Jurnal Inovasi Teknik dan Edukasi Teknologi, 3(4), 2023, 182-190
ISSN: 2797-7196 (online)
DOI:10.17977/um068v3i42023p182-190

Kirkpatrick's Evaluation Model for The Implementation of Industrial Standard GTAW Welding in Vocational Teacher Training Center

Khotimatul Farida, Didik Nurhadi*
Universitas Negeri Malang, Jl. Semarang No. 5 Malang, Jawa Timur, Indonesia
*Penulis korespondensi, Surel: didik.nurhadi.ft@um.ac.id

Paper received: 10-04-2022; revised: 13-04-2022; accepted: 28-04-2022

Abstract

The Vocational Teacher Training Center held industrial-based training by applying project-based learning to train Industrial Standard GTAW Welding. Then, this study was carried out to evaluate the effectiveness of training implementation of Industrial Standard GTAW Welding. This study used the Kirkpatrick Evaluation Model in reaction and learning levels. A questionnaire and interview were chosen to collect data. The data were analyzed by using descriptive technique, t-test, and qualitative data analysis with NVivo. The findings indicated that the participants' satisfaction scores in reaction and learning levels were very high. The assessment of the participants at the reaction level was seen from three perspectives: instructors' reaction, reaction to the training delivery, and reaction to the training environment. Assessment of participants at the learning level was viewed from the impact of learning and knowledge training. The training proved that the program has been successful in developing the trainees' skills. This also showed that the program has been running effectively. However, the final products from trainees did not meet the industry's standards. Optimizing this training requires additional time and standardization of participants' abilities using portfolios from training candidates.

Keywords: industrial standard training; Kirkpatrick evaluation; training center; training satisfaction; welding training

Abstrak

Balai Diklat Guru SMK menyelenggarakan pelatihan berbasis industri dengan menerapkan pembelajaran berbasis proyek untuk melatih Pengelasan GTAW Standar Industri. Kemudian penelitian ini dilakukan untuk mengevaluasi efektivitas pelaksanaan pelatihan Pengelasan GTAW Standar Industri. Penelitian ini menggunakan Model Evaluasi Kirkpatrick pada tingkat reaksi dan pembelajaran. Kuesioner dan wawancara dipilih untuk mengumpulkan data. Data dianalisis dengan menggunakan teknik deskriptif, uji-t, dan analisis data kualitatif dengan NVivo. Temuan menunjukkan bahwa skor kepuasan peserta pada tingkat reaksi dan pembelajaran sangat tinggi. Penilaian peserta pada tingkat reaksi dilihat dari tiga sudut pandang yaitu reaksi instruktur, reaksi terhadap penyampaian pelatihan, dan reaksi terhadap lingkungan pelatihan. Penilaian peserta pada tingkat pembelajaran dilihat dari dampak pembelajaran dan pelatihan pengetahuan. Pelatihan tersebut membuktikan bahwa program ini berhasil mengembangkan keterampilan peserta pelatihan. Hal ini juga menunjukkan bahwa program tersebut telah berjalan efektif. Namun, produk akhir dari peserta pelatihan tidak memenuhi standar industri. Dalam mengoptimalkan pelatihan ini memerlukan tambahan waktu dan standarisasi kemampuan peserta dengan menggunakan portofolio dari calon peserta pelatihan.

Kata kunci: pelatihan standar industri; evaluasi kirkpatrick; Pusat Pelatihan; kepuasan pelatihan; pelatihan pengelasan

1. Introduction

Teachers have a central role as implementers of learning activities [1]. One of vocational teachers' success indicator is the height number of students who are accepted for work. To achieve this, teachers need to keep relevance between the skills taught at schools and the

technology used in industry. In line with one of the link and match 8 + I strategies, teachers need to receive training on technology updates and obtain competency certification of industry standards [2]. So it is important to implement industry-based teacher education and training programs [3]. This industry-standard training is proven effective to be implemented in education and training [4].

VTTC is one of the providers of education and training in vocational education, especially in the electronics and automotive fields. In order to guarantee the quality of vocational education, VTTC provides training aimed for vocational college lecturers, vocational teachers, and instructors of course and training institutions.

