Enrichment in the Electrical Engineering Vocational and Education (EEVE) Study Program by Augmenting the Image Processing Study Course

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Abstract. An improvement of each curriculum usually is linear with the demand required by the stakeholders and it is happened in EEVE study program as well. One of the improvement asked is the augmenting of the Image Processing course study to support the need of the industrial sector such as mining, forecast weather, IT, graphic analysis, petroleum, and so on, for the skills of image processing. By implementing a study called adjusted curriculum-characteristic, this paper shows a method how to inject a new course with different characteristic in a vocational and education study field. This approach is expected to be a pattern for the other university to implement an augmenting method for its curriculum.

1. Introduction

Addition of new courses is something that normally happens in every curriculum. This process is needed to ensure that each graduate of the study program has competence which is in accordance with what is desired by the graduate user which is one of the stakeholders from a study program. No exception to what happened in education study programs electrical engineering which until now is a study program that always provides vocational educators in various fields that require educators, such as vocational schools, vocational training centres, companies, and other industrial employment. As long as it's a basic need electrical engineering, in addition to the educational competencies of the PTK (Vocational and Educational Technology), of course, which are always asked by the stakeholders of EEVE graduates are scientific installations, generators energy, and control systems. However, in order to keep up with the developments that have taken place entered the era of 4.0, where computerized capabilities include one of them ability someone to uncover and analyze a signal and image, then it is appropriate also the EEVE to consider injecting subjects that are in harmony with things it is a digital image processing (DIP) course.

Given the importance of the role of the curriculum in education and in the development of technology and human life, the preparation of the curriculum cannot be done without using a solid and strong
foundation. The existence of technological developments requires a curriculum to adjust to technological developments that occur. The need for curriculum development denotes the way of human being to meet the human needs and to improve student competence in facing existing technological developments. Compilation and curriculum development cannot be done carelessly. Various strong foundations are needed so that they can be used as a foundation in carrying out the process of implementing education, so that they can facilitate the achievement of education and learning goals more effectively and efficiently [1]. Higher Education is one of them that conduct the process of organizing education.

Padang State University is one of the universities that hold vocational education graduates developed through the Faculty of Engineering. The Padang Faculty of Engineering developed two tasks: namely to hold educational study programs at undergraduate and non-educational levels at S1, D4 and D3 levels. The Faculty of Engineering has the mission of providing education to produce superior education staff in the PTK field that are relevant to the needs of the labour market and able to innovate in the values of society [2]. To fulfil this mission, the competence of undergraduate graduates from the Faculty of Engineering must be fulfilled. Every department in engineering must have graduate competence in order to achieve the Faculty of Engineering's own mission.

The Electrical Engineering Department is one of the majors from the Faculty of Engineering, Padang State University. Electrical Engineering has 3 study programs including D3 in Electrical Engineering, D4 in Industrial Electrical Engineering, and S1 in Electrical Engineering Education. In general, D3 electrical engineering aims to produce intermediate experts in the electrical engineering field who are able to work as technicians in the field of lighting installations and personnel and technicians in the field of electric drives, while D4 Electrical Engineering Industry aims to produce professionals in the field of Electrical Engineering for industrial purposes and S1 Electrical Engineering Education aims to produce educational scholars who have the ability to base broad and deep expertise, so that academically able to develop themselves and adapt to the development of the world of work and society, and be able to develop science and technology in the field of Electrical Engineering. S1 Electrical Engineering Education prepares and produces technical teachers and instructors of vocational secondary schools or industrial training centres. The preparation of curriculum and curriculum development based on the development of education and technology that occur is one of the tasks of graduates of S1 Electrical Engineering Education who are competent in vocational education.

The S1 Electrical Engineering Education curriculum is designed to provide comprehensive expertise for students so that they have basic competencies for all fields of Electrical Engineering [3]. To produce students who are competent in the field of Electrical Engineering there needs to be a good curriculum. To get a good curriculum, evaluation or enrichment must always be made in the curriculum. Curriculum enrichment can be done by adding or reducing courses. Addition and reduction of these courses are common things in the process of curriculum evaluation or enrichment. Due to the comparison of observations on the 2014 EEVE FT UNP curriculum with the 2017 FT-UNP (Faculty of Engineering of UNP)-EEVE curriculum there were several changes, namely the reduction and addition of courses. The curriculum is the most important thing in the learning process. The curriculum is also an educational design that has a very strategic position in all aspects of educational activities. If the curriculum given to students can be appropriate and of good quality, then directly the results of education will be able to produce good output as well. Therefore, there is a need for enrichment or curriculum evaluation by adding or reducing courses [4, 5]. In this study curriculum enrichment was carried out with the addition of courses namely Image Processing.

