



The Development of Assessment Instrument for Vocational High School Students' Competency Test in Automotive Occupational Positions

Rakhmad Hadiyanto^{1✉}, Basyirun Basyirun², Yeri Sutopo²

¹SMK Negeri 1 Kota Semarang, Jawa Tengah, Indonesia

²Pascasarjana, Universitas Negeri Semarang, Indonesia

Article Info

Article History :

Received

April 2022

Accepted

June 2022

Published

December 2022

Keywords:

Competency Assessment Instrument; Competency Test; Engine Tune Up EFI

Abstract

In the development of competency assessment instruments, it becomes possible to eliminate the weaknesses of previous competency assessment instruments. It results in an ideal competency assessment that can enhance students' competencies in the Automotive Engineering program.

The aim of this research is to develop an assessment instrument for vocational high school students' competency test in automotive technician positions in the professional automotive field. This research follows the Research and Development (R&D) approach, specifically the ADDIE model, which stands for Analysis, Design, Development, Implementation, and Evaluation.

The instrument used in this study consists of questionnaires. The questionnaires were employed to assess the validity, practicality, and to determine factor analysis. The data for the validity of the assessment instrument were collected from assessment experts (assessors), subject matter experts from the business and industrial sector (Indonesian: Dunia Usaha Dunia Industri, DUDI), and evaluation experts (lecturers). The practicality data of the assessment instrument in this research were gathered from automotive teachers at Semarang State Vocational High School 1.

Based on the data analysis results, the validity test yielded a score of 4.60, which indicates a significantly valid instrument. The practicality test resulted in a 91% score, meeting the criteria for a highly practical instrument. Additionally, the factor analysis showed that the Sum of Loadings of Factors (SLF) for 60 items was ≥ 0.5 , indicating that all items were proven valid. Therefore, it can be concluded that this competency assessment instrument possesses good construct validity and reliability.

✉ Correspondence:

Alamat: Jalan Dokter Cipto No.93, Sarirejo, Kec. Semarang Tim., Kota Semarang, Jawa Tengah 50124, Indonesia
E-mail: rhy604218@gmail.com

p-ISSN 2339-0344

e-ISSN 2503-2305

INTRODUCTION

There are four elements of the Indonesian National Education Standards that characterize the 2013 curriculum: graduation standards, process standards, content standards, and assessment standards. According to Satria, Widjanarko, and Anis (2023), education is deliberate guidance provided by adults to children concerning their physical and spiritual growth, assessed to be beneficial for both oneself and society. The form of assessment implemented in the 2013 curriculum is known as assessment. One of the assessment instruments capable of measuring students' competencies is project assessment. Vocational High Schools (Indonesian: *Sekolah Menengah Kejurusan*, SMK), as one of the vocational education institutions, aim to prepare students and graduates as mid-level workers with the potential to produce quality human resources.

Research conducted by Jannah (2022) highlights that students must keep pace with technological advancements to ensure the effectiveness and efficiency of the learning process in achieving its objectives. According to Agus Suratno in his study (2016), a student is considered to pass when they have reached the standard competency limit or the minimum set abilities. Furthermore, research by Frovihandika (2018) emphasizes that Vocational High Schools serve as institutions where students acquire various knowledge and skills that can be applied in the business and industrial sector (DUDI). Relevant research by Joko Nur Fitriyanto (2019) indicates that the developed assessment instrument fulfills valid criteria based on the results of the instrument's validity test analysis, with a CVI coefficient of 0.99 for each item. Additionally, the developed research instrument meets the criteria of adequacy and high stability, with ICC values of 0.835 (media expert instrument), 0.815 (material expert instrument), and 0.732 (user response instrument).

Based on the pre-research observations conducted at SMK Negeri 1 Semarang from July to October 2021, several weaknesses were identified in the implementation of competency assessment, leading to the following impacts: Inadequate alignment of competency assessment with the real-world requirements for engine tune-

up EFI, resulting in students' limited mastery of the competency materials; the continuous development of assessment instruments for engine tune-up EFI competency has sometimes caused confusion among students in handling the engines; lack of enrichment related to the existing competencies required in the automotive industry job market; limited practical resources available for engine tune-up EFI competency, resulting in students having insufficient mastery of the skills required for this particular competency.

Based on the aforementioned issues, the researchers conducted a study entitled "The Development of Assessment Instrument for Vocational High School Students' Competency Test in Automotive Occupational Positions" in response to the challenges faced in the field of vocational education.