In July 2022, VTTC conducted a program to improve the competence of industrial-standard vocational teachers in several departments, including the mechanical engineering department. The training is about GTAW welding. The trainee were 15 teachers of welding engineering competence and metal fabrication techniques from Vocational Schools in East Java Province. The industry standard training program is carried out for 17 days, with the following details: 13 days of training at VTTC, six days of internship in industry, and competency certification by the industry for one day. Some participants felt that the time was too fast in completing the project. The materials during the training included general material on vocational education policies and specific material on technopreneurs, leadership, independent curriculum, project-based learning (PjBL), risk management, project-based learning (PBL) implementation, presentation of project results, expose, and training follow-up. The products of the GTAW welding training are garden chairs and folding clotheslines. It will be exhibited in the expose. During the expose, participants present and promote products. Afterward, participants will participate in an internship and get certification from the industry.

Industry-standard training at VTTC applies the PBL learning method. The PBL method is appropriate because it can improve the quality of learner-centered learning and allow them to gain knowledge through experience working on projects [5]. PBL can also improve 21st-century competencies, especially 4C, critical thinking, creativity, collaboration, and communication [6]. In addition, the training participants' practice results are used as a product that can be sold. The concept encourages participants to produce quality products. Overall, the methods applied in training aim to make teachers accustomed in implementing project-based learning and producing excellent products. Based on the results of observations during training, the product is not appropriate to the standard.

To measure the effectiveness of the program is necessary an evaluation. Evaluation is an important stage in the development of curriculum and programs in education[7]. Evaluation is a systematic procedure for collecting and analyzing training information to determine training efficiency and effectiveness [8]. The evaluation model used in this article is Kirkpatrick. This model was chosen because it is suitable for evaluating training implementation and commonly used.

Kirkpatrick's evaluation model has applied the reaction and learning levels. The reaction level assesses participants' thoughts and feelings about the training program [9]. It is important to know because positive reactions from participants will support them in studying well. The learning level provides data on the degree of change in knowledge, skills, or attitudes emanating from the program as assessed using some performance test or by participant feedback on the extent to which participants have learned the training material [9]. Both levels are relatively

easy to assess because they can be done as long as the participants are still in the training program. While levels 3 and 4 proved challenging to do as they required post-hoc studies and evaluating participants' performance in the field[10].

Several articles have discussed the evaluation of training programs using the Kirkpatrick model [8,11–16]. There are no articles that specifically discuss industry-standard training programs. This article aims to evaluate the implementation of industry-standard training using the Kirkpatrick model. The evaluation results are expected to be considered when preparing future training programs.

2. Methods

2.1. Types of research

This type of research is an evaluation using the Kirkpatrick model. The models level which are applied are reaction and learning. The reaction levels is used to define participants' satisfaction with the training. At the same time, the learning level is used to measure participants' learning outcomes, including cognitive, psychomotor, and affective aspects.

2.2. Research subject

The research subjects were 15 participants in industry-standard training provided by VTTC.

2.3. Research Instruments

The instruments used in this study were tests and non-tests. The test instrument used the results of the pre-test and post-test assessments. Meanwhile, non-test instruments were obtained through questionnaires and interviews. The questionnaire adapted from the instrument used to evaluate the implementation of the training using the PBL method [8, 17, 18, 19]. The questionnaire used consisted of an open-ended question and a closed-ended question.

The questionnaire was developed based on two variables: reaction and learning. The instrument was developed into four indicators. The reaction variable is broken down into three indicators: the participant's reaction to the instructor, the participant's reaction to the training delivery method, and the participant's reaction to the training environment. The learning variable is described as an indicator of the impact of training on learning and knowledge. The indicator is then outlined into 30 items. Each item was tested for validity and reliability from previous research, and then the questionnaire was validated by experts. The questionnaire uses a 4-point Likert scale, which consists of responses to strongly disagree, disagree, agree, and strongly agree with the statements in the questionnaire.

