Development of Internship Instruments in the Implementation of Independent Learning Faculty of Engineering - Unimed

by Harun Sitompul

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Abstract

Engineering Faculty (EF) UniversitasNegeri Medan (Unimed) is a vocational faculty consisting of (pure) education and engineering study programs. The Unimed Faculty of Engineering uses a curriculum based on the Indonesian national qualification framework, one of which is Internship. Internship courses in the field of engineering are carried out in the business and industrial world (BIW). Competency assessment for internship courses uses instruments prepared by lecturers. The purpose of this research is to produce an instrument of competency assessment for internship courses for students of the Unimed engineering faculty. An assessment instrument that is able to measure the competence of prayer in the cognitive domain accurately and accountably. The research approach is in the form of development. The development of the apprenticeship assessment instrument was carried out through the Borg and Gall approach. The respondents of this research are the head of the study program, the supervisor of the internship, and the supervisor in the Industrial World. The result of the research is the preparation of the competency assessment instrument for the cognitive domain apprenticeship course. The assessment instrument has met the validity and reliability requirements and is suitable to be used to assess student competence in participating in internship courses. Development of instruments with data sources from the Unimed Engineering Faculty with the Industrial World. The instrument developed can be used to measure the competence of students participating in internships in the Industrial World. This research produces an instrument for assessing the competence of the cognitive domain apprenticeship standardized in accordance with the formulation of the competency of the subject. The instrument can be used in general with the same competence in other areas of expertise.

Keywords Instrument Development, Competence, Cognitive Domain, Internship.

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INTRODUCTION

The Faculty of Engineering is one of the faculties at Unimed, ad consists of 13 study programs. Each study program uses a curriculum based on the Indonesian National Qualifications Framework (INQF) with "Merdeka Belajar" (Free Learning) which is oriented towards the business world and industrial Dania. In the implementation of the independent learning curriculum, one of the activities in each study program is training or work practice. Activity training aims to forge students' knowledge and skills according to market needs, based on theoretical

material obtained in lectures. Training activities are an effort to equip students with field experience (both knowledge, attitudes, and skills) as a form of learning in the world of work.

The implementation of internship activities is carried out in semester 6 or semester 7. Based on the results of the researcher's observations, there are several obstacles and weaknesses in the implementation of the internship, including 1) difficulties in choosing a place for the internship implementation, 2) The internship implementation system at Business World Industrial World is not standardized, 3) The internship location is relatively far from the Unimed engineering faculty, 4) There is no written agreement between the Unimed engineering faculty and the Industrial World Business World regarding the implementation of technical internships, 5) not yet available Appropriate apprenticeship assessment system and agreed upon between the engineering faculty of Unimed and the Industrial World Business, 6) there is no standardized measuring instrument to measure student competence after carrying out the internship, and, 7) students do not understand in compiling reports and mapping the contents of internship reports.

Research by Dika Ayu A and Ali Wafa (2016), found that the obstacles to implementing the internship were: lack of debriefing or orientation, administrative constraints, difficulty finding agencies, and inappropriate reasons for choosing agencies. The problems faced by students in the implementation of internships are that there is no clear work schedule, the work is not as expected, and the assessment system for the implementation of internships is not standard. The problem after the implementation of the internship is that the guidelines and systematics of preparing the final report are not clear, and perf performance/competencies are not carried out in the implementation of the internship.

Catur A and Bambang S (2016) stated that internship activities are quality control of students, whether they have met the competencies as required by the industry, and whether they have met the principles of link and match between the program and the industry. The implementation of the internship is to carry out the function of public relations (public relations) for educational institutions, which will provide a positive view through students who have good attitudes and abilities during internships, or vice versa a negative view occurs if students' attitudes and abilities are not good. Internships can also serve as graduate marketing, or other partnership activities with the industry such as research, community service, and so on, all of which must provide mutual benefits for both parties. Ismail (2018) the most important aspect of the apprenticeship program for education study programs is to prepare graduates who are professional educator candidates, it takes stages starting from their ability to recognize, and observe schools to being able to stand teaching in class as a figure that is awaited and missed by students, it takes a long process

Assessment has a purpose, function, and principle, so to get a good assessment it is necessary that the quality of the instrument must be valid, reliable, relevant, representative, practical, discriminatory, specific, and proportional. this is done to produce the objectives, functions, and principles of the assessment to be achieved. The results of the observations found that the objectives of the internship courses had not been maximally achieved and their competencies had not been measured properly. To be able to find out the root of the problem and the solution to solving the internship problem at the Unimed Faculty of Engineering, an in-depth research is needed.

