Competency Analysis The Field Of Expertise Of Automotive Engineering In Automotive Engineering Curriculum Of FT UNY

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Abstract. The study aimed to: (1) mapping the competencies of graduates in the field of Automotive Engineering Education Study Program of the FT UNY required by the TKRO of Vocational Expertise and the Automotive Industry, (2) Identify the competencies in the field of Automotive Engineering which occupied by graduates of the Automotive Engineering Education Study Program of the FT UNY in order to meet the needs of TKRO Vocational School and Automotive Industry, and (3) Determine the relevance of the competencies in the field of Automotive Engineering which is possessed by graduates of the Automotive Engineering Education Study program with the competencies required by TKRO Vocational and Automotive Industry. This research was descriptive research with a survey of senior teachers at the TKRO Vocational School and the vehicle service industry in the Special Region of Yogyakarta. Data collection techniques used questionnaire and interview methods by using the questionnaire instruments and interview guidelines. The data analysis technique used quantitative descriptive analysis in the form of percentages and qualitative descriptive analysis. Based on the responses the party of the Vocational School, the soft skill competencies of the highest order and most needed are knowledge, discipline, and honesty. The competencies possessed by graduates of the Automotive Engineering Education Study Program of FT-UNY from the highest to the lowest are discipline, honesty and interest. The graduates of PTO FT UNY are superior to the theoretical aspects than the practical aspect. Based on the response of the Automotive Industry, the soft skills needed by the industry from the highest to the lowest are honesty, discipline, and cooperation. The competencies possessed by graduates from the highest to the lowest are honesty, cooperation, and discipline. The material mastery of the graduates of the Automotive Engineering Education of FT UNY based on the theory and practice showed that the theoretical ability of the graduates of PTO FT UNY is better than practical abilities.

Keywords: competence, technical knowledge, curriculum

1. Introduction
The Educational Personnel Education Institution will produce bachelor education as teacher candidates from the level of PAUD (Kindergarten), SD (Elementary), SMP (Junior High School) and SMA
Based on the regulation of the ministry of research and higher education No. 55 of 2017 on Teacher Education Standards, Chapter I on General Definition Article 1 paragraph (3) stated that LPTKs are responsible to organize PAUD teacher training programs on formal education, basic education, and secondary education as well as organizing and developing education and non-education sciences. Furthermore, in paragraphs (4) and (5) stated that the LPTK holds a Bachelor degree of Education program and Teacher Professional Education program (PPG) to obtain the educator’s certificate.

With the growing fast the number of vocational school in Indonesia on 2016 (Kompas, 17 October 2016), the total is 13,552 Vocational Schools consisting of 3,468 Public Vocational Schools (25.6%) and 10,084 Private Vocational Schools (74.4%). It indicated that the need of vocational teachers, including TKRO Vocational Expertise, is actually quite high. Based on the number of more than 60 vocational schools on TKRO Expertise Competency of Vocational Schools in the Special Region of Yogyakarta, the needs of Vocational School teachers, especially on TKRO Expertise Competency should be quite high.

However, there are recent indications that the number of bachelor education is huge (Kompas, January 19, 2018, p. 11). It stated by the Director General of Science and Technology and Higher Education Resources, Ali Gufron Mukti. There were 254,669 bachelor educations in 2016, which they could not immediately become teachers because they had to take in PPG (Teacher Professional Training Program). The number of the graduates who join in PPG reached 2,309 people.

Moreover, Gufron stated, based on the competency test on the institutional background, showed that teachers of higher education had better grades than graduates of LPTK. Gufron, in this case, stated that revitalization of public and private LPTKs must be carried out. Meanwhile, many other regions still lack teachers and they ask the government to appoint teachers.

Yuswono et al. (2013: 39) conducted research to 50 teachers of the TKR Expertise Competency of Vocational School in the Special Region of Yogyakarta. The findings showed that the number of teacher competencies was still below the average. In 2014, Yuswono et al. also conducted other research to 12 teachers of the TKR Expertise Competency Vocational School in Sleman Regency. The findings also showed that the professional competencies were low. The professional competence in this research is the ability to carry out 6 job practices provided in automotive workshops in the Automotive Engineering Education Department.