2.4. Data analysis

The data from this study consisted of two types; they are quantitative and qualitative. Quantitative data analysis used descriptive techniques to describe reactions and changes in knowledge of the Kirkpatrick model in tabular form and t-tests to determine the increase in participants' competence after implementing the training. Qualitative data obtained from open-ended questions and interviews were analyzed using Nvivo software. The data will be used to support quantitative data.

3. Results and Discussion

3.1. Participant Characteristics

The activity participants are teachers in the working area of VTTC, which consists of 15 teachers of welding and metal fabrication engineering expertise in the province of East Java, namely two vocational schools from wilker 1, one vocational school from wilker 2, one vocational school from wilker 3, and three vocational schools from wilker 4. Each school delegates two participants to make it easier for the trainees to apply the knowledge gained during the training. The characteristics of the trainees are shown in table 1.

Table 1. Characteristics of Training Participants

Characteristics	Classification	N(%)
Expertise	Welding technique	10 (66.6%)
	Mechanical Engineering	4 (26.6%)
	Machining technique	1 (6.6%)
Last education	Bachelor/ D4	14 (93.7%)
	Master	1 (6.3%)
Teaching experience	< 2 years	8 (53.3%)
	5 -10 years	5 (33.3%)
	11-20	2 (13.3%)
Gender	Man	14 (93.7%)
	Woman	1 (6.3%)

Table 1 shows that young teachers dominated the trainees. Teaching experience can be one of the factors that affect teacher competence [20]. It can make participants have difficulties in producing products in a short time. In addition, the lack of work experience harms the quality of metal products produced[21]. This may result the product will not appropriate with the standard.

3.2. Reaction

The evaluation results of GTAW welding training at the reaction level are very good. The results are viewed from three things; the participant's reaction to the instructor, the participant's reaction to the training delivery, and the participant's reaction to the facilities. Table 2 below presents the data from the quantitative analysis at the reaction level.

Table 2. Results of Quantitative Analysis in the Reaction Level

No.	Indicator	Mean	Standar Deviation	Predicate
1	Participant's Reaction to Instructor	3.92	0.22	Very good
2	Participant's Reaction to Training Delivery	3.87	0.25	Very good
3	Participant's Reaction to the Training Environment	3.90	0.20	Very good

Based on the results of processing the questionnaire data in table 2, the participant's reactions to the instructor, in this case, were widyaiswara, were in the very good category, with

an average of 3.92. This is supported by qualitative data, which states that the instructor is the most favorite part of the training. Widyaiswara has been able to apply an andragogy approach that is compatible with the characteristics of the trainees. The term andragogy is synonymous with adult learning [22].

GTAW welding training is carried out by considering the characteristics of adult education by developing four main things: self-concept, the role of experience, learning readiness, and learning orientation[23]. Widyaiswara acts as a mentor and facilitator for participants in completing projects. The relationship between instructors and training participants is multi-communication due to the concept of the andragogy approach[22]. This teaching pattern, suitable for the self-concept of adults, has been able to direct them to achieve the desired goals. The trainees are teachers with experience in the welding field; these factors play the most crucial role in andragogy education[24], and topics that match the participants' experience will be more exciting and easier to learn.

Based on the data in table 2, the teacher gave a very good assessment of the delivery of GTAW welding training with an average score of 3.87. However, one indicator has a low percentage, namely the indicator of the duration of the training implementation, with an average score of 3.5. This figure gets the lowest percentage among the other items, in line with the participant's statement that the duration of the training is something that needs to be improved in this training. It is supported by the results of interviews with training participants. Some participants felt that the duration of the training was too short of finishing the project. However, some other participants felt that the duration of the training was sufficient. Participants who gave low ratings of training duration were those with less than two years of teaching experience. There is a significant influence between teaching experience on teacher competence [25,26].