To determine the competence of students after doing an internship, an instrument is needed to measure it. Furthermore, the instrument used to measure student competence must have adequate validity and reliability. Instrument experts argue that valid and valid instruments are called standard instruments because the process is through standardization activities in a study.

According to Ebel (1991), a standard instrument is an instrument that: (1) is compiled by instrument-making experts and calibrated, analyzed and improved, (2) has clear implementation and scoring instructions, and (3) has a norm reference for interpreting a sequence. A standard instrument is an instrument that is developed empirically through several tests. Standard instruments have several restrictions, both regarding the content, implementation of measurements and measurement results, the construction of a measuring instrument / instrument concerns several issues. Gronlund (1990) explained the characteristics of standard instruments, namely: (1) technically quality items, (2) clear administration and assessment, (3) the existence of definite norms and interpretations, (4) the presence of instructions and other instrument equipment. In general, there are two important things in the bookkeeping of instruments, namely their content and administration. According to Aiken (1994) in addition to seeing validity and reliability, the bookkeeping of instruments also concerns the administrative aspects of the instruments and their scoring. Based on the above theories, it can be said that a standard instrument is an instrument obtained from the process of instrument development through theoretical and empirical procedures with several tests.

Development of the internship instrument that will be carried out in this study aims to produce a policy to reduce various obstacles in the implementation and assessment of internship activities for students of the Unimed Faculty of Engineering. With the policies and guidelines that have been prepared, they will be able to achieve the objectives of the internship optimally, so that students have the knowledge and skills (competencies) that are in accordance with the needs of the market and the Industrial World. Thus, graduates of the Unimed Faculty of Engineering become graduates who are ready to work and are professional according to their fields of expertise.

METHODS

The research was conducted at the Faculty of Engineering, Unimed and the Industrial World. This type of research is development research by adopting eight steps of Research and Development (R&D) research according to Sugiyono (2014). The steps are: (1) The stage of seeing potentials and problems, (2) The stage of gathering information and studying literature, (3) The stage of designing the product, (4) The stage of design validation, (5) The stage of revising the design, (6) The stage of conducting product trials, (7) Stages of revising products that have been tested (8) Stages of testing using products that have been revised. The development of research products in the form of assessment instruments is used to measure student competence after internships in the Industrial World Business Internship. The development of the internship assessment instrument was carried out to measure the dimensions of knowledge, attitudes and skills.

The data obtained in this study are in the form of qualitative and quantitative data. Qualitative data in the form of information about the process and implementation of internships in each study program at EF Unimed, such as the formulation of internship competencies, assessment systems and assessment rublics.

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Quantitative data in the form of descriptive about the process of instrument validity, testing the quality of instruments, and determining the testing of internship competency factors in the cognitive realm.

The subjects and data sources in this study are all people and agencies involved in the implementation of student internships at Faculty of Engineering Unimed. The research subjects are students, supervisors, heads of study programs and Business and Industrial World. To obtain data from the subject of the study, several methods and data collection tools are used. Research data collection methods carried out such as observations, interviews and the provision of questionnaires.

Data analysis carried out is qualitative and quantitative. The analysis of quantitative data in this study is divided into 2 (two), namely: the feasibility test of the apprentice competency assessment instrument and the quality test of the assessment instrument based on the Indonesian National Qualifications Framework curriculum. Qualitative analysis was carried out through the results of the questionnaire, namely a review analysis to determine the feasibility of the content validity of the test instrument. This data includes qualitative data in the form of criticism, suggestions, and responses from validators which were analyzed descriptively regarding the feasibility of the resulting product. The resulting product feasibility data is determined through analysis of the validation results of material experts, linguists, and evaluation experts.

RESULTS

Research data was obtained from field supervisors, study program heads and Business World Industrial World. Among the respondents in the study, there were 96 people, consisting of 13 study programs with a distribution as shown below.