The increase in the Open Unemployment Rate (TPT) with an education level background of SMK which has the total of 11.1% in 2016; it rises an assumption that the TPT was caused by vocational teachers were less competent in teaching due to the vocational teachers were mostly LPTK graduates. In fact, based on Yuswono et.al, there were indications that teacher competence, especially professional competence, was still not in a satisfactory category.

The initial analysis of the professional competence of vocational teachers, especially the TKR Expertise Vocational School teacher, who associated with the LPTK as the education provider of prospective TKRO vocational teachers, raises the assumption that the Department of Automotive Engineering Education (PTO) has a problem. These issues are related to various factors, such curriculum, lecturers, learning facilities, and education management. If the competencies in the PTO curriculum have low relevance to the competency needs of the teacher of TKRO vocational skills, then the teacher's competency will be worse. And, if the competence of the lecturers at PTO is not in accordance with the competencies expected by the teacher, surely, it will cause problems for vocational teachers in the future.
The research limitation is to the PTO Curriculum because the curriculum is a guideline of all learning activities that contain competencies both in the aspects of educational academic competence and scientific competence in Automotive Engineering. In the regulation of the Ministry of the Research and Higher Education (Permenristekdikti) No 55 of 2017 on Graduates Competency Standards (SKL), article 7 paragraph (3) and (4), stated that the formulation of learning outcomes of graduates of the Bachelor Education program are (1) containing the academic aspects of education and scientific fields and/or expertise. These aspects include: (a) students’ understanding of competencies, (b) educating learning competencies, (c) mastery competencies in the scientific fields and/or expertise, and (d) attitudinal and personal competencies.

From the aspects of education academic and the scientific field and/or expertise, the research limitation is to the mastery competencies in the field of Automotive Engineering in graduates of PTO FT UNY with the main requirement of a teacher is mastery the material in the field, namely the Automotive Engineering scientific field. Based on the various phenomena and problems, the study aimed to obtain scientific competencies, identify the competencies and determine the relevance of Automotive Engineering scientific competencies possessed by graduates of the FT UNY Automotive Engineering Education program, in order to meet the needs of TKRO Vocational and Automotive Industries.

2. Method
The research type was descriptive research. It aimed to obtain, identify and determine the scientific competence of graduates of Automotive Engineering of the FT UNY Automotive Engineering Education Study program, which was required by TKRO Vocational and Automotive Industries. This research conducted through a survey of the competencies possessed by graduates of the FT UNY and also the needs of the Vocational and Automotive Industry towards the competency of the graduates. The subject of the research was the senior teacher of vocational school with TKRO as the field of expertise in the Special Region of Yogyakarta. The senior teacher means a teacher who had experience for a long period of time. The subjects’ personnel of the Automotive Industry are graduates of PTO who work in the Industry.

3. Results and Discussion
3.1 The competencies need by Vocational School and Industry
The data in figure 1 are opinions of the respondents of vocational high school in TKRO expertise competencies of the competencies needed from 15 data as samples:
Meanwhile, the Competence of field of expertise in the Automotive Engineering possessed by graduates of the Automotive Engineering (PTO) Study Program of FT UNY in becoming Teachers at vocational high school, of 15 data are:

**Figure 1.** Graph of Competency Data in the Field of Automotive Engineering at the graduate of PTO required by Vocational High Schools

**Figure 2.** Graph of Competency Data in the Field of Automotive Engineering possessed graduates of the Automotive Engineering (PTO) Study Program of FT UNY in becoming teacher of Vocational High Schools
Aiming to find out the relevance competencies regulated by stakeholders and competency possessed by the graduated of PTO of FT UNY; it is necessary to make a comparison of the needed and possessed the Competency Levels of the Automotive Fields of Engineering to become Teacher of vocational high school. Figure 3 is the results of the comparison:

![Comparison of the needed competency and possessed competency](image)

**Figure 3.** Graph on comparison of mastery level of competency that needed and possessed to be a teacher of vocational school

The data of the level of material mastery in Automotive Engineering for each Vehicle System by the graduate in Automotive Engineering Education (PTO) FT UNY was taken using a closed questionnaire. There are 7 (seven) competencies with different statement items for each competency, namely 9 items of gasoline engines, 7 items of diesel engine, 10 items of automotive electricity, 13 items of chassis, 5 items of body and vehicle painting, 9 items of motorcycle technique, and 5 items of heavy equipment technique. The recapitulation of respondents' ratings is presented in table 1.

**Table 1.** The Recapitulation of the Assessment of the Mastery Level of Materials in Automotive Engineering for each Vehicle System by the graduate of Automotive Engineering Education (PTO) of FT UNY

| No | Competency in the System                      | Mastery Level |          |          |
|----|-----------------------------------------------|---------------|----------|----------|
|    |                                               | Theory        | Practical|          |
|    |                                               | Total X       | Total X  |          |
| 1  | *Gasoline Engine* (9 items)                   | 1113 8.2      | 1071 7.9 |          |
| 2  | *Diesel Engine* (7 items)                     | 844 8.0       | 817 7.8  |          |
| 3  | *Automotive Electricity* (10 items)          | 1182 7.9      | 1153 7.7 |          |
| 4  | *Chassis* (13 items)                          | 1520 7.8      | 1482 7.6 |          |
| 5  | *Body* and *Vehicle Painting* (5 items)       | 444 6.9       | 435 6.5  |          |
| 6  | *Motorcycle Technique* (9 items)              | 748 7.6       | 726 7.5  |          |
| 7  | *Heavy Equipment Technique* (5 items)         | 235 4.7       | 224 4.5  |          |
Figure 4 is a graph of mean both the aspect of theory and practice.

![The mastery level of material on automotive engineering](image)

**Figure 4.** Graph of Mastery level of material in Automotive Engineering for each Vehicle System by the graduate of Automotive Engineering Education (PTO) of FT UNY

Data from questionnaires are filled by a graduate who has sat in the position of head of the workshop or trainer and have experience in the industry. The data in this study are: (1) Competency Data of Automotive Engineering in graduate of Automotive Engineering Education Study Program FT UNY required by Automotive Industry, (2) Competency Data of graduate in field of expertise in the Automotive Engineering Education (PTO) of FT UNY to work in Automotive Industry, (3) Competence in the Field of Expertise of Automotive Engineering in graduates of Automotive Engineering Education Program FT UNY needed by Automotive Industry in terms of Field Groups Expertise of Automotive Engineering, and (4) Mastery level of Graduates of Automotive Engineering Education FT UNY on automotive engineering scientific material in each vehicle system.

3.2 The Competency of Automotive Engineering for graduates of Automotive Engineering Study Program of FT UNY needed by the automotive industry

Data on the competency of Automotive Engineering for graduates of Automotive Engineering Study Program of FT UNY needed by the automotive industry is presented in the appendix and figure 5.
There are several inputs of the needed competencies according to respondents from Industry. The additional competencies needed for graduates of the PTO Study Program of FT UNY are basic electronics (score 9), digital electronics (score 9), managerial ability (score 10), business sense (score 9), people management (score 9), ability to interact (score 10), ability to lead (score 10), hear opinions (score 10), service marketing & promotion (score 6), service people promotion (score 8), service market analysis (score 6), leadership (score 9), Communication (score 9), Analytic thinking (score 9), Communication (score 10), and English (score 8).

3.3 The Competency Possessed by Graduate of Automotive Engineering Study Program of FT UNY to work in the automotive industry

The data of competency in the field of expertise of automotive engineering possessed by graduates of PTO study program of FT UNY to work in the automotive industry is presented in the appendix and figure 6.
3.4 The comparison of competency level of the field of expertise in the automotive engineering for graduates of Automotive Engineering Study Program of PTO FT UNY possessed to work in the Automotive Industry

Figure 7 is the comparison of competency level needed to work in automotive industry.

