Mapping graduate learning competencies of the automotive engineering education

A Budiman*, W Suyanto, and Y Efendi
Department of Automotive Engineering Education, Universitas Negeri Yogyakarta Indonesia

*agusbudiman@uny.ac.id

Abstract. The number of unemployed graduates from vocational schools continues to increase. The cause of unemployment is indeed complex. Various studies state that one of the causes of unemployment is teacher competency. Therefore, it is important to study the learning competencies of graduates of the Automotive Engineering Education Department, Universitas Negeri Yogyakarta (UNY), as one of the institutions producing vocational teacher candidates. This study was obtained from research using a qualitative descriptive method. The results showed that the learning competencies of the graduates of the Automotive Engineering Undergraduate Program required by the Light Vehicle Technology (TKRO) Vocational School varied greatly, but were dominated by behavior and attitudes towards students in learning. Learning competencies possessed by graduates of UNY's Automotive Engineering Education Program are included in both categories. In addition, the competencies of graduates of the UNY in Automotive Engineering Education Program required by vocational school and those possessed by graduates are included in the relevant category.

1. Introduction
Nowadays teacher competence is the government's concern. Teacher competencies that are considered the most determining success of education are the competencies of these education graduates. The government's attention is carried out with professional education, so that teachers are more professional in their duties. Teacher Professional Education (TPE) is held for fresh graduates of university education and for teachers who have several years of teaching experience. Previously the government had conducted Teacher Education and Professional Training (TEPT) in stages in an effort to train teachers in the short term to become professional teachers.

Graduates of educational universities are undergraduate education programs at the Undergraduate level and teacher professional education. Universitas Negeri Yogyakarta (UNY) currently holds TPE Pre-service for undergraduate graduates from educational universities with no teaching experience, TPE in positions of teachers who have had several years of teaching experience, and TPE from the outermost regions, namely undergraduate graduates from educational universities and general universities [1].

Graduates Competency Standards (GCS) from the Bachelor of Education Program are formulated in graduate learning outcomes that include academic aspects of education and scientific fields and / or expertise, which include: (1) students' understanding competencies, (2) educative learning competencies, (3) mastery competence in the scientific field and / or expertise, and (4) competency for attitude and personality [1].
One of the educational universities that produce undergraduate education and TPE vocational teacher candidates for the automotive light vehicle engineering expertise competency is Universitas Negeri Yogyakarta at the Faculty of Engineering, Automotive Engineering Education Study Program. Graduates of the undergraduate education program and TPE at the Automotive Engineering Education Study Program are expected to work as teachers in the vocational automotive light engineering expertise competency, motorcycle engineering and business, automotive body engineering, engineering ototronik, and heavy equipment engineering, namely in the automotive engineering expertise program and the field of technology and engineering expertise.

The number of vocational schools (VHS) in Indonesia is 13,710, consisting of 3,519 state vocational schools (25.6%) and 10,191 private vocational schools (74.4%) indicating that the needs of vocational school teachers include vocational school technical expertise automotive is actually quite high [1]. Judging from the number of light vehicle technology competencies in the Special Region of Yogyakarta, which amounted to more than 60 schools also shows that the need for teachers of light vehicle technology should be quite large as well.

However, there have been signs recently stating that the number of undergraduate education is abundant [2]. It was stated by the Director General of Science and Technology Resources and Higher Education, Ali Gufron Mukti, that in 2016 there were 254,669 bachelor of education, which they could not immediately become teachers because they had to follow TPE. The number of bachelor who took part in TPE in that year was 2,309 people. Furthermore, Gufron stated that from the results of the competency test based on the teacher's alma mater, it appears that teachers graduating from public universities have better grades than LPTK graduates. Gufron in this case states that the revitalization of state and private LPTKs must be carried out. While many regions still lack teachers, they ask the government to appoint teachers.

Based on the results of research with 50 respondents of vocational school teachers with light vehicle engineering skills competency in the Special Region of Yogyakarta, it is showed that the teacher competency scores were still below average [3]. Another study of 12 vocational school teachers in the TKR Skills Competency in Sleman also showed that these professional competencies tended to be low [4]. Professional competence in the study is the ability to carry out 6 practical jobs provided in automotive workshops in the Department of Automotive Engineering Education.