The organization of training material is arranged appropriately to the needs of trainees' lives. The presentation's order is according to the readiness of trainees. This is proved by the delivery of GTAW welding training material divided into five stages. First, the delivery of material on technopreneurs, leadership, independent curriculum, and PBL, which was delivered simultaneously with other field training participants. Second, participants received an explanation of the training objectives, project orientation, and introduction to GTAW welding by widyaiswara. Third, widyaiswara trains participants' competence in welding GTAW. Fourth, in groups, the trainees work on the project. Finally, participants presented the project results in the expose activities, which were carried out with training participants in other fields. Fourth, the material taught in GTAW welding training can support the work of the trainees so that the training is suitable for the participant's learning orientation. Adults seek to learn knowledge and skills to increase the effectiveness of their work[27].

GTAW welding training applies the PBL learning method. PBL is an effective learning method for acquiring knowledge and skills [28]. The gold standard of project-based learning must be applied strictly to improve the quality of training. The main criteria for the gold standard for project-based learning are learning based on challenging problems or questions; learning encourages continuous inquiry; authentic / directly connected to real-world problems; paying attention to student voices and choices; reflection on the learning activities that have been carried out; students get criticism and revision from other students, teachers and, or experts; and produce products that are presented to the general public [29].

To meet the gold standard project-based learning criteria, the projects created must come from the initiative of the participants. The limited time provided made participants did not have the opportunity to design the project according to their original ideas. The competency factor of the participants also hindered the implementation of the gold standard project-based learning. Not all participants have the skills to design a product; this is evidenced by the statement of participants who want additional material about metal product design. However, the participant's response to the training method was very good. Participants feel they have gained knowledge about PBL. Several participants stated that the learning method was the most favorite part of the training. Even the participants were inspired to implement PBL in schools.

The application of the gold standard project-based learning will have the consequence of increasing the duration of the training time[30]. The implementation of PBL will not be optimal if it is not supported by insufficient training duration. It was appropriate with the participant's response which stated that the duration of the training was too short to learn GTAW welding materials and produce home furniture products. These limitations can be overcome using the flipped classroom training model. The application of the PjBL method in the flipped classroom model is proven to positively contribute to the effectiveness of learning [4,31,32]. The VTTC implemented this model in 2021. However, the model was not implemented further due to time and human resource constraints.

The diverse competencies of participants can cause the problem of reactions to inadequate training duration; there is no standardization of competency qualifications for teachers participating in the training. The development of information technology, especially big data, can be used to analyze teacher education and training policies [33]. Teacher professional development management platforms like SIM PKB can be used optimally to map teacher competencies and analyze the need for teacher competency improvement.

The training environment is a crucial factor responsible for the successful implementation of the training program, which includes the suitability of physical facilities, equipment, classrooms, and accommodation. The learning environment plays a positive role in the training program's success [8]. Based on the data in table 2, the participant's reactions to the learning environment showed an excellent percentage. It was supported by the participant's response which stated that the facilities provided by VTTC were the things they liked the most in training.

The equipment, classrooms, and accommodation facilities provided by VTTC are in accordance with the standards set by legislation. The room has adequate lighting and air circulation, and the ratio of the work area is 4.4 m2 per participant; these conditions are in accordance with the standards of the training institution[34]. The tools and materials provided during the training meet the needs of the participants. During work, participants are equipped with complete welding personal protective equipment consisting of welding helmets, aprons, gloves, safety shoes, and masks.

3.3. Learning

The evaluation results at the learning level were viewed from two perspectives: the results of the participant's answers to the questionnaire on indicators of the impact of training on learning and knowledge and the results of the different tests from the pre-test and post-test scores. The data from the quantitative analysis at the learning level can be seen in table 3.

Table 3. Data from the Quantitative Analysis of the Learning Level

No.	Indicator	Mean	Standard Deviation	Predicate
1	Impact of Training on Learning and Knowledge	3.93	0.16	Very good

The results showed that participants felt confident that their knowledge, information, and practical skills improved after attending the training program. Participants learn about some law, theory, and practice or find information related to their work. Suitable with the training objectives to improve standardized professional competencies according to the needs of the world of work.

