

The Relevance of Dacum Chart to the Updated Semester Learning Plan of Food Industry Technology Study Program Politeknik Negeri Jember in the Academic Year of 2020

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Abstract—The Food Industry Technology Study Program of the Politeknik Negeri Jember has used higher education curriculum. Develop a Curriculum (Dacum) method can be included as a need analysis process in the framework of the higher education curriculum. Dacum is needed in order to meet the requirement of graduate users that can be a reference for producing the Semester Teaching Plans. This study has two aims, the first is to analyze the application of the Dacum Chart in the semester learning plans of Food Industry Technology Study Program. The second is to measure the relevance of the Dacum Chart with the semester learning plans of Food Industry Technology Study Program. The data were obtained by interview, documentation and literature review. Qualitative descriptive analysis and quantitative technique with simple percentage tabulation was used to analyze the data. The results show that 69.45% of Dacum Chart was relevant to the Semester Learning Plans of Food Industry Technology Study Program. However, the application of Dacum Chart in Semester teaching Plans of Food Industry Technology Study Program needs to be redesigned to meet the minimum standard of Dacum Chart.

Keywords—*dacum chart, implementation, semester learning plan, food industry technology*

I. INTRODUCTION

The mandate of Law Number 12 of 2012 Article 35 paragraph 2 about curriculum states that the Higher Education Curriculum is developed by every Higher Education Institution with reference to the National Higher Education Standards for each Study Program which includes the development of intellectual intelligence, morals, and skills [1] [2] [3] [4]. The development of this curriculum is carried out periodically by all Politeknik Negeri Jember programs, especially by the Food Industry Technology Study Program (FIT SP).

The FIT SP curriculum at the Diploma-III level, which is implemented starting in the 2018/2019 academic year, is designed using higher education curriculum. Develop a Curriculum (Dacum) can be included as a need analysis process in the framework of the higher education curriculum. Dacum is needed in order to meet the requirement of graduate

users that can be a reference for producing the Semester Teaching Plans. So, the Dacum method is needed for completing the higher education curriculum, especially for vocational higher education so that it is hoped that Dacum can be a reference for designing semester teaching plans so the output can meet the needs of the industry.

The curriculum development activities aim to correct the deficiencies. They began with the holding of an Industry Gathering or Workshop on September 18th 2018 which was attended by six Industry representatives. The workshop aims to gather information from the employer regarding the current responsibilities, authorities and duties for the profile of study program graduates. The DACUM method, which has been proven to be effective, can gather information needed as an initial step in curriculum development activities [5]. The Politeknik Negeri Jember has prepared several core staff to be able to act as DACUM Facilitator and DACUM Recorder in DACUM Need Analysis activities.

The next activities, namely DACUM Task and Job Analysis and DACUM Course Design, were carried out at the Politeknik Negeri Jember. Both activities are designed by involving all members of the Study Program. Then in early 2020 it was continued with the Semester Teaching Plan workshop. Through these activities, a FIT SP curriculum document is produced which served as a reference for the learning process, which at the same time is believed to produce graduates with high acceptance in industries.

Stakeholders in FIT SP believed in DACUM activities that produce DACUM Chart products which became a reference for the learning process such as curriculum documents including Course Networks and Semester Teaching Plans. The focus of this research refers to two things, namely: Implementation of the Dacum Chart in the current semester teaching plans of the FIT SP and the relevancy level of the Dacum Chart with the semester teaching plans.

II. LITERATURE REVIEW

A. *Dacum*

DACUM stands for Develop A Curriculum, is an effective and innovative work analysis method in producing process and function analysis [6]. DACUM workshops involve trained DACUM facilitators, a committee of five to twelve skilled workers from the same position and job. The results obtained are a detailed chart description of the duties and job descriptions of the work being analyzed. In addition to the knowledge and tools used, worker traits and future job concerns were also identified.

DACUM philosophy [7] are; i) Expert practitioners can define and describe their work more accurately than anyone else, ii) An effective way of describing a job is to describe precisely the tasks performed by expert practitioners, iii) All tasks in order to be carried out correctly require knowledge, skills, tools and attitudes.

The advantages of the DACUM chart workshop are; i) As a strong foundation for program development or curriculum changes, ii) used for review or curriculum revision, iii) Assessment of training needs, iv) Development of work standards, v) Evaluation of employee performance, vi) Development of competency testing. The Dacum Chart workshop and the philosophy could help lecturers in designing their semester teaching plan, so that the output and outcome meet the industrial needs.

