporting forms that have been agreed by the study program and partner institutions. The assessments are expressed in the range:

- Letter A is equivalent to the number 4 (four) excellent categorized;
- Letter B is equivalent to the number 3 (three) in good category;
- Letter C is equivalent to the number 2 (two) categorized as average;
- Letter D is equivalent to the number 1 (one) categorized as below deficient; or
- Letter E is equivalent to the number 0 (zero) categorized as very less.

f. Student graduation in the implementation of CPDFS

The results of the assessment and approval of Project-Based Learning in CPDFS are announced to students after implemented the stages of CPDFS. Students report the results in seminars with partner institutions or Agrotechnology program. Students who are declared graduated are entitled to:

1) CPDFS implementation value;
2) Certificate of competence from partner institutions with the expertise in the branch of Science

g. Standards of Lecturers and Educational Personnel

Lecturers of Project-Based Learning in CPDFS are professional educators and scientists with the main task of transforming, developing, and disseminating science, technology through education, research, and community service. The standard of lecturers and educational personnel in CPDFS is a minimum criteria on the qualifications and competencies of lecturers and educational personnel to organize education in terms of graduate learning achievement. Beside lecturers mastered in Agrotechnology, students who carried out CPDFS are also guided by field lecturers from partner institutions. Appointment of field lecturers is the same with the criteria determined and appointed by partner institutions leader, decree issued by the program.

h. Standards of learning facilities and infrastructure

Standard learning facilities and infrastructure is a minimum criteria about facilities and infrastructure the same with content needs and learning process to fulfill the graduate learning achievement.

Learning facilities and infrastructure, training and field practice such as land, classrooms, libraries, laboratories/studios/workshops/production units required for the success CPDFS are provided by the program Faculty of Agriculture in collaboration with partner institutions.

i. Standards of Learning Management

Learning management standards are minimum criteria on planning, implementation, control, monitoring and evaluation, as well as reporting learning activities at the study program level (Permenristek DIKTI no 44 year 2015).

When implementing CPDFS model, learning management standards are carried out by the program with reference to the standards of graduate competency, learning content, learning process, lecturers and educational personnel, as well as learning facilities and infrastructure.

Agrotechnology study program does, a) develop policies, strategic plans, and operations of CPDFS activities that can be accessed by academicians and stakeholders and used as guidelines for the study program; b. organize type and program of CPDFS should be in line with the graduates learning achievements; c. maintain and improve the progam quality management program when implementing CPDFS with targeted consistency as the university vision and mission; d. monitor and evaluate activities to carry out CPDFS; e. has guidance on planning, implementation, evaluation, supervision, quality assurance, and development of CPDFS activities; f. deliver performance reports to faculties, universities and partner institutions. CPDFS activities are also reported on higher education databases.

j. The Standards of Learning Financing

Standards of learning financing is a minimum criteria about components, amount of investment, and operational costs that are prepared to fulfill graduate learning achievement (Permenristek DIKTI no. 44 year 2015).

CPDFS financing standards are determined by Agrotechnology program and partner institutions based on the components, amount of investment costs which are included to part of facilities and infrastructure procurement in higher education, lecturers and educational personnel development. Operational costs are part of costs required to carry out CPDFS activities including lecturer fees, educational personnel costs, CPDFS operational materials costs, and indirect operational costs. They are prepared to fulfill graduate learning achievement.

Conclusion

Project-Based Learning in Control of Plant Diseases Field School (CPDFS) is an implementation of *Merdeka Belajar - Kampus Merdeka* aimed to improve the knowledge, skills, and attitudes of Agrotechnology students, Faculty of Agriculture UNINUS so that they have competence to build an environmentally friendly Agricultural system suited to Good Agriculture Practices (GAP) and Good Handling Practices (GHP). It is expected that they also can apply Plant Destruction Organism (PDO) based on ecological, economic, and social approach by combining a variety of compatible control techniques with the results that Plant Destruction Organisms are below the economic threshold.

The Project-Based Learning in CPDFS involves a student-centered learning model. It provides a wide opportunity for students to enrich and improve their insights and competencies in the real world of Agriculture that suits their interests and talents. Students are trained to build knowledge according to their own content, and they become more active in solving the problems. In consequences, the students acquire new knowledge, skills, and experiences as well as collaboration, and improve networking for sure.

Recommendation

Agricultural education system in various sectors has to be implemented comprehensively based on students and stakeholder needs. Curriculum evaluation and development with stakeholders should supervise periodically to adjust graduates competence to the job market needs.

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