The emergence of an increase in Open Unemployment Rate (OUR) with vocational education which in 2016 amounted to 11.1% led to speculation that it was partly due to inadequate VHS teachers, because the VHS teachers were mostly education institutions graduates. In fact, based on Yuswono et al's research there are indications that teacher competencies, especially professional competencies, are still unsatisfactory.

However, the research results [9] showed that according to the vocational school and the vehicle service industry, the competence in the scientific field of graduates of the Automotive Engineering undergraduate program in UNY was considered to be sufficiently qualified. In this research has not been revealed regarding the competencies of graduates in teaching or learning competencies.

In general, competence is defined as the ability demonstrated by someone in carrying out their duties. A competence is an underlying characteristic of an individual that is causally related to criterion-referenced effective and/or superior performance in a job or situation". In this case competence is seen as a fundamental individual characteristic which is causally related to effective performance which refers to criteria and superior in a job or situation [5].

Some aspects contained in the concept of competence are: (1) knowledge, namely awareness in the cognitive field, (2) understanding, namely cognitive and affective depth that owned by an individual, (3) skill, is something that is owned by an individual to perform the task or work assigned to him, (4) value, which is a standard of behavior that has been believed and psychologically united in a person, (5) attitude, which is a feeling (happy-not happy, likes-dislikes) or a reaction to a stimulus that comes from outside, and (6) interest, namely the tendency of someone to do something [6].

As a prospective teacher, graduates of the Automotive Engineering undergraduate program are expected to be able to demonstrate their ability to carry out their duties as automotive teachers at
vocational high schools. Competence is a combination of knowledge, skills, values and attitudes shown in the habits of thinking and acting [6].

The main problem in the Automotive Engineering Education study program is that the competency structure of scientific fields and/or expertise and learning competencies has not been clearly arranged, has not been classified explicitly, so there is still a missing link between the competency groups. In addition, the flow between competencies has not been clearly drawn. Therefore it is important to know how the learning competencies of graduates of the Automotive Engineering Education Bachelor program at UNY are in order to meet the needs of vocational schools.

2. Methods
This research was conducted through a survey of the competencies possessed by graduates of the Automotive Engineering Education program at UNY. As research subjects consisted of 4 groups which are Department of Youth and Sports Education in Yogyakarta Province, Vocational Manager (Principal, Vice Principal, Head of Competency Competency), Senior Vocational Teacher and Representative industries involved in developing Teacher competencies (YPTI Ltd., Yogyakarta). The research subjects were involved in the following activities: forum group discussion, interview, and complete the questionnaire. Data from the questionnaire were analyzed with quantitative descriptive in the form of polygon tables and graphs.

3. Results and Discussion
In this study, data collection instruments on learning competencies were divided into 3 groups of assessment aspects, namely technical competency, professional competency and personal competency. Technical competency includes knowledge and skills to be taught. Professional competency includes knowledge of instructional planning, knowledge of instructional delivery, and knowledge of instructional evaluation while personal competency consists of attitude, intellectual ability, creativity and interpersonal skills.

Based on the results of the questionnaire, it is known that graduates majoring in Automotive Engineering Education at the Faculty of Engineering, UNY have mastery of scientific and automotive engineering skills that are classified as good. With the details that 75% of respondents stated that graduates have good automotive knowledge, 83% of respondents think their skills are also good and 77% of respondents stated that graduates have good basic science. This result is illustrated in figure 1.

![Figure 1. Knowledge and skills of graduates in implementing learning in vocational schools](image-url)

In the world of Education, especially vocational education, mastery of the field of expertise is the main provision that teachers must possess. So, graduates who will become teachers do indeed have to master the science of their fields. If not, then he will have difficulty in delivering learning material. With the existence of 1 and 2 respondents who rated it sufficient for technical competency,
professional competency and personal competency. Technical competency is still considered reasonable as a result of the education process where not all graduates have competencies that are in line with expectations.