Figure 7. Graph of comparison of competency level needed to work in automotive industry
4. Discussion
Based on the data, then it continues to data analysis. There are 2 (two) main topics, namely the respondents’ opinion of SMK and the opinions of Industry respondents on the competencies needed and possessed by graduates of the Bachelor Education of the PTO Study Program of FT UNY.

4.1 Assessment of respondents in the Vocational School of TKR Expertise Program. There are 5 main topics, namely:

4.1.1 Competence in the Field of expertise of Automotive Engineering for the graduate of Automotive Engineering Education Program (PTO) of FT UNY needed by Vocational Schools
Based on Figure 1, the competencies that most needed by Vocational Schools are knowledge competence, discipline, honesty, and collaboration. The four competencies obtained the same mean score of 9.3. Furthermore, skills and interest competencies are the second most important competencies with the same mean score of 9.2. The next most needed sequence of competencies is the attitude competency in work with a mean score of 9.1 followed by motivational competencies obtained a mean score of 9.0. Meanwhile, the competence of accuracy, fidelity, and carefully obtained the same mean score, i.e., 8.9, meanwhile, the self-confidence competency was in the lowest with a mean score of 8.8.

Based on the results, the sequences of needed competencies from the highest level to the lowest are 1) knowledge, 2) discipline, 3) honesty, 4) cooperation, 5) skills, 6) interests, 7) attitudes, 8) motivation, 9) accuracy, 10) fidelity, 11) carefully, and 12) confidence.

Based on the data, there several additional competencies needed by Vocational Schools, namely 1) knowledge of basic electronics, 2) never giving up, 3) reading and writing, 4) creativity, and 5) responsibility. The competency according to vocational teacher respondents is needed for graduates to become vocational school teachers.

4.1.2 Competence in the field of expertise of automotive engineering possessed by the graduates of the Automotive Engineering Education Program (PTO) of FT UNY to become teachers in vocational schools.
Based on the graph on the assessment of the Vocational teacher respondents toward the competencies possessed by graduates, found out that the discipline competencies are the highest competencies possessed by graduates compared to other competencies. Discipline competency has a mean score of 9.0. And, the lowest competency possessed by graduates to become teachers is the accuracy in work with a mean score of 8.0.

Based on the graph, the sequences of competencies possessed by the graduates from the highest level to the lowest level are 1) discipline with the score of 9.0, 2) attitude and honesty with the score of 8.8, 3) interest and collaboration with the score of 8.7, 4) confidence and knowledge with the score of 8.3, 5) skills and accuracy with the score of 8.2, 6) motivation and accuracy with the score of 8.1, and 7) accuracy with the score of 8.0.

4.1.3 Comparison of the Competency Level the Field of expertise of Automotive Engineering of graduated that needed and possessed to become a Vocational Teacher
The comparison graph of the results of the competencies needed and possessed showed that the competencies possessed are still below the required competencies. This clearly showed that the competence of graduates of the PTO Study Program of FT UNY has not fulfilled the needed competencies to become a vocational teacher. All competency levels possessed by graduates of PTO FT UNY have not matched the level of needed competency to become a vocational school teacher.
4.2 Assessment of respondents in the Automotive Industry. There are 5 main topics, namely:

4.2.1 The Competency in the Field of Expertise of Automotive Engineering for graduates of Automotive Engineering Study Program of FT UNY needed by the automotive industry

The most needed competency according to respondents from industry is honesty with a score of 9.7. This showed that honesty for a graduate is very important and very much needed than other competencies. Meanwhile, the skills competency obtained the lowest score of 8.5. These skills are not the only competencies that must be possessed by graduates because graduates with honesty attitude are more needed in the industry. The sequences of competencies needed by the industry from the highest to the lowest are 1) honesty, 2) discipline and cooperation, 3) motivation and self-confidence, 4) attitude, 5) accuracy, 6) accuracy, 7) knowledge, interests and accuracy, and 8) skills.