B. *Dacum Chart*

The output of the DACUM workshop is the DACUM chart. The DACUM chart consists of the occupations or jobs being analyzed. Every occupation has several duties or responsibilities and each duty consists of several tasks. In general, a DACUM workshop is used for the analysis of one occupation and each occupation consists of eight to twelve duties which broken down again into 50 - 200 tasks [8]. For each task resulted in the need for knowledge, equipment, work attitude, entry requirements and work attitude. The chart of the DACUM chart can be seen in the image below:

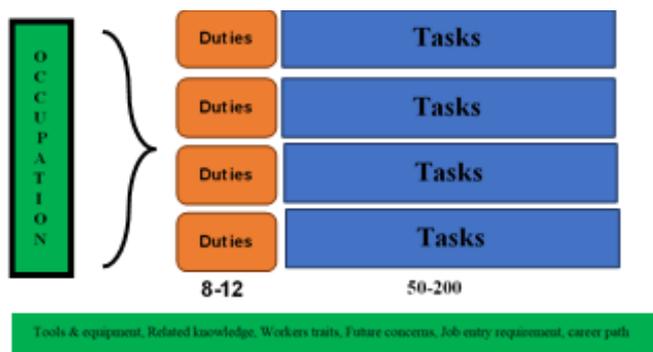


Fig. 1. Dacum Chart

Duties or responsibilities is a general description of the performance scope, as the title of a group of related tasks, consists of one verb that is not specific and became a statement of the to do work. Task is a unit of specific work that describes the task clearly in terms of performance, it should be a single verb and an observable work process. Steps is a sequence of processes carried out in each task. In this step, the student should know about the equipment and knowledge needed.

C. *Semester Teaching Plan*

The Semester Teaching Plan (STP) is a learning program document designed to produce graduates that have the ability to meet the specified Graduate Learning Outcomes (GLO), so that the linkages and conformity with the curriculum concept must be traced [9]. The design focuses on how to guide students to learn so that they have the ability to meet the GLO that set out in the curriculum, it wasn't based on the interests of teaching lecturers' activities but it is student centered learning (SCL). Semester teaching plan must be reviewed and adjusted regularly based on the developments of science and technology.

Semester Teaching Plan, according to the National Higher Education Standards should contain at least; i) the name of study program, name and code of courses, semesters, credits, name of teaching lecturer, ii) the learning outcomes of graduates imposed on courses, iii) final abilities planned at each stage of learning to meet graduate learning outcomes, iv) study materials related to the capabilities to be achieved, v) learning methods, vi) the time provided to achieve the ability at each stage of learning, vii) the student learning experience which is manifested in a description of the assignments that the student has to do for one semester, viii) criteria, indicators, and weight of assessment, ix) list of references used.

D. *Bloom's Taxonomy*

Bloom's Taxonomy is a tool that elaborates some processes in learning and developing subjects. It's founded by Benjamin Bloom in 1956. Bloom's Taxonomy has become a standard tool for developing educational objectives, assessment and activities for teaching and learning processes. It consists of six categories which in abbreviation called KCAASE.

In this research, Bloom's Taxonomy is used to tabulate the semester learning plans and Dacum Chart using Bloom's Taxonomy theory. Editing and tabulating are done by grouping verbs in the GLO and Sub GLO into one category of verbs in Bloom's Taxonomy. The categories are Affective, Cognitive and Psychomotor which are part of the Bloom's Taxonomy pyramid.



Fig. 2. Bloom's Taxonomy

E. *Literature Review*

The results of research by Wijanarka [10] entitled "Comparison Between The Dacum and Work Process Analysis For Vocational School Curriculum Development To Meet Workplace Need" states that (1) DACUM is suitable for developing tasks according to the needs of task analysis and vocational education curriculum development, (2) Work process analysis is suitable for developing occupational levels,

especially at the workshop level, (3) DACUM and Work Placement Analysis (WPA) have their own advantages and can be used both for vocational education curriculum development.

According to Syahrul et al. [11] in the research entitled "Development of Dacum as Identification Technique on Job Competence Based-Curriculum in High Vocational Education" says that based on the analysis of electrical competency needs through workshops, involving skilled workers from certain electrical jobs.

Based on the research conclusion by Halbrooks [12] in the research entitled "Dacum as a Model for Horticulture Curriculum Development and Revision; A Case Study" said that Dacum is a flexible curricular development and revision tool that can be effectively applied in education practice.

III. METHODS

A. Research Plans

This research is a descriptive qualitative research, using documentation and literature study methods. The data collected is then compiled, analyzed, and explained so that it describes the relationship and draws conclusions from the results of the analysis.

The research data were analyzed by using qualitative descriptive analysis and quantitative technique with simple percentage tabulation. The purpose of this simple tabulation is to provide an overview of the data obtained from interviews and documentation which describe certain characteristics of the respondents. In order to know the overall categorization of the answers to the sub-variables, the intervals need to be determined first. According to Sugiyono [13], the interval size is obtained from the highest score minus the lowest score, then divided by the total number of alternative answers.