As a result of the training, participants experienced increased skills in metal fabrication, occupational safety and health (K3), entrepreneurship, drawing reading, and GTAW welding. After completing the training series, participants are required to carry out follow-up actions in the form of impacting teachers and students in their work environment. Stimulating activities become important to do related to teachers' main tasks and functions [35]. Inducement positively impacts the equitable distribution of teacher competencies [36]. Impacting will be more effective in subject-teacher deliberations (MGMP) activities[37]. The VTTC sets no special requirements regarding the technical implementation of the impact. The follow-up plan that the training participants will carry out is to apply the PBL learning method and materials about GTAW welding and to impart their knowledge to the teachers in their environment. However, only a few schools have GTAW welding kits. So VTTC needs to consider the benefits of the knowledge gained by the training participants.

The data from the pre-test and post-test were tested for normality of the data before the paired difference test analysis was applied. Based on the results of the normality test of the data, it is known that the scores are not distributed normally, so the normality test method is used to determine the difference between the pre-test and post-test values. Based on the statistical results of the paired difference test, a significance of 0.00 was obtained, which means that there was a significant difference between the two groups of pre-test and post-test data. It indicates that the participants experienced increased skills and knowledge due to the training.

Home furniture products produced by GTAW welding trainees still do not meet the standards regarding precision and aesthetics. These problems are closely related to the duration of the training and the competencies possessed by the participants. Limited experience and competence will result in increased time to learn.

4. Conclusion

Industry-standard teacher training has succeeded in improving participants' skills and obtaining a high satisfaction score; this means that the program has been running effectively. However, the products produced by the trainees did not meet the standards. It is due to the limited time provided and the varying initial abilities of the trainees. Lack of experience and skills makes the participants need more time to learn. They were increasing the effectiveness of the training necessary to standardize the qualifications of the trainees. To determine the qualifications of prospective trainees, VTTC can select participants based on their portfolio of work and the competence of prospective participants. In addition, VTTC can also take advantage of big data to determine participants' preferences and qualifications.

References

E. Ginting, "Studi Kinerja Mengajar Guru Produktif SMK," *J. Pendidik. Tambusai*, vol. 6, pp. 2342–2356, 2022.

Kemdikbud, "Kemendikbud Gunakan Rumus 8+i Guna Capai Tujuan SMK Pusat Keunggulan," 2021.

C. Hofmeister and M. Pilz, "Using E-learning to Deliver In-service Teacher Training in the Vocational Education Sector: Perception and Acceptance in Poland, Italy and Germany," *Educ. Sci.*, vol. 10, no. 7, pp. 1–17, 2020, doi: 10.3390/educsci10070182.

Y. Sopian, "Pengaruh Penerapan Kombinasi Model Flip Classroom dan Project- Based Learning pada Pelatihan Upskilling Guru Kejuruan Berstandar Industri," *Oase Nusant.*, vol. 1, no. 1, pp. 59–68, 2022.

R. Belwal, S. Belwal, A. B. Sufian, and A. Al Badi, "Project-based learning (PBL): outcomes of students' engagement in an external consultancy project in Oman," *Educ. Train.*, vol. 63, no. 3, pp. 336–359, 2020, doi: 10.1108/ET-01-2020-0006.

Asman, M. Kumaro, and M. S. Barliana, "Integration of 4Cs Skills into Learning by Using the Project Based Learning (PjBL) Model to Face the Challenges of the 21st Century," *Proc. 4th Int. Conf. Innov. Eng. Vocat. Educ. (ICIEVE 2021)*, vol. 651, no. Icieve 2021, pp. 88–93, 2022, doi: 10.2991/assehr.k.220305.018.

M. Cahapay, "Kirkpatrick Model: Its Limitations as Used in Higher Education Evaluation," *Int. J. Assess. Tools Educ.*, vol. 8, no. 1, pp. 135–144, 2021, doi: 10.21449/ijate.856143.

A. Alsalamah and C. Callinan, "Adaptation of Kirkpatrick's four-level model of training criteria to evaluate training programmes for head teachers," *Educ. Sci.*, vol. 11, no. 3, 2021, doi: 10.3390/educsci11030116.

P. Tamkin, J. Yarnall, and M. Kerrin, *Kirkpatrick and Beyond: A Review of Models of Training Evaluation*. United Kingdom: Institure for Employment Studies, 2002.