METHOD

Research Method

The method employed in this research is Research and Development (R&D). The research procedure adopts the ADDIE development model by Dick and Carey (1996), which consists of five stages: analysis, design, development, implementation, and evaluation.

Research Location and Data Sources

The research was conducted from March 27 to April 11, 2023, at SMK Negeri 1 Semarang, which holds a license for competency assessment in the Automotive Engineering program. The data for the validity of the competency assessment instrument were collected from assessment experts, subject matter experts, and evaluation experts. On the other hand, the practicality data of the competency assessment instrument were gathered from users, specifically automotive teachers.

Data Collection Techniques

Data collection techniques refer to the methods used by researchers to gather the desired data for their study, aligning with the research objectives. This step of data collection is critical since incorrect data could lead to erroneous conclusions (Arikunto, 2016). In this study, the data were collected using a questionnaire as the

data collection technique, which included three questionnaires: one for assessing the validity of the assessment instrument, one for evaluating the practicality of the assessment instrument, and another for factor analysis of the assessment instrument items.

1. The Assessment Instrument Validity Rating Sheet

The Assessment Instrument Validity Rating Sheet was conducted by two assessors as assessment experts, two representatives from business and industrial sector (DUDI) as subject matter experts, and two lecturers as evaluation experts. The researchers conducted the validity test by distributing a questionnaire as a research instrument to collect numerical data. In this response, the form of the Assessment Instrument Validity Rating Sheet used is a questionnaire consisting of five options: strongly agree, agree, unsure, disagree, and strongly disagree.

2. The Assessment Instrument Practicality Questionnaire

The Assessment Instrument Practicality Questionnaire was administered to 10 automotive engineering teachers at SMK Negeri 1 Semarang. Data collection began with providing the assessment instrument, followed by distributing a 20-item questionnaire with two response options: agree = practical and disagree = not practical. This allowed the researchers to collect practicality data based on the teachers' responses to the questionnaire.

3. Item Analysis Using Factor Analysis

The factor analysis validation test of the competency assessment instrument was conducted to assess the behavior of each statement item related to the implemented competency assessment indicators. The measurement scale used was Likert with a 5-point scale. The study involved 85 productive teachers as users of the assessment instrument. Data collection was performed by distributing the competency assessment instrument through a Google Form, which the researchers disseminated via the school's WhatsApp group. The data analysis was conducted using SPSS Statistics 23 with the Confirmatory Factor Analysis (CFA) method.

The Validity and Reliability Test of the Instrument

To determine the validity and reliability of the scale used in the research, it is essential to conduct testing on the items of the instrument beforehand. This testing aims to assess whether the questions formulated are understandable to the research subjects and to evaluate the validity of each item. Additionally, the testing helps to examine the overall condition of the research instrument used.

1. The validity and reliability testing of the validity rating sheet instrument for the competency assessment instrument

The validity rating of the competency assessment instrument used in this research was first piloted to test its validity. For the validity and reliability testing of the validity rating instrument in this study, the following validity and reliability tests were employed:

a. Validity

Validity with the type of response in the form of Likert scale scoring, an instrument is considered valid if it has a CVR (Content Validity Ratio) value above 0.99. If the valid items do not meet the target of $r \geq 0.98$, the obtained value is compared to the minimum value with the number of experts used. The formula for calculating the CVR of the validity rating sheet instrument is as follows:

$$CVR = (2ne/n) - 1$$

(Source: Nyoman, Ketut, & Tanggu, 2022)

Based on the data analysis conducted by the assessors and representatives from business and industrial sector (DUDI), the CVR score is 0.99. This data analysis indicates that the validity rating sheet instrument for the competency assessment instrument used in the research is valid.

b. Reliability

The reliability of the validity rating sheet instrument for the competency assessment instrument is tested using the Kappa statistic or interrater reliability, which is a measure used to assess agreement between two individuals (evaluators/observers) on categorical variables. If there are more than two evaluators, the multi-rater Kappa technique can be used. The Cohen's Kappa statistic is a common measure of interrater reliability and generally ranges from 0 to 1.0 (although negative values are possible), where

larger values indicate better reliability, and values approaching or below zero indicate that agreement is due to chance. The formula for Cohen's Kappa coefficient is as follows:

$$\kappa = \frac{\sum_{i=1}^I \pi_{ii} - \sum_{i=1}^I \pi_{i+} \pi_{+i}}{1 - \sum_{i=1}^I \pi_{i+} \pi_{+i}}$$