Based on the data from the questionnaire, it obtained inputs and suggestions from the industry on the competencies needed by industry, namely: 1) basic and digital electronics, 2) managerial abilities, 3) business sense, 4) communication, 5) people management, 6) service marketing and promotion, 7) service market analysis, and 8) analyzing thinking.

4.2.2 The Competency Possessed by Graduate of Automotive Engineering Study Program of FT UNY to work in the automotive industry

In the competence possessed by graduates according to the competency on industry respondents, honesty has the highest score of 9.3. This showed that the graduates have good honesty attitude. Meanwhile, self-confidence obtained the lowest score of 7.7. It showed that the graduates still lack confidence in their abilities. The sequences of competencies from the highest to the lowest are 1) honesty, 2) cooperation, 3) discipline, 4) knowledge, attitude, and carefully, 5) interest, motivation, and fidelity, 6) accuracy, 7) skills, and 8) confidence.

4.2.3 The comparison of mastery level of competency of the graduates that needed and possessed to work in the automotive industry

Based on the comparison graph among the competencies needed and possessed, the competencies possessed by graduates are not in accordance yet with the need of the automotive industry. This found out in the competency graph that is still below the competency graph needed by the industry. Therefore, it is necessary to increase the competence of graduates aiming to meet the need of the automotive industry, especially the competency of self-confidence because it has a very far range of score than other competencies.

5. Conclusion

There are two topics of conclusions, namely conclusions based on the response of the Vocational School and conclusions based on the response of the Automotive Industry. The conclusions are:

- Based on the response of the Vocational School, the sequences of competencies from the highest level to the lowest are 1) knowledge, 2) discipline, 3) honesty, 4) cooperation, 5) skills, 6) interests, 7) attitudes, 8) motivation, 9) carefully, 10) accuracy, 11) fidelity, and 12) confidence. Competencies needed by industry from the highest to the lowest are 1) honesty, 2) discipline and cooperation, 3) motivation and self-confidence, 4) attitudes, 5) accuracy, 6) fidelity, 7) knowledge, interests and carefully, and 8) skills.

- The competencies possessed by graduate of PTO FT UNY from the highest to lowest are 1) discipline with the score of 9.0, 2) attitude and honesty with the score of 8.8, 3) interest and collaboration with the score of 8.7, 4) confidence and knowledge with the score of 8.3, 5) skills and accuracy with the score of 8.2, 6) motivation and accuracy with the score of 8.1, and 7) accuracy with the score of 8.0. The graduate of PTO FT UNY is superior in the theoretical aspects than the practical aspect. Gasoline material is the best-mastered material both theory and practice. According to industry, the competencies possessed from the highest to the lowest
are 1) honesty, 2) cooperation, 3) discipline, 4) knowledge, attitude, and carefully, 5) interest, motivation, and accuracy, 6) fidelity, 7) skills and 8) self-confidence.

- According to the respondent of the Vocational School, the competence of graduates of PTO FT UNY does not meet the needed competencies to become a Vocational Teacher. And, it still requires additional competence and reinforcement. Also, the opinion of respondents from the industry; the competencies possessed by graduates are not in accordance with the needed of the automotive industry and needs to strengthen the soft skills competence.

6. Suggestion
The research suggests:

6.1 Suggestions based on respon of vocational teacher
- In the lecturing process, need to add the additional competencies, including 1) knowledge of basic electronics, 2) never giving up, 3) reading and writing, 4) creativity, and 5) responsibility.
- Increasing the graduate competency to meet the need to become a vocational teacher.
- Practical aspects must be improved because the graduates of PTO FT UNY are still low on this aspect.