[V. Aryadoust, "Adapting Levels 1 and 2 of Kirkpatrick's model of training evaluation to examine the effectiveness of a tertiary-level writing course," *Pedagogies*, vol. 12, no. 2, pp. 1–28, 2016, doi: 10.1080/1554480X.2016.1242426.

H. Asyari, T. Rusman N, and A. Riyana, "Evaluasi Program Pelatihan Guru di Pusdiklat Tenaga Teknis Pendidikan dan Keagamaan Kementerian Agama Republik Indonesia," *Tadbir J. Stud. Manaj. Pendidik.*, vol. 4, no. 1, pp. 67–86, 2020, doi: 10.29240/jsmp.v4i1.1441.

R. Hermawan, "Tingkat Kompetensi Guru Pasca Pelatihan Substantif Pengelolaan Penilaian Hasil Belajar Siswa," *Perspektif*, vol. 14, no. 2, pp. 269–282, 2021.

J. Lestyowati and I. Rahmi, "Evaluasi Pelatihan Jarak Jauh Model Kirkpatrick: Studi Kasus Pjj Communication Skills Angkatan Ii Pada Balai Diklat Keuangan …," *J. Transform. Adm.*, no. April 2021, pp. 1–19, 2021.

R. Ritonga, A. Saepudin, and U. Wahyudin, "Penerapan Model Evaluasi Kirkpatrick Empat Level Dalam Mengevaluasi Program Diklat Di Balai Besar Pelatihan Pertanian (BBPP) Lembang," *J. Pendidik. Nonform.*, vol. 14, no. 1, p. 12, 2019, doi: 10.17977/um041v14i1p12-21.

T. Suhartati, "Evaluasi Program Pendidikan Pelatihan Pembinaan Ideologi Pancasila Bagi Guru Menggunakan Model Kirkpatrick," *ETJ Educ. Technol. J.*, vol. 2, no. April, pp. 45–55, 2022.

Y. Supriyati and I. Abraham, "Model Pengembangan Kirkpatrick Plus Level 5 (Return on Training Invesment) (Kirkpatrick Plus Level 5 Development Model)," *J. Ilm. Mandala Educ.*, vol. 7, no. 1, pp. 134–143, 2021, doi: 10.36312/jime.v7i1.1712.

B. Gómez-Pablos, Verónica, M. Martín del Pozo, and A. García-Valcárcel Muñoz-Repiso, "Project-based learning (PBL) through the incorporation of digital technologies: An evaluation based on the experience of serving teachers," *Comput. Human Behav.*, vol. 68, p. 501, 2017, doi: 10.1016/j.chb.2016.11.056.

S. Palmer and W. Hall, "An Evaluation of a Project-based learning Initiative in Engineering Education," *Eur. J. Eng. Educ.*, vol. 36, no. 4, pp. 357–365, 2011, doi: 10.1080/03043797.2011.593095.

G. Pan, V. Shankararaman, K. Koh, and S. Gan, "Students' evaluation of teaching in the project-based learning programme: An instrument and a development process," *Int. J. Manag. Educ.*, vol. 19, no. 2, p. 100501, 2021, doi: 10.1016/j.ijme.2021.100501.

D. E. Ritonga, R. Pohan, R. Sianturi, G. R. Hutagalung, and G. H. Purba, "Pengaruh Pengalaman Mengajar, Etos Kerja Dan Motivasi Mengajar Terhadap Kinerja Guru SMK Negeri 1 Sibolga," *JEKKP (Jurnal Ekon. Keuang. dan Kebijak. Publik)*, vol. 2, no. 2, pp. 126–138, 2021, doi: 10.30743/jekkp.v2i2.3388.

J. Y. Triyadi, "Pengaruh Latar Belakang Pendidikan dan Pengalaman Kerja Terhadap Kualitas Potongan Logam Menggunakan Las Gas di Sentra Industri Logam Desa Ngingas Kecamatan Waru Kabupaten Sidoarjo," *JTM*, vol. 2, no. 3, pp. 63–74, 2014.