2. The validity and reliability testing of the practicality rating sheet instrument for the competency assessment instrument

The practicality rating sheet instrument for the competency assessment instrument used in this research was first piloted to test its validity. For the validity and reliability testing of the practicality assessment instrument in this study, the following validity and reliability tests were employed:

- a. Validity

Validity with the type of response in the form of interval/ratio scale scoring, the formula to calculate the point-biserial correlation coefficient for the practicality rating sheet instrument of the competency assessment instrument is as follows:

$$rpbi = \frac{Mp - Mq}{St} \sqrt{pq}$$

(Source: Azizah. 2022)

If the correlation coefficients for all items have been calculated, it is necessary to determine the minimum correlation coefficient, which is equal to 0.30. This means that the higher the correlation approaches one (1.00), the better the consistency (validity) of the instrument. Based on the data analysis of all the question items in the practicality rating sheet answered by the user (teachers), the average point-biserial correlation coefficient (Rpbi) obtained is 0.66. As per the validity criteria, if the point-biserial correlation coefficient is greater than 0.30, then, from the calculation results, it can be concluded that $Rpbi = 0.66 > 0.30$, indicating that all the items are valid.

- b. Reliability

Reliability is used to indicate whether a questionnaire can be trusted as a data collection tool, given that the practicality questionnaire has already demonstrated good results. The formula used for measuring reliability is as follows:

$$KR_{20} = \left(\frac{n}{n-1} \right) \left(\frac{St^2 - \sum pq}{St^2} \right)$$

The formula for variance used to calculate reliability is as follows:

$$St^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{N}}{N}$$

(Source: Miatin, dan Yahya. 2023)

From the overall reliability test calculation conducted using Microsoft Excel, it can be observed that the reliability value obtained from the average of each item is 0.425, which can be interpreted as falling into the "Moderate" category. Therefore, it can be concluded that the overall average of the reliability calculation for all items falls into the "Moderate" category.

Data Analysis Techniques

The data analysis technique is conducted using quantitative descriptive analysis following the implemented development procedure.

1. The Feasibility Test of Competency Assessment Instrument by Assessors' Expertise

The feasibility analysis technique of the competency assessment instrument is conducted using quantitative descriptive analysis. The data on the feasibility analysis of the competency assessment instrument is obtained directly through a response questionnaire carried out by the validator, who is an assessor expert.

2. The Feasibility Test of Competency Assessment Instrument by Subject Matter Experts from Business and Industrial Sector (DUDI)

The feasibility analysis technique of the competency assessment instrument is conducted using quantitative descriptive analysis. The data on the feasibility analysis of the competency assessment instrument is obtained directly through a response questionnaire carried out by the validator, who is a subject matter expert from business and industrial sector (DUDI).

3. The Feasibility Test of Competency Assessment Instrument by Evaluation Experts

The feasibility analysis technique of the competency assessment instrument is conducted using quantitative descriptive analysis. The data on the feasibility analysis of the competency assessment instrument is obtained directly through a response questionnaire carried out by the validator, who is an evaluation expert from Universitas Negeri Semarang, UNNES (English: Semarang State University).

4. The Practicality Test of Competency Assessment Instrument

The data from the practicality analysis of the competency assessment instrument, in the form of response questionnaires, will be tested for KR-20 reliability. Subsequently, the data from the practicality questionnaire will be used to determine the score of the coefficient of reproducibility (Kr) and the coefficient of scalability (Ks) to assess the practicality of the competency assessment instrument based on pre-established criteria.

The practicality analysis technique of the competency assessment instrument is conducted using quantitative descriptive analysis. The data on the practicality analysis of the competency assessment instrument is obtained directly through a response questionnaire carried out by the validator, who is a user, specifically a teacher of Automotive Program. The data from the validator, the teacher of Automotive Program, is then used to calculate the score of the coefficient of reproducibility (Kr) and the coefficient of scalability (Ks) to determine the practicality of each aspect based on the following formulas:

$$Kr = 1 - e/n$$

5. The Confirmatory Factor Analysis of the Competency Assessment Instrument Rating Sheet.

According to Hair et al. (2010), Confirmatory Factor Analysis is a part of Structural Equation Modeling (SEM) that is useful for testing how well variables are measured in describing or representing a set of factors, which can also be referred to as constructs. Confirmatory Factor Analysis is also used to test measurement theory postulates. The general measurement equation for Confirmatory Factor Analysis can be formulated as follows:

$$X = \Lambda\xi + \Psi\epsilon$$

Where X is a matrix (p x 1) of indicators, ξ is a matrix (g x 1) of constructs, g is a matrix (p x 1) of errors, Λ is a matrix (p x g) of loadings between indicators and constructs, Y is a diagonal matrix (p x p) of loadings between indicators and errors, p is the number of indicators, and g is the number of constructs. To simplify the discussion, it is assumed that $E[\xi\xi'] = 0$ and $E[\epsilon\epsilon'] = I$ (the identity matrix).

RESULTS AND DISCUSSION

Results and discussion

The results of the competency assessment instrument development process were carried out through various stages to obtain a well-constructed competency assessment instrument. This process involved validation by assessors' expertise, subject matter experts from business and industrial sector (DUDI), evaluation experts (lecturers), and users, who are Automotive Program Teachers. The validation was conducted in the field, aiming to obtain data for the purpose of revising the competency assessment instrument product.

Seals and Richey (1994) defined development research as a systematic study of the design, development, and evaluation of programs, processes, and learning products that must meet the criteria of validity, practicality, and effectiveness. Additionally, Plomp (1994) added the criterion "able to demonstrate added value" to the three aforementioned criteria. The feasibility testing was based on assessment sheets reviewed by assessors' expertise, subject matter experts, and evaluation experts. The practicality test was conducted by the Automotive Program Teachers, who are users of the competency assessment instrument.

The Feasibility of Competency Assessment Instrument

After conducting the validation test, the competency assessment instrument has been concluded as the final product and deemed highly suitable for use by schools to conduct competency assessments for Vocational High School (SMK) students aspiring to become technicians in the automotive industry job field.

A. The results of the Competency Assessment Instrument for Competency Testing

The conclusion of the feasibility of this competency assessment instrument is based on the validation results from 2 assessors, 2 subject matter experts from business and industrial sector (DUDI), and 2 evaluation experts. In this stage, the validation by assessors and DUDI regarding the relevance aspect of the competency assessment instrument obtained a score of 4.50, categorized as highly feasible. The completeness aspect of the competency assessment instrument received a score of 4.75, also categorized as highly feasible. The accuracy aspect of the competency assessment instrument obtained a score of 4.58, which is highly feasible, and the learning aspect of the competency assessment instrument received a score of 4.79, also considered highly feasible.

B. Discussion

The results of the feasibility test of the competency assessment instrument are as follows:

1. The Feasibility Test of the Competency Assessment Instrument

This stage is conducted to determine the feasibility of the developed competency assessment instrument. The feasibility test of the Competency Assessment Instrument for Vocational High School (SMK) students aspiring to become technicians in the automotive industry job field is conducted by 2 expert assessors and 2 validators from business and industrial sector (DUDI) as subject matter experts. The purpose is to obtain feedback and critiques from the validators regarding the developed product. The feasibility test instrument in this study adopts the questionnaire of The National Education Standards Agency (Indonesian: *Badan Nasional Standar Pendidikan*, BNSP), which has proven its validity. The validators in this feasibility test consist of 2 expert assessors from academic and practical backgrounds.

The results of this research can be concluded that the data analysis of the feasibility test of the competency assessment instrument, using expert assessment sheets observed by validators, received scoring from 2 expert assessors, 2 subject matter experts from business and industrial sector (DUDI), and 2 evaluation experts (lecturers). Based on the data from this study, it can be determined that the overall average score is 4.60,

categorized as highly feasible. Therefore, the competency assessment instrument is deemed valid and highly suitable for assessing the competency of Vocational High School (SMK) students aspiring to become technicians in the automotive industry job field.

The data analysis of Kr and Ks scores for the practicality test conducted by the Automotive Program teachers showed a coefficient of reproducibility or Kr = 0.9, indicating that the developed competency assessment instrument is highly practical for use as it meets the practicality criteria of 0.9. This is further supported by the scalability test, where the coefficient of scalability or Ks = 1, which also meets the criteria by being above 0.60. Based on these results, the practicality level is at 91%, as the overall average score corresponds to the tabulation of the practicality level, indicating that user responses fall within the range of 75%-100%. This means that the competency assessment instrument for assessing the competency of Vocational High School (SMK) students aspiring to become technicians in the automotive industry job field is highly practical to use.