6.2 Suggestions based on respon of automotive industry
- Add the competence to graduates, such as 1) basic and digital electronics, 2) managerial abilities, 3) business sense, 4) communication, 5) people management, 6) service marketing and promotion, 7) service market analysis, and 8) analyzing thinking.
- The self-confident of graduates in competencies needs to improve because it obtained the lowest score.
- The competence of graduates of PTO FT UNY still needs to improve because all competencies do not meet the needs of the automotive industry.
- Need to improve on the practical material mastery of graduate of PTO FT UNY because to strengthen the practice material which is still under the mastery of theoretical material.

7. References
[1] Braskamp, L. A. et al. (1984). Evaluating Teaching Effectiveness. Beverly Hills: SAGE Publications, Inc.
[2] Gage, N. L. (1978). The Scientific Basis of the Art of Teaching. New York: Teacher College Press.
[3] Hamalik, O. (2001). Proses Belajar Mengajar, Jakarta: Bumi Aksara.
[4] Leighbody, G.B. and Kidd, D. M. (1968). Methods of Teaching Shop and Technical Subjects. New York: Delmar Publishers.
[5] Mulyasa, E. (2002). Kurikulum Berbasis Kompetensi: Konsep, Karakteristik, dan Implementasi. Bandung: PT Remaja Rosdakarya.
[6] Mei, D.M. (2011).Potret Kompetensi Mengajar Guru Program Keahlian Teknik Gambar Bangunan Di SMK N 1 Sedayu Bantul. Skripsi SL. UNY: Fakultas Teknik
[7] Spencer Jr., L. M. and Spencer, S. M. (1993). Competence at Work: Models for Superior Performance. New York: John Wiley & Sons, Inc.
[8] Sudsomboon, W. (2009). A Development of Competency Analysis Profile on Automatic Transmission Service Course for Training Undergraduate Students. The Journal KMUTB. Vol. 19 (1). Januari-April 2009. pp. 43-54.
[9] Sudsomboon, W. (2008). Construction of an Automotive Technology Competency Analysis Profile for Training Undergraduate Students: A Case Study of Automotive Body Electrical Technology System. EDU-COM International Conference. (Edith Cowan University Research Online, 19-21 November 2008), pp.427-442.
[10] Sudsomboon, W. (2007). Construction of a Competency-Based Curriculum Content Framework for Mechanical Technology Education Program on Automotive Technology Subjects. Proceeding of ICASE Asian Symposium 2007. Pattaya, Thailand. pp.

[11] Sudsomboon, W. & Anmanatarkul, A. (2007). Competence-based Curriculum Development on Automotive Technology Subjects for mechanical Technology Education Program. The 5th international Conference on Developing Real-Life Learning Experiences: Education Reform through Educational Standards (ERES) 2007. pp. 35-43.

[12] Susanto, H. (2012). Faktor-faktor yang mempengaruhi kinerja guru Sekolah Menengah Kejuruan. Jurnal Pendidikan Vokasi. Vol. 2. No. 2. pp. 197-211.

[13] Yuswono, L.C., dkk. (2013). Kompetensi Guru SMK Teknik Otomotif di Kabupaten Sleman. Laporan Penelitian (tidak dipublikasikan). Yogyakarta: Fakultas Teknik UNY.

[14] Yuswono, L.C. dkk. (2013). Profil Kompetensi Guru SMK TKR di Daerah Istimewa Yogyakarta. Laporan Penelitian (tidak dipublikasikan). Yogyakarta: Fakultas Teknik UNY.

[15] Winanti, T & Salim, A. (2010). Kompetensi pedagogik guru Teknik Bangunan Gedung yang telah memiliki sertifikat pendidik. Prosiding Seminar Nasional Pendidikan Teknologi dan Kejuruan. Surabaya: Fakultas Teknik Universitas Negeri Surabaya, pp. 116-123.

[16] Wirawan. (2002). Profesi dan Standar Evaluasi. Jakarta: UHAMKA Press

[17] Zais, R. S. (1976). Curriculum: Principles and Foundations. New York: Harper & Row Publisher.

[18] Zamroni. (2000). Paradigma Pendidikan Masa Depan. Yogyakarta: Bigraf Publishing.