Hiryanto, "Pedagogi, Andragogi dan Heutagogi Serta Implikasinya dalam Pemberdayaan Masyarakat," *Din. Pendidik.*, vol. 22, no. 1, pp. 65–71, 2017.

Sunhaji, "Konsep Pendidikan Orang Dewasa," *J. Kependidikan IAIN Purwokerto*, vol. 1, no. 1, pp. 1–11, 2013.

Y. Yusri, "Strategi Pembelajaran Andragogi," *Al-Fikra J. Ilm. Keislam.*, vol. 12, no. 1, p. 25, 2017, doi: 10.24014/af.v12i1.3861.

S. Sugito, Y. Suyitno, and K. Kuntoro, "Pengaruh Masa Kerja Dan Motivasi Kerja Terhadap Kinerja Guru Sekolah Dasar Di Desa Samudra Dan Samudra Kulon," *Din. J. Ilm. Pendidik. Dasar*, vol. 11, no. 1, p. 1, 2019, doi: 10.30595/dinamika.v11i1.5980.

M. Rakib, A. Rombe, and M. Yunus, "Pengaruh Pelatihan Dan Pengalaman Mengajar Terhadap Profesionalitas Guru," *J. Ad'ministrare*, vol. 3, no. 2, pp. 137–148, 2017.

M. H. S. Park, "We Knew It All Along! Using Cognitive Science to Explain How Andragogy Works," *Eur. J. Train. Dev.*, vol. 40, no. 3, pp. 171–190, 2016, doi: 10.1108/EJTD-10-2015-0081.

H. A. M. Sayuti, T. G. Ann, W. M. S. A. Saimi, M. A. B. Bakar, S. N. A. Dawawi, and M. Mohamad, "Using Gold Standard Project Based Learning for Intermediate Year Three Pupils to Enhance English Speaking Skill: A Conceptual Paper," *Creat. Educ.*, vol. 11, no. 10, pp. 1873–1889, 2020, doi: 10.4236/ce.2020.1110137.

J. Larmer, J. Mergendoller, and S. Boss, "Gold standard PBL: Essential project design elements," *Buck Inst. Educ.*, pp. 1–4, 2019.

S. Aldabbus, "Project-Based Learning: Implementation & Challenges," *Int. J. Educ. Learn. Dev.*, vol. 6, no. 3, pp. 71–79, 2018.

K. J. Chua and M. R. Islam, "The hybrid Project-Based Learning–Flipped Classroom: A design project module redesigned to foster learning and engagement," *Int. J. Mech. Eng. Educ.*, vol. 49, no. 4, pp. 289–315, 2021, doi: 10.1177/0306419019838335.

L. Moreno-Ruiz *et al.*, "Combining flipped classroom, project-based learning, and formative assessment strategies in engineering studies," *Int. J. Eng. Educ.*, vol. 35, no. 6 A, pp. 1673–1683, 2019.

B. Wang, H. Li, and X. Wang, "The Implementation of Network Big Data on Vocational College Teacher Training Strategy," vol. 2022, 2022.

Mendikbud, "Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 33 Tahun 2017." pp. 39–69, 2017.

T. A. Sutikno, "Indikator produktivitas kerja guru sekolah menengah kejuruan," *J. Teknol. dan Kejuru.*, vol. 32, no. 1, pp. 107–119, 2009.

I. B. Muktyas, M. Amin, and F. Fajarudin, "Pelatihan (Pengimbasan Master Trainer) Keterampilan Berpikir Tingkat Tinggi Guru Mata Pelajaran Matematika SMP Kabupaten Bogor," *J. Pengabdi. Pada Masy.*, vol. 7, no. 2, pp. 308–317, 2022, doi: 10.30653/002.202272.78.

I. Agung, Yufridawati, F. D. Sulistyo, A. B. Susanto, and L. Efaria, "Strategi pengimbasan Pembelajaran Kreatif Guru Penggerak," *Risalah Kebijakan*. Pusat Penelitian Kebijakan Badan Penelitian dan Pengembangan dan Perbukuan Kementerian Pendidikan dan Kebudayaan, Jakarta, pp. 1–10, 2020.

.