B. Time and Locations

This research was conducted at the Politeknik Negeri Jember especially the FIT SP which some of the lecturers has joined Dacum Workshop. This is a six months research that started in April and ended in October 2020.

C. Data Collecting Technique

The data collected by using documentation and literature study which consists of Dacum Chart data; Duties, Tasks, steps and Semester Learning Plan at the FIT SP. The data was obtained from the Head of the FIT SP and the S4C Swiss Contact Representatives at the Politeknik Negeri Jember as sponsors for the Dacum workshop.

The Dacum Chart and the semester learning plans that collected then compiled in a tabulation process called relevancy tabulation. It is used for knowing the level of relevancy between Dacum Chart and the semester learning plans owned by FIT SP:

TABLE I. DACUM CHART RELEVANCY LEVEL TABULATION

NO	TASK OF DACUM CHART	GLO of STP
1		
2		
3		
Etc.		

source: team analysis, 2020

The results from the tabulated data then operationalized with the following formula:

$$E = \frac{n}{N} \times 100\%$$

note:

E = percentage of relevance Dacum Chart to STP
n = number of relevant / irrelevant GLO and Sub GLO
N = Total number of GLO and Sub GLO in STP

IV. RESULT

In the process of data collection, the research team collected 24 Semester Teaching Plans (STPs) of the FIT SP which has been revised in early 2020. The updated semester teaching plans are designed based on the Vocational Higher Education curriculum. The list of registered semester learning plans can be seen in Table 2. After obtaining the necessary STPs data, the research team divided the tasks to tabulate and the process of sorting the GLO and Sub GLO that had relevance to the DACUM Chart.

TABLE II. LIST OF STP WITH THE AMOUNT OF GLO AND SUB GLO

No	Name of the STP	Total	
		GLO	Sub GLO
1.	Food Chemical Analysis	2	10
2.	Bio Chemistry	3	7
3	Basics of Microbiology	4	23
4.	Food Processing Statistics	3	14
5	Food Processing Technology	2	10
6	Food Material Knowledge	4	10
7	Microbiology	4	24
8	Hygiene and Sanitation	5	12
9	Food Packaging Technology	2	18
10	Post-Harvest Vegetable Technology	3	11
11	Animal Post Harvest Technology	5	25
12	Nutritional Aspects of Food Processing	4	18
13	Food Physics Analysis	3	20
14	Sensory Test	5	24
15	Quality Control	5	10
16	Economic Techno	3	9
17	Scientific Writing Techniques	5	13
18	Entrepreneurship	6	10
19	HACCP	5	12
20	Factory Design	5	9
21	Processing of Animal Husbandry Products	4	13
22	Waste Treatment Technology	4	14
23	Pastry Bread Technology	3	22
24	Food Industry Management	4	8

Source: Team Analysis, 2020

After obtaining the 24 STPs, the research team then used the Dacum Chart document and the curriculum development activity report of FIT SP that made in 2018 to analyze them all. These documents have been approved by industries, vocational higher education and DACUM Curriculum developer facilitators. The two documents basically consist of the scope of Duties, Tasks, Knowledge, Skill, Attitude and tools which are then developed to meet industry standards. The complete Duties and Task Dacum Chart which are used

as a reference for this research are presented in the table below:

TABLE III. TASK AND DUTIES DACUM CHART OF PS TIP

DUTIES	TASK
A. Realizing the Production Work Plan	1. Understand the work plan 2. Prepare materials 3. Prepare the tools 4. Organize people 5. Create a work schedule
B. Running the Production Process	1. Understand the principles of making food products 2. Understand work instructions 3. Realizing the process 4. Repair minor damage 5. Carry out the 5R
C. Ensuring Product Safety	1. Understand product safety standards 2. Understand the SOP 3. Running the SOP 4. Make corrections
D. Evaluating Work	1. evaluate the work 2. conduct briefings 3. use a mass balance 4. Doing Action
E. Reaching Target	1. understand the target 2. carry out the procedure 3. conduct evaluation and correction
F. Interdepartmental Coordination	1. make communication 2. prepare data 3. carry out the results of coordination 5. ensure the implementation of coordination results
G. Making Reports	1. collect data 2. input data 3. processing data 4. report the results
H. Doing Development	1. Collect data 2. do a trial run 3. evaluate the results
I. Managing and Developing HR	1. Train the staff 2. guide the staff 3. conduct counseling
J. Develop Yourself	1. attend training 2. deepen knowledge

Source: FIT SP, 2018

After getting all the required documents. The research team then carried out a basic analysis. From the results of the basic analysis, it was found that the Duties and Task instruments on the Dacum Chart apparently did not match the learning outcomes in all the STPs for FIT SP. Then, the research team developed the instrument by adding derivatives from Duties and Tasks by including instrument knowledge and skills into the relevance analysis section of STP.