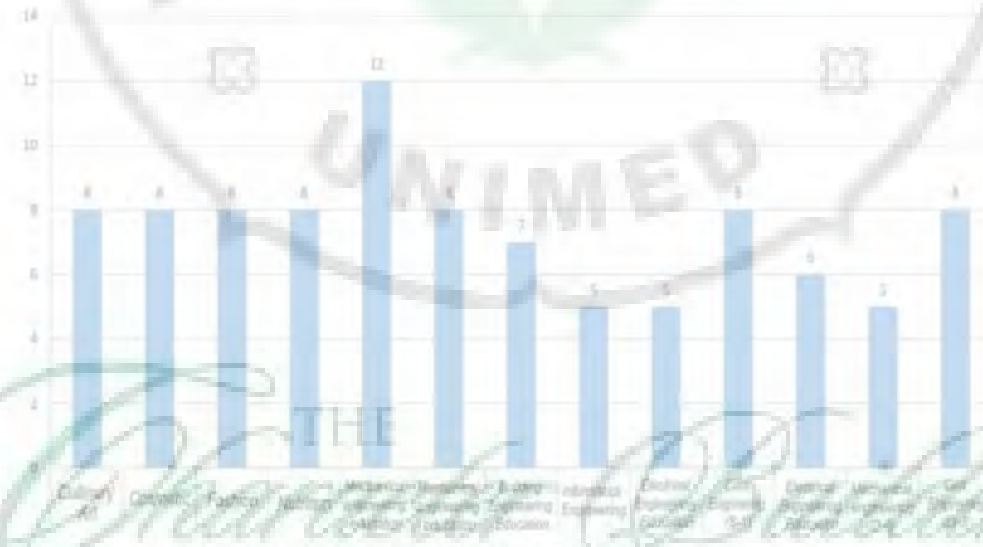

Figure 1. Number of Respondents Based on Programs Study

The places and locations for student internships at the Unimed Faculty of Engineering based on majors are presented in the following table:

Table 1. Internship Place for EF Unimed Students By Major

No.	Department	Internship Place
1	Mechanical Engineering Education	Workshop and Manufacturing
		Machining Workshop
		Vehicle Service, Spare Parts
		Factories (Plantations)
2	Building Engineering Education	Construction
		Road Construction
		Planning Consultant
		Supervisory Consultant
		Darmaga Development and Water Building
3	Elekto Engineering Education	State Electricity Company
		Power Generation Company
		Network Installation (Telkom)
		Workshops and Housing (Network)
4	Family Welfare Education	Salon, Cosmetology business
		Boutiques, Production Houses
		Hospitals, Polyclinics
		Hotel, Restaurant, Bakery

The stages of developing an internship competency test for students of the Unimed Faculty of Engineering start from the stage of compiling the competency formulation, determining the type and form of the instrument, determining the dimensions, developing indicators, compiling grids, weighing questions and filling out rubrics. Before testing the instrument, the content validity test was first carried out through an expert.

The results of rational trials through expert judgment were conducted to determine content validity and reliability. The results of the competency suitability assessment with dimensions, dimensions with indicators and indicators with items in the cognitive domain are presented in the following table.

Table 2. Expert Assessment of the Suitability of content in the cognitive realm.

Construct/Content Validity	Median (min)	Description
Domain conformity with competence	7,0	Valid
Conformity of competencies with indicators	7,5	Valid
Conformity of the indicator to the question item	7,5	Valid

The data used in the calculation of the reliability index is data from the assessment of experts regarding the suitability between the realm and the competence of the internship which has also been used to calculate the validity of the construct. The summary data of the results of the calculation of reliability *(interrater consistency)* on the suitability of competencies, dimensions, indicators and points of questions in the cognitive realm are presented in Table 3.

Table 3. Expert Assessment Of Competency Suitability, Dimensions, Indicators and Question Items In The Cognitive Domain.