2. The Feasibility Evaluation Form for Assessment Instrument Competency Test

In this stage, the relevance aspect of the competency assessment instrument obtained a score of 4.50, indicating that it is highly feasible. The completeness aspect of the competency assessment instrument received a score of 4.75, also meeting the criteria for being highly feasible. The accuracy aspect of the competency assessment instrument obtained a score of 4.58, indicating that it is highly feasible. Lastly, the learning aspect of the competency assessment instrument received a score of 4.79, demonstrating that it is highly feasible.

In the validation phase by expert evaluators, which involved 2 experts (lecturers), the results obtained were as follows: the relevance aspect of the competency assessment instrument received a score of 4.38, falling within the highly suitable criteria; the representativeness aspect received a score of 4.63, also falling within the highly suitable criteria; the practicality aspect obtained a score of 4.63, considered highly suitable; the discriminative aspect received a score of 4.25, indicating high

suitability; and the specificity aspect obtained a score of 4.88, also considered highly suitable.

3. The practicality test of the competency assessment instrument

The practicality test was conducted by 10 productive automotive teachers to obtain evidence from the responses indicating the practicality of the competency assessment instrument used in the research. The results of this study on the indicators are as follows: the indicator of ease of understanding the assessment materials obtained a percentage of 87% with a criteria of very practical, the indicator of alignment of materials with the competencies required in business and industrial sector (DUDI) obtained a percentage of 88% with a criteria of very practical, the indicator of understanding the language of the assessment instrument obtained a percentage of 93% with a criteria of very practical, and the indicator of completeness of competency assessment materials obtained a percentage of 96% with a criteria of very practical. Therefore, based on all the mentioned indicators in terms of user responses, the overall average practicality test result obtained a percentage of 91% with a criteria of very practical.

4. Content Validity Using Confirmatory Factor Analysis

The validation of the instrument's content assessment was conducted with the aim of assessing the behavior of the statement items with the competence assessment indicators that had been implemented. A Likert scale with 5 points was used as the measurement scale. The research involved 85 respondents who were productive automotive teachers and users of the instrument. Data collection was carried out by distributing the instrument of competence assessment through a Google Form, and distribution was done by the researcher via the school's WhatsApp group. The data analysis was performed using SPSS Statistics 23 with the Confirmatory Factor Analysis (CFA) method, and the results were analyzed using the Standard Loading Factor (SLF).

The results of the data analysis using CFA show that each item in the statements was analyzed for its Standard Loading Factor (SLF). SLF is defined as the magnitude of the correlation between the indicator and its latent construct. Indicators with the highest SLF have a significant

contribution to explaining the latent construct, while indicators with the lowest SLF have a weak contribution to explaining the latent construct. An SLF value ≥ 0.50 is considered to have sufficient validity in explaining the latent construct.

In the above results, it is shown that the highest SLF value is for item P5 with a value of 0.962, while the lowest SLF value is for item H4 with a value of 0.562. Therefore, based on the analysis, all statement items are considered valid because they have an overall SLF value ≥ 0.50 .

5. The implementation of the developed competency assessment instrument

To assess the level of validity of the developed instrument, a construct validity test using Confirmatory Factor Analysis (CFA) is performed. In this study, the CFA analysis shows that the Standard Loading Factor (SLF) values range from 0.562 to 0.962. As all 60 items have SLF values ≥ 0.5 , it indicates that all items are proven to be valid. Theoretically, the construct of each item in the competency assessment instrument is logically organized.

With the demonstrated validity, it is confirmed that the instrument can be used by teachers or stakeholders for the implementation of the competency assessment for SMK students in the Automotive Engineering program. This signifies that the instrument has undergone rigorous testing and can effectively measure the competencies of the students in the field of Light Vehicle Technology.

CONCLUSION

Based on the results of the conducted research and the detailed analysis, it can be concluded that the competency assessment instrument has obtained a score within the criteria of very feasible during the feasibility test. The practicality test also falls within the criteria of very practical. The CFA analysis confirms the validity of all items in the assessment instrument. Therefore, the assessment instrument is ready to be used by teachers or stakeholders for conducting competency assessments for Vocational High School (SMK) students in the Automotive Engineering program.

