Analysis on vocational high school teacher competency gaps: implication for VHS teacher training needs

D S Wahyuni\textsuperscript{1}, K Agustini\textsuperscript{2}, I G P Sindu\textsuperscript{3} and N Sugihartini\textsuperscript{4}

\textsuperscript{1,2,3,4}Informatics Engineering Education Study Program, Universitas Pendidikan Ganesha, 81116, Indonesia

Email: \textsuperscript{1}seri.wahyuni@undiksha.ac.id

Abstract. This study proposed a novel approach that integrates qualitative and quantitative methods to identify the competency gaps of VHS teachers in Vocational High Schools (VHSs). It comprised four research steps, namely (1) determining the ideal teacher competencies through Fuzzy Delphi technique, (2) arranging the competency priorities by using the analytic hierarchy process, (3) conducting VHS teacher performance evaluation by using a 360-degree rater, and (4) the competency gaps analysis using the IPA matrix. The sample members involved in this study were 7 experts from the industry, academia, and government, and 50 VHS teachers from several regencies in Bali Province, Indonesia. This study suggested that the gaps analysis between the existing VHS teacher competencies and the ideal ones include (1) the pedagogical competency – the low level of factual knowledge mastery in vocational knowledge and skills; (2) mastery in the application of contents; (3) mastery of content knowledge related to vocational teaching subjects; (4) networking and collaboration between the relevant industry and government; (5) continuous professional development; and (6) entrepreneurship. These findings imply that these needs of competencies should be the focus of teacher training programs for VHS teachers.

1. Introduction

Vocational education is considered as the key factor for improving or maintaining the competitiveness of enterprises and national economies \cite{1}, \cite{2}. The learning goal of vocational education is to prepare young people for broad vocational areas in specific jobs and give impact and influence on the improvement of life quality and productivity of people's lives in various fields of life \cite{3}, \cite{4}. Vocational schools in Indonesia are essentially aimed at producing graduates who are better prepared for the workplace, yet the current statistics indicate a high number of unemployed vocational graduates \cite{5}. Learning processes in vocational education involve VHS teachers whose tasks are to support and direct pupils in teaching, learning, and practicing. Improving VHS teacher quality is, therefore, a significant level for increasing the quality of vocational education, as acknowledged by many international and national organizations.

Additionally, the quality of the VHS teachers has a significant effect on teaching performance (learning) and learning outcomes. Improved teacher quality will have an impact on the improvement of the quality of competency of vocational high school graduates. This finding proves that teacher contribution is important in affecting the quality of all types of education, including vocational education. Thus, it is mandatory to give more attention to teacher quality. Further, the most significant difference between VHS teachers and general ones should be addressed, namely how they prepare the
students in schools to be work-ready labor with specialized skills and competencies [6]. VHS teachers should not only deliver the contents of the learning subjects but also relate connected and integrated vocational contents into real life [7] which later these quality teachers have a significant part on teaching performance and learning outcomes [8]–[11]. Later, these VHS teachers can be the professionals who are specially educated and trained and are capable of teaching vocational knowledge skills and moral behaviors to develop the students’ ethics, vocational skills [6], as well as capable of developing their knowledge and skills related to occupation and students’ character, personality, critical thinking, inter- and intra-personal skills [12].

This study proposed competency gaps analysis of VHS teachers through comparing the importance of competency and actual competency. Competency gaps are discrepancy between what should be happening and what is happening [13]. The terms what should be happening is the same as the ideal conditions. In this case, ideal conditions mean the importance or optimal competency of VHS teachers. While the term what is happening means the actual conditions VHS teachers such as teaching performance of vocational teachers. Competencies are the appropriate combination of knowledge, skills, and attributes required for a job that should be possessed by an individual. While vocational teacher competencies are the appropriate knowledge, skills, and attitudes required for conducting teaching and learning in a classroom activity that should be possessed by teachers as a form of professional teacher. A competency of vocational teachers is linked to action and has to be identified as a teaching standard by the government. The government and education sector department are the best party to identify the required competencies for vocational teachers’ teaching quality. Competencies gaps analysis collected information which involves identifying the competencies required for the teaching quality performance and the finding out how existing condition vocational teacher performance matches these competencies and what can be done to build these competencies through training. Identifying competencies gaps usually involves three kinds of elements as the parties involved in the vocational education development program. Three parties include (1) industry; (2) government; (3) VHS teachers. Competencies gaps analysis is the most fundamental requirement for analyzing training needs of VHS teachers.

Therefore, this study proposed an approach that integrates qualitative and quantitative approaches for conducting competencies gaps analysis of VHS teachers. The approach combined Focus group, Fuzzy Delphi Method for identifying the importance of competencies and indicators via experts’ opinions and questionnaires. More and more organizations integrate 360-degree rater is applied for performance evaluation by collecting evaluation data from supervisors, subordinates, peers, and VHS teachers themselves [14]. The 360-degree rater is applied for VHS teachers’ performance evaluation and also can be used as a reference in competency gaps analysis [15]. The participants who participate in a 360-degree rater process would increase their self-awareness and willingness to improve their competence performance [16]. Our approach and research results offered vocational education development center (VEDC), VHS, and governments a clear training needs of VHS teachers as a competency needs for conducting training program. Additionally, the performance of the indicator can be applied as the indicators for VHS to evaluate the VHS teacher’s performance as the career promotion.

2. Method

According to the literature, the steps of conducting competency gaps analysis include three steps: identify the importance competency, describe the actual competency VHS teachers and determine the gaps through importance-performance matrix (IPA-matrix). Additionally, data is gathered from self- and peer evaluation to help ensure competency gaps analysis is systematic. Competency gaps analysis is based on a competency-based model in which each competency is prioritized. This study developed a competency framework for the VHS (as shown in Fig. 1) and assessed its feasibility via a case study. The study objectives include the following:

1. Identify the ideal competency of VHS teachers and prioritize each competency required by the VHS
2. Describe the actual competency through conducting VHS teachers performance evaluation
3. Determine the competency gaps through IPA-matrix
2.1. Participants and context
In the first phase of this research, a qualitative survey included selected experts, such as VHS principals, VHS teachers, academicians in universities/teacher training institutions, and experts from industry who had extensive work experience with relevant expertise. These experts were asked to complete the questionnaire at their workplaces. In selecting the experts being involved in this study, some criteria were taken into consideration, such as VHS teacher’s work experience, managerial positions within VHSs, pride, and relevant teacher’s expertise and knowledge. The experts of the study were selected from the top-ranked VHS located in various areas.

The snowball sampling technique was used to take the sample of this study then the representative sampling strategy was used to inferences on the whole population [17]. To enlarge the sample, the experts were asked to mention other people according to a defined sampling criterion. By interviewing and discussing the newly mentioned people, 23 experts became the respondents of this study. Questionnaires were distributed, and all responses were collected, representing a 100% response rate. According to [18], if there are more than 11 experts assessed using the Delphi Method, satisfactory results are obtained.

The second phase involved the reputable VHS principals, the outstanding VHS teachers, and educational experts in teacher training institutions. The respondents taking part in phase two were given questionnaires. There were six experts in total, and six distributed questionnaires were collected from them. The data collected from the survey were used to adopt AHP and to conduct weight analysis to reconfirm the variables stemming from the first-stage findings. The snowball sampling method was used similarly to the first phase, followed by extensive work experience, good performance as VHS teachers, and relevant expertise. The number of experts in the AHP for weighting competencies, based on [17], should be limited to five-fifteen. Therefore, this study distributed six questionnaires, so six responses were obtained. Thus, the response rate in the second phase is 100%.

2.2. Fuzzy Delphi method
This study adopted Fuzzy Delphi Method, based on experts’ opinions to confirm the importance of the competencies required in VHS teachers. VHS teachers’ competencies identified through previous steps were used as analytical indicators. Fuzzy Delphi was applied in this study to identify by screening the teachers’ competencies and sub-competencies based on the hierarchy of competency standard. Fuzzy Delphi method provides more advantages than the traditional Delphi technique. First, it provides an effective and efficient solution to determine the important criteria and sub-criteria [19]. This study indicates that Fuzzy Delphi could be used in a single round for screening criteria. Second, it enables the decision-makers to formulate a complex problem in the form of a simple hierarchy and to evaluate several criteria and sub-criteria in a systematic way under multiple environment criteria in conflict [20].

In this step, the researcher determined competency and sub-competency through review of the literature and the results of interviews through the focus group, and then the competency indicators were extracted and modified to formulate a questionnaire draft covering pedagogical, professional, vocational, and technological aspects. The draft was reviewed by two experts from the teacher training institutions and eight qualified VHS teachers teaching at the prestigious VHSs. The analysis included 4 dimensions competency with 23 competency domains and 60 sub-competencies. Thirteen experts (VHS teachers, industry experts, academic experts) were recommended and invited to complete the fuzzy Delphi questionnaires. Fuzzy Delphi employs a three-step approach to data analysis. First, developing the structure of VHS teacher competency standard through reviews of the literature and the results of focus group and interviews. Second, setting up the evaluations of weights. In this step, the survey experts’ recommendations were collected from questionnaires to determine whether revisions were necessary. Then, experts’ recommendations were used to estimate and find triangular fuzzy numbers. Third, choosing the appropriate VHS teacher competencies and sub-competencies. The fuzzy weight number generated from Step Two could not be used for direct comparison. Therefore, this study employed the fuzzy mean and spread method [19].
2.3. Analytic hierarchy process (AHP)

The AHP is a powerful and flexible multi-criteria decision-making tool for dealing with complex problems where both qualitative and quantitative aspects need to be considered [21]. The second phase involved the quantitative analysis design with outstanding VHS teachers and the reputable VHS principals interviewed to reconfirm the variables stemming from the first-phase findings. The AHP analysis results are presented in Table 2. In this phase, interviews with six experts from the most-liked VHSs were conducted, and the AHP was used to weight analyze VHS teachers’ competencies prioritized for future reference in terms of educational and training program planning especially for VHS teachers for continuing their career.

Data analysis for an AHP comprises four main steps. First step, developing the hierarchical structure. Structure of hierarchy was then developed using the structure of VHS teacher competency constructed in Fuzzy Delphi Method, and then the research objective was formulated. The objective of conducting the research was in line with the developed hierarchical structure. It aimed at selecting the best VHS teacher competencies. The hierarchy depends on the complexity of the structure. In this research, the hierarchy covered three levels in which level 1 consists of pedagogical, professional, vocational, and technological aspects, and level 2 contains 21 aspects of the aforementioned competencies. This study categorized the best competencies into level 1 and level 2. Step two: Setting up the pairwise comparative matrixes through the questionnaire. Following the 9-level evaluation scale [22],[23], the questionnaire for the survey was designed to obtain the results of comparing each pair of the construct in expert pairwise. Step three: finding the eigenvalues and eigenvectors. This step was done in accordance with [23] procedure. Step four: aggregating the relative weights. Various levels obtained in step three were combined to produce a vector of composite weights, which serves as the selection rate for VHS teacher competency in achieving the most general objective of this research.

2.4. 360-degree Rater

Reference [24] proposed that when identifying competency gap analysis involves comparing performance with stated intended competencies by subordinate-evaluation, superordinate-evaluation, peer-evaluation, self-evaluation. This study employed 360-degree rater to evaluate VHS teachers’ competencies in the case study. Four evaluator raters were developed to conduct VHS teacher performance evaluation including self-evaluator rater, supervisor evaluator rater, subordinate evaluator rater, and peer evaluator rater. Each item was rated on a scale ranging from one to five. The combined results of the four raters showed the VHS teachers performance evaluation in four competency dimensions.

The scores from each rater were combined and weighted to produce an evaluation performance score. Related literature did not suggest the most suitable weighting to each rater, so each rater, based on focus

![Figure 1. Conceptual Framework of Competency Gaps Analysis.](image)
group discussion with the academic experts and reputable VHS was assigned a weighting reflecting VHS consideration. The weighting supervisor rater is worth 25%, 30% for the peer rater, 30% for the sub-ordinate rater, and 15% for the self-rater. The results of the 360-degree rater of each VHS teacher become the actual performance in teaching, learning and practicing of VHS teachers.

2.5. Importance-performance analysis, IPA
Importance-performance matrix was used to analyse VHS competency gaps. The importance score obtained via the AHP method and the actual competency obtained from 360-degree rater were analyzed