Assessed aspects	Coefficient Reliability	Information
Conformity of Dimensions to Competence.	0,844	Reliable
Conformity of Indicators With Dimensions	0,806	Reliable
Conformity of indicators to question items	0,803	Reliable

Based on the results of data analysis, it is known that the reliability between assessors (r_{xx}) for cognitive domain internship competencies is 0.844. This means that cognitive domain competencies are trusted enough to measure the cognitive competence of an intern student because they have good enough reliability. This is in Naga's opinion that the reliability coefficient exceeding 0.75 is quite good. With a reliability coefficient of 0.844, it is hoped that the test will have consistency or accuracy in measuring the cognitive domain competence of interns. Likewise, other realms of competence, such as the affective realm have a reliability coefficient of 0.922, and the psychomotor domain with a reliability coefficient of 0.918. Basically, the value of the coefficient of reliability of the entire competency domain is above 0.75, so it is feasible to use it to measure the internship competence of EF Unimed students.

The empirical trials were based on data provided by 96 respondents. The analysis process was carried out with the impasse of SPSS Version 24.0. To determine the measure of the adequacy of the sample used the Kaiser-Meyer-Olkin (KMO) formula by comparing the value of the observational correlation coefficient with the partial correlation coefficient. If the value of the partial correlation coefficient is close to zero, then the Kaiser-Meyer-Olkin value is close to the opposite state. If the Kaiser-Meyer-Olkin value of 0.90 belongs to the perfect category; the value of 0.80 includes good; the value of 0.70 includes enough; and below 0.50 is unacceptable. The results of the analysis using SPSS 24.0 are as follows:

Table 4. Kaiser-Meyer-Olkin and Barlett's Test of the Internship Competency Test

KMO	Bartlett's Test Sphericity	Df	Significance
0.868	2230.3 31	153	0,000

From the results of the analysis, it shows that Kaiser-Meyer-Olkin is quite sufficient (above 0.60) therefore a factor analysis can be carried out. From Bartlett's test of the form of the correlation matrix *(Bartletts test of sphericity)* obtained *Chi-Square* = 2230.3 31 with Df = 153 and Significant value = 0.00 which means the correlation matrix is not an identity matrix so factor analysis can be used.

In the affirmatory approach carried out through computing with the *maximum likelihood* method, to test whether the estimated factors formed are normally distributed. In this case, the *goodness of fit test* is calculated by the chi-squared formula. From the calculation results obtained an index of 277,739 with a free degree of 191 and a probability of 0.000. The calculation results are as in the following table:

Table 5. Goodness of fit Test of Competency Test

Chi-Square	Df	Significance
277,739	191	0,000

DISCUSSION

The results of the expert's review of the competency test kits are that in general the internship competency test kits are quite adequate when viewed from the content, language, and writing. The contents and instructions for filling out the test are mostly in accordance with the realm of competence so that they are suitable for measuring the internship competence of Unimed Engineering Faculty students. The test material needs to be examined. However, according to the assessment of the experts, the layout and arrangement of the materials as well as the guidelines for filling out the participants still need to be improved.

The language used in the preparation of this competency test tool is considered by experts to be quite communicative. However, there are some sentences on the test that are recommended to be corrected because they allow misinterpretation. In addition, the use of terms to be uniformed and still uses terms that are already well known.

Based on the input from the results of the rational assessment of the experts, the following improvements were made:

a. The layout and arrangement on the filling instructions are refined so that they are more systematic.

b. Given that there is some input related to sentences and the use of technical terms, it is done to adjust on aspects of language or on certain sentences that cause misinterpretations. The terms are made consistent with the original terms for easy understanding.

c. The sentences on the competency test device are refined to be more operational and the writing on the competency test device is revised so that the sentences are more concise, concise, clear and comprehensive so that they are easy to understand.

The results of improvements and improvements to the performance test kit were re-examined by two experts involved in the assessment rationally, especially in experts who had provided input.

Based on the results of calculations with factor analysis, there are no items whose AIC MSA value is small from 0.50, so there are no items that fall, so the number of internship competency tests in the cognitive domain is 18 points. Based on the results of the construct validity analysis through factor analysis, results were obtained, that there are 3 factors that have an *eigenvalue* of more than 1.00. After adjusting to theoretically developed factors, it turns out that there are fifteen factors that have not been covered in the instrument. But the factors developed in the test instrument are quite representative of measuring what should be measured. From the results of the analysis, it was found that the items developed could measure the construct of internship competence by 81,790%, having exceeded the compulsive standard of 60%. So it can be concluded that from the results of the factor analysis it is found that the instrument developed has met the requirements for the validity of the construct.