The Image Processing course is a course to increase the expertise of students in the field of Electrical Engineering which discusses the processing of data and analyzes data in the form of any image into important information and details as requested. The implementation of the Image Processing course
has been found in everyday life. For example on mobile phones, television, satellites, weapons and many others who are now using the science of Image Processing. Based on the description above, it is felt that it is necessary to do further research on the feasibility study of inputting scientific processing in the Electrical Engineering Vocational Education curriculum of Padang State University.

2. Proposed Method
The method in this study is descriptive qualitative using the ex post facto approach. Based on the problems and research objectives that have been stated, the research used is comparative causal research which aims to see the effects of a phenomenon and examine the causal relationship of the data after all the events collected have been completed. Comparative causal research is a type of research with problem characteristics in the form of causation between two or more variables. Comparative causal research is an ex post facto type of research because this research was conducted to examine events that have occurred. In comparative causal research, two groups are different on certain variables compared to other variables.

The purpose of ex post facto research is to look at the effects of a phenomenon and examine the causal relationship of the data after all the collected events have been completed. The ex post facto causal comparative research method is a study that observes and sees a problem deeply into a living situation by comparing two different group situations. In other words, in this comparative research the researcher tries to examine the question of how to assess the course so that later it can be said to be very appropriate, appropriate, and not in accordance with the needs of the job and what underlies a person according to whether or not the course matches the needs.

3. Research Results
This study uses a comparative analysis of the University's official online web data, namely a comparison of 3 LPTK (the University as Education Institution for Educational Resources) curriculums in Electrical Engineering Education and a comparison of 3 Non-LPTK University curriculums in Electrical Engineering.

a. LPTK University Curriculum for Electrical Engineering Education
In this study researchers used a comparison of 3 LPTK Universities outside Padang State University, namely Yogyakarta State University, Jakarta State University, and Indonesian Education University. In the LPTK University curriculum in Electrical Engineering Education, namely UNP, UNY, UNJ, and UPI, the composition of the subjects consisted of groups of general subjects, engineering courses, and professional skills courses. The researcher conducted a study of the engineering subject groups by examining 3 courses in the engineering subject group through syllabus and RPS. The researcher found that the university engineering courses of the LPTK had learning outcomes, namely to be able to explain and understand the theories of the course. In accordance with the achievements of LPTK University graduates based on the achievement of the Higher Education standard, it is to produce graduates who are competent to become professional teachers by mastering the overall capabilities of engineering and vocational pedagogy, being able to work in the industry and able to communicate both oral and written.

From the results of research that researchers describe from the findings of the study the University Curriculum of the LPTK based on syllabus and RPS can be summarized in the table below.
Table 1. From the University as Education Institution for Educational Resources

| Indicator | Universitas Negeri Padang | Universitas Negeri Yogyakarta | Universitas Negeri Jakarta | Universitas Pendidikan Indonesia |
|-----------|---------------------------|-------------------------------|---------------------------|---------------------------------|
| Learning Outcome | Can understand and apply the basic concepts of engineering courses | Can understand and explain the basic theory of engineering courses | Can understand and apply the basic theory of engineering courses | Can understand and explain and apply the basic concepts of engineering courses |

b. Non-LPTK University Curriculum in Electrical Engineering

Researchers used 3 Non LPTK Universities, namely University of Indonesia, Gadjah Mada University and Bandung Institute of Technology to compare the curriculum of the three Non LPTK Universities to obtain the characteristics of image processing science. The curriculum in Electrical Engineering UI, UGM, and ITB has a composition consisting of groups of general subjects and engineering courses. Based on a review of researchers in the curriculum in Electrical Engineering UI, UGM, and ITB, image processing science is one of the courses in the engineering subject group. The researcher examined the image processing knowledge of each Non LPTK University through syllabus and RPS. Researchers get learning outcomes in image processing courses at Non LPTK universities where students are able to understand, explain, analyze and apply the theories obtained in image processing science. In accordance with the achievements of Non LPTK University graduates based on the Higher Education standard that it is expected that engineering graduates can design, handle problems and apply knowledge in the field of Electrical Engineering.