The second competency measured is professional competency. In this professional competency, the measured aspect is knowledge of the learning plan, the ability to carry out learning, and the ability to evaluate learning at Automotive Engineering Education at the Faculty of Engineering, Universitas Negeri Yogyakarta Graduates in carrying out learning in vocational schools (VHS). In the aspect of knowledge about learning plans, the components seen are understanding core and basic competencies, understanding competency achievement indicators, develop learning objectives, determine learning strategies, designing learning steps, preparing media and learning resources, describe learning materials and develop learning evaluation tools. Results of the questionnaire from assessment of 36 respondents could be seen in table 1.

**Table 1. The ability of students in arranging learning plans**

| Learning Plan Aspects                                      | Respondent Assessment |
|------------------------------------------------------------|-----------------------|
|                                                            | Lacking | Sufficient | Good | Excellent |
| Understanding core and basic competencies                  | 0        | 1          | 26   | 9         |
| Understanding Competency Achievement Indicators            | 0        | 4          | 26   | 6         |
| Develop Learning Objectives                                | 0        | 1          | 25   | 10        |
| Determine Learning Strategies                              | 0        | 6          | 27   | 3         |
| Designing learning steps                                   | 0        | 3          | 27   | 6         |
| Preparing media and learning resources                     | 0        | 5          | 19   | 12        |
| Describe learning material                                | 0        | 2          | 26   | 8         |
| Develop learning evaluation tools                          | 0        | 5          | 27   | 4         |

The second aspect of professional competence is ability to carry out learning. This aspect consists of preliminary activities (goals, apperception), core activities (implementing strategies) and closing activities (conclusions, assignments). The results of the respondents' assessments are shown in table 2.

**Table 2. The ability of students in carrying out learning**

| Ability to carry out learning                              | Respondent Assessment |
|------------------------------------------------------------|-----------------------|
|                                                            | Lacking | Sufficient | Good | Excellent |
| Preliminary activities (goals, apperception)               | 0        | 2          | 24   | 10        |
| Core Activities (implementing strategies)                  | 0        | 3          | 25   | 8         |
| Closing activities (conclusions, assignments)              | 0        | 28         |      |           |

The last aspect of professional competence is the ability to carry out an evaluation / assessment. This aspect consists of conducting an assessment according to plan, performing calculation of the results of the assessment; analyzing the questions; establishing assessment results; and utilizing the results of the assessment. The results of the respondents' assessment of the graduates' evaluation ability can be seen in table 3.

**Table 3. The ability of students in carrying out evaluations/ assessments**

| Ability to Carry Out Evaluations/Assessments              | Respondent Assessment |
|-----------------------------------------------------------|-----------------------|
|                                                            | Lacking | Sufficient | Good | Excellent |
| Conduct an assessment according to plan                    | 0        | 3          | 28   | 5         |
| Perform calculation of the results of the assessment       | 0        | 2          | 25   | 9         |
| Analyzing the questions                                   | 0        | 5          | 28   | 3         |
| Establish assessment results                               | 0        | 2          | 28   | 6         |
| Utilizing the results of the assessment                    | 0        | 3          | 31   | 2         |
Based on tables 1, 2 and 3, it is known that most respondents gave "good" and "excellent" ratings on aspects of professional learning competencies where the percentage is above 83% which accumulates in both categories. The highest rating is the closing activity which contains concludes material and tasks that reach 100%. Then followed by the points "understanding core and basic competencies" and "develop learning objectives" which are both considered good and very good by 97.22% of respondents. The basic aspects of competencies and learning objectives are basic in the learning process. So if both aspects are mastered by the teacher (graduate teacher candidates), it is assumed that other aspects will adjust. That is why the respondents' assessment of the professional competencies of the majority of Automotive Engineering Education graduates is in the good and very good categories.