Table 6. Total Variance Explained Competency Test

Factors/ Component	Extraction Sum of Square Loading		
	Total	% of Variance	% of Comulative
1	11,643	64,683	64,683
2	1.9 13	1 0.628	75,312
3	1.1 66 6	6,479	81,790

The total variance explained in the form of a graph is shown in the scree diagram (*scree plot*) in the following figure.

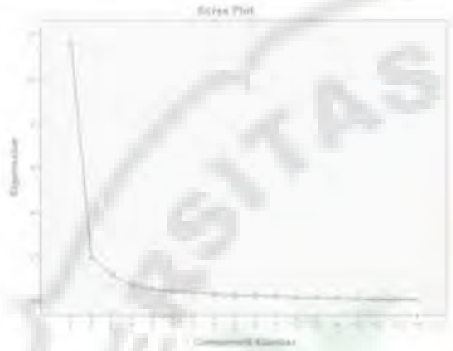

Figure 2. Scree Plot of the Cognitive Realm Competency Test

A scree plot is a plot of *eigenvalue* as a function of many factors in an extraction effort. The figure above is evidence that shows scree begins to occur at eigenvalue 2, while in eigenvalue 1 scree at number 10. This figure indicates the number of factors that are formed after rotation. After a varimax rotation of 25 repetitions (*interaction*), all grains have above 0.30 thus all grains are valid.

To see the suitability of theoretically developed indicator items with the grouping of test items obtained through data analysis, it can be known through the factor matrix rotation technique. Based on the results of the analysis, it can be seen that in general, the construct of the internship competency test instrument from the empirical trial results is in accordance with theoretical / rational studies. However, there are some test items that are located not according to the original factor. Similarly, several other test items are exchanged in place as seen in the copy of the above factor matrix rotation results. So that the distribution of the grains developed changes.

Table 7. Distribution of Cognitive Competency Test Items After Rotation

Factor	Grain Distribution	Factor Name
Factor 1	K13, K,14, K15, K21, K22, K23, K24, K25, K26, K36	Business Opening Opportunities
Factor 2	K31, K32, K33, K34, K35	Behavior To Open A Business
Factor 3	K11, K12, K16	Types of Business Fields

The display *of Component Plot in Ratated Space* in the form of grafik can be seen in Figure 3 below:

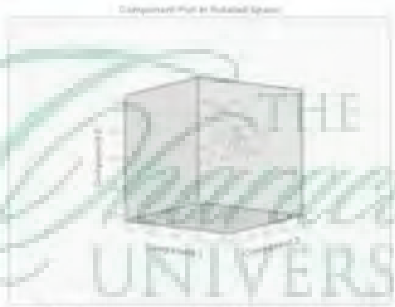

Figure 3. Component Plot in Ratated Space Competency Test

The results of the study with factor analysis presented in Table 6 and Table 7, showed that from 18 points of cognitive domain questions to measure the competence of apprentices were grouped into 3 main factors. Factor 1 can explain 64.683% of the internship competence with the name of the opportunity factor to open a business. Factor 2 can explain 10.628% of the competence of the internship with the name of behavior to open a business and factor 3 can explain 6.479% of the internship competence with the name of the type factor of the business field. Compulsively factors 1, 2 and 3 can explain the internship competence of 81.790%. This

shows that to find out the internship competence of students can be explained for knowledge about the ability to see opportunities to open a business, knowledge of behavior to open a business and knowledge of the types of business fields that can be done.

CONCLUSIONS

Based on the results of data analysis, several conclusions can be drawn, namely: 1) the preparation of an internship competency assessment instrument, especially in the cognitive realm, 2) The instruments compiled have met the requirements for content validity and test reliability, 3) Internship competencies in the cognitive realm are formed on 3 main factors of 16 questions with a total variance that can be explained by 81.790%. Thus the instruments developed can be used to measure the cognitive domain in EF Unimed student internship courses. The instrument can also be adapted in general to measure the competence of interns in other fields.

AUTHOR CONTRIBUTIONS

Competing interests

This article is the result of research involving study programs at the Faculty of Engineering, Unimed and the Industrial World in accordance with the study program. This research resulted in the development of an internship instrument to measure the cognitive competence of interns at the Unimed Faculty of Engineering.

Grant information

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