The next step is the research team edited and tabulated the semester learning plans and Dacum Chart using Bloom's Taxonomy theory. Editing and tabulating are done by grouping verbs in the GLO and Sub GLO into one category of verbs in Bloom's Taxonomy. The categories are Affective, Cognitive and Psychomotor which are part of the Bloom's Taxonomy pyramid.

The next step was for the team to perform the analysis manually based on the tabulation and editing that had been done. A total of 24 FIT semester learning plans that has been successfully analyzed by team. The analysis was carried out to separate learning outcomes and sub- learning outcomes

that were considered less relevant to the Dacum Chart. After knowing the number of GLO and Sub GLO which has relevancy to the Dacum Chart, the research team then calculated the level of relevance by using a simple formula that was presented in the research method section. The results of the level of relevance are presented in the table and formula below:

TABLE IV. TABULATING AND ELIMINATING RESULTS

No	Name of the STP	The Total of GLO and Sub GLO	
		Relevant	Irrelevant
1.	Food Chemical Analysis	4	16
2.	Bio Chemistry	2	8
3	Basics of Microbiology	0	28
4.	Food Processing Statistics	14	2
5	Food Processing Technology	9	3
6	Food Material Knowledge	12	1
7	Quality Control	10	4
8	Economic Techno	8	4
9	Scientific Writing Techniques	8	7
10	Entrepreneurship	8	8
11	HACCP	13	2
12	Factory Design	4	9
13	Processing of Animal Husbandry Products	0	31
14	Waste Treatment Technology	18	0
15	Pastry Bread Technology	22	3
16	Food Industry Management	11	1
17	Microbiology	28	0
18	Hygiene and Sanitation	17	0
19	Food Packaging Technology	19	1
20	Post-Harvest Vegetable Technology	14	0
21	Animal Post Harvest Technology	16	0
22	Nutritional Aspects of Food Processing	13	0
23	Food Physics Analysis	22	0
24	Sensory Test	19	0
Total		291	128

Source: Team Analysis, 2020

From the tabulation, we can conclude that the total of GLO and Sub GLO are 419. The next step is to determine the level of relevance of the FIT STPs with the Dacum Chart instrument using a simple formula that has been explained before in the methods part. The formula can be used to determine the level of relevance and irrelevance of the STPs to the Dacum Chart. If the tabulated results in table 5 are entered into the formula, it produced the following relevance level:

$$E = \frac{291}{419} \times 100\%$$

The percentage level of relevance of the Dacum Chart to the FIT STP is 69.45%. from the relevant percentage, it can be assumed that the level of irrelevancy of Dacum Chart to FIT STP is 30.55%. It means that the level of relevance of the STP to the Dacum Chart is high, while the level of irrelevance

also needs attention because it takes a quite huge difference (15.5%). However, the research team also needed to look at the comparison of the relevant and irrelevant GLO and Sub GLO numbers compared to the number of tasks and duties on the Dacum Chart. The results of this comparison can be seen in the chart below:



Fig. 3. Comparison between GLO with Duties and Task Dacum Chart

From the pie chart above, it can be concluded that GLO and Sub GLO has more quantity in number. The Dacum Chart of FIT should be remake or redesign in order to achieve a perfect relevancy with the semester learning plans or vice versa. If the relevancy level shows a perfection, it can be sure that the quality of graduate is highly improve

V. CONCLUSION

From the results of the research, it can be concluded that the level of relevance to the Dacum Chart was 69.45%. This is because FIT's Dacum Chart is deemed inadequate in its manufacture and does not meet the requirements of the Dacum Chart Standard in general.

Then, research team tried to provide suggestions for the Dacum Chart and the Development of the STP Curriculum for the FIT SP, including:

1. Dacum Chart the FIT SP needs to be more detailed by applying the general standards of the Dacum Chart, namely specific, observable, unique procedure, unit of work, broken down into two or more steps, start / end point and product service or decision;
2. The standard number of Duties and Task Dacum Chart is at least 75 instruments, while those of the FIT SP are only 48 instruments, so it is necessary to add Duties and Task instruments in the Dacum Chart TIP;
3. The addition of scientific writing instruments or scientific reporting on the Dacum Chart needs to be added because it is related to student final assignments and report writing is also needed in the industry;
4. A further study about FIT SP DACUM Chart contribution to the post-pandemic education need to be explored.

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