REFERENCES

- Suratno, Agus. 2016. Pengembangan Instrumen Penilaian Kompetensi Praktikum Engine Siswa SMK Program Keahlian Teknik Otomotif. Kompetensi Keahlian Teknik Kendaraan Ringan, Sekolah Menengah Kejuruan Negeri 1 Cikarang, Bekasi. *VANOS Journal of Mechanical Engineering Education*, Vol.1, No.1.
- Budiman, Arif & Ayub Budhi Anggoro. 2022. Pengembangan Media Pembelajaran Vlog Terhadap Penguasaan Kompetensi Siswa Pada Kompetensi Dasar Perawatan Sistem Utama Engine Dan Mekanisme Katup. *Automotive Engineering Education Program*, Faculty of Engineering, Universitas Negeri Semarang. *Jurnal Pendidikan Teknik Mesin*, Vol. 22, No. 2.
- Arikunto, Suharsimi (2016). *Prosedur Penelitian Suatu Pendekatan Praktik* (Jakarta: Rineka Cipta 2010, Ed. Rev.2010, 14th Edition).
- Assriyanto, K. E., Sukardjo, J. S., & Saputro, S. 2014. Pengaruh model pembelajaran berbasis masalah melalui metode eksperimen dan inkuiri terbimbing ditinjau dari kreativitas siswa pada materi larutan penyangga di SMA N 2 Sukoharjo tahun ajaran 2013/2014. *Jurnal Pendidikan Kimia*, 3(3), 89-97.
- Azizah, Z. N., & W. Budijastuti. 2022. Pengembangan Instrumen Penilaian untuk Mengukur Keterampilan Literasi Sains pada Submateri Sistem Peredaran Darah Manusia. *Bioedu*, 11(1), 88-97.
- Dick, W., & Carey, L. 1996. *The Systematic Design of Instruction* (4th ed.). New York: Harper Collins College Publishers.
- Frovihandika, D. E. 2019. Kesesuaian Skema Sertifikasi Kompetensi SMK LSP PI Otomotif terhadap Kebutuhan Dunia Usaha dan Dunia Industri di Kota Semarang. Thesis. Yogyakarta: Postgraduate Program, Yogyakarta State University.
- Jannah, R. N., Khumaedi, M., & Widjanarko, D. (2022). Developing Audio-Visual Learning Media in The Competency of Making Robe Patterns Based On The Design. Universitas Negeri Semarang, Indonesia. *Journal of Vocational and Career Education*, 7(2).
- Fitriyanto, Joko Nur, Dwi Widjanarko, Muhammad Khumaedi. 2019. Validity and Reliability Test of Assessment Instrument of the Suitability of Electric Power Steering Media. Universitas Negeri Semarang, Indonesia. *Journal of Vocational Career Education*, 4(1).
- Hair, J. F., et al. (2010). *Multivariate Data Analysis*. New Jersey: Pearson Prentice Hall, Inc.
- Miatin, Ghoni and Yahya, Mokh. (2023) *Hubungan Antara Penguasaan Diksi Dan Minat Baca Dengan Keterampilan Menulis Teks Cerita Pendek Pada Siswa Kelas IX SMP Al Azhar Syifa Budi Solo Tahun Ajaran 2021/2022*. Skripsi thesis, UIN Raden Mas Said Surakarta.
- Nyoman, P. G. A., Ketut, S. N., & Tanggu, R. N. 2022. Pengembangan E-Modul Topik Sifat dan Perubahan Wujud Benda Kelas V Sekolah Dasar Gugus II Kecamatan Buleleng. *Jurnal Pedagogi dan Pembelajaran*, 5(3).
- Plomp, Tj. (1994). *Educational Design: Introduction*. From Tjeerd Plomp (eds). *Educational & Training System Design: Introduction*. Design of Education and Training (in Dutch). Utrecht (the Netherlands): Lemma. Netherland. Faculty of Educational Science and Technology, University of Twente.
- Satria, A., Widjanarko, D., & Anis, S. 2023. Developing Adobe Flash Media with Android-Based to Improve Students' Learning Outcome in Anti-Lock Brake System. Universitas Negeri Semarang, Indonesia. *Journal of Vocational and Career Education*, 8(1).
- Seels, Barbara B. & Richey, Rita C. (1994). *Teknologi Pembelajaran: Definisi dan Kawasannya*. Translator Dewi S. Prawiradilaga, et al. Jakarta: Kerjasama IPTPI LPTK UNJ.
- Sugiyono. (2011). *Metode Penelitian Kuantitatif, Kualitatif, dan R & D*. Bandung: Alfabeta.