The last aspect reviewed in this study is personal competency. This aspect concerns the personal character and behavior of Automotive Engineering Education at the Faculty of Engineering, Universitas Negeri Yogyakarta graduates in carrying out learning at vocational schools (VHS), which consists of 10 assessment components. Following are the 10 components and the respondents' assessment of these components:

| Personal Competencies                              | Respondent Assessment |
|----------------------------------------------------|-----------------------|
|                                                    | Lacking | Sufficient | Good | Excellent |
| 1 Attitude in teaching                             | 0       | 0          | 22   | 14        |
| 2 Intellectual ability (intelligence)              | 0       | 0          | 24   | 12        |
| 3 Creativity in teaching                           | 0       | 1          | 29   | 6         |
| 4 Interpersonal relationships in class             | 0       | 1          | 23   | 12        |
| 5 Full attention (considerate) in teaching         | 0       | 1          | 24   | 11        |
| 6 Collaborate with students                        | 0       | 1          | 20   | 15        |
| 7 Give praise for students' achievements           | 0       | 3          | 28   | 5         |
| 8 Friendly to students                             | 0       | 1          | 19   | 16        |
| 9 Involve themselves with students                 | 0       | 3          | 21   | 12        |
| 10 Be professional towards students                | 0       | 1          | 19   | 16        |

Based on table 4 above, it is known that almost all respondents give good and very good value for the personal competency of Automotive Engineering Education graduates, Faculty of Engineering, UNY. In fact, all respondents gave good and very good ratings for the components of Attitude in teaching and Intellectual ability (intelligence). These results are in accordance with the focus and commitment of the academic community of Universitas Negeri Yogyakarta that integrates character education in every course, in all learning. Nevertheless, it must be recognized that the personal character possessed by the teacher is obtained from a long process and sufficient teaching experience. Thus, there are still some respondents who consider the personal competence of graduates in the category sufficient, which seems aimed at graduates whose teaching experience is still small.

4. Conclusions
Based on the results of the study, the learning competencies possessed by graduates of the Automotive Engineering Education at the Faculty of Engineering, Universitas Negeri Yogyakarta according to education practitioners (teachers, principals, vocational supervisors, deputy principals, head of education centers) on average stand out in the good category, and not yet in the very category well. Based on these conclusions, it is recommended that technical competence and professional competence in learning are absolutely necessary and must be possessed by graduates of the Automotive Engineering Education Department, UNY. It is also suggested that personality competence in learning in the form of behavior in learning and attitudes towards students in learning must continue to be developed especially in order to educate students in the future so that they have critical, creative, able to communicate, and collaborative minds.
References

[1] Republik Indonesia 2017 Permenristekdikti Nomor 55 Tahun 2017 tentang Standar Pendidikan Guru

[2] Anonymous 2017 Sarjana Pendidikan Melimpah Kompas 19 Januari 2017 p 11

[3] Yuswono LC, Martubi, Sukaswanto, and A Budiman 2013 Converence Nasional APTEKINDO VII IV p 580

[4] Yuswono LC, Martubi, and Sukaswanto 2014 Jurnal Pendidikan Teknologi dan Kejuruan 22 p 173

[5] Spencer Jr LM and Spencer SM 1993 Competence at Work: Models for Superior Performance (New York: John Wiley & Sons Inc)

[6] Mulyasa E 2002 Kurikulum Berbasis Kompetensi: Konsep, Karakteristik, dan Implementasi (Bandung: PT Remaja Rosdakarya)

[7] Braskamp LA, Brandenburg DC, and Ory JC 1984 Evaluating Teaching Effectiveness (Beverly Hills: SAGE Publications, Inc)

[8] Mei DM 2011 Potret Kompetensi Mengajar Guru Program Keahlian Teknik Gambar Bangunan Di VHS N 1 Sedayu Bantul Research Report (Yogyakarta: Fakultas Teknik UNY)

[9] Miller WR 1990 Instructors and Their Jobs (Homewood: American Technical Publishers, Inc)

[10] Susanto H 2012 Jurnal Pendidikan Vokasi 2 p 197

[11] Suyanto W 2017 Analisis Kompetensi Bidang Keilmuan Teknik Otomotif pada Kurikulum Pendidikan Teknik Otomotif FT UNY Research Report (Yogyakarta: Fakultas Teknik UNY)