Table 2. From the Common University

| Indicator | Universitas Indonesia | Universitas Gajah Mada | Institut Teknologi Bandung |
|-----------|-----------------------|------------------------|---------------------------|
| Learning Outcome | Can understand, explain and analyze the basic concepts of scientific Image Processing | Can analyze and apply Image Processing science | Can understand, analyze and apply Image Processing science |

From the results of research that researchers describe from the findings of the LPTK University Curriculum and Non LPTK University Curriculum researchers can summarize in the table below.
Table 3. Characteristic of both Universities

| Indicator          | LPTK Universities | Non LPTK Universities |
|--------------------|-------------------|-----------------------|
| Graduate Profile   | Produce an educator who has teacher and vocational competence in the field of Electrical Engineering | Produce graduates of a bachelor who have comprehensive expertise in students so that they have competence in the field of Electrical Engineering |

4. Discussion
Curriculum enrichment is one of the steps that must be taken to meet human needs and improve student competence in facing existing technological developments. Curriculum enrichment can be done by inputting courses. In the discussion of this research, researchers conduct curriculum enrichment by inputting scientific studies of Image Processing. This study uses a comparative analysis of official university online web data with 2 literature studies, namely examining the characteristics of the University curriculum in LPTK and reviewing the curriculum of Non LPTK Universities. Image Processing Science is one of the courses in the curriculum structure of Non LPTK Universities. According to the results of research that researchers found that Image Processing science or digital image processing is one of the engineering subjects in the field of Electrical Engineering that discusses the image processing study. Some of the discussed materials are the basic principles of digital image, the characteristics of digital images and methods of improving image quality. Where based on the study conducted by the researchers on the syllabus and Lecture Planning in a Semester (RPS) that the learning achievement of students is able to explain, understand and analyze scientific theories of image processing.

Based on the results of research that researchers can characterize the LPTK University curriculum, namely in the composition of engineering courses the learning achievements obtained in the LPTK University curriculum are that students are able to understand and explain the theories of engineering courses. Based on the review and description of the results of the above research, the researchers concluded that the image processing course can be assimilated into the LPTK University curriculum, namely Padang State University on engineering subjects with learning achievements at the RPS, namely the FTP PSPE students were able to explain and understand basic theories of science image processing from several basic theories of image processing including the basic principles of digital image, the characteristics of digital images and methods of improving image quality.

5. Conclusion
Researchers have made various efforts so that this research will run smoothly and there is no shortage at all, but due to various unavoidable research limitations, this research needs various inputs and improvements in the future.

Limitations of Researchers:
1. Lack of documents makes this research need to be continued in order to be complete and comprehensive. However, the focus of the researchers on the research section was felt to be sufficient.
2. Knowledge and ability of researchers in processing data is still minimal so it requires more time in the learning and research process. However, many researchers received assistance from various parties, especially from the previous research.
6. References

[1] Mukhaiyar R 2016 Studi Kajian Pengreorganisasian Kurikulum Prodi-Prodi di Jurusan Teknik Elektro UNP sebagai Acuan Kebijakan bagi Universitas LPTK Lainnya In Proceeding of KONASPI VIII 2018 pp 97-102

[2] Mukhaiyar, Utari S, and Mukhaiyar R 2016 English as a Second Language for an International Nursery Student in United Kingdom In Proceeding of The 4th UPI International Conference on Technical and Vocational Education and Training pp 107-114

[3] Curtis RF and Crunkilton 1984 Curriculum Development in Vocational and Technical education: Planning, Content, and Implementation (Allyn and Bacon Inc)

[4] Dolgan RAC and Altun S 2013 Teachers’ Perceptions on the Effectiveness of Curriculum Mapping: the Case of Turkey Journal of Educational and Instructional Studies in the World vol 3 no 4 pp 50-60

[5] Konokman GY, Yelken TY, Karasolak K, and Cesur E 2017 Teacher’s Perception: Competent or Not in Curriculum Development Malaysian Online Journal of Educational Science vol 5 iss 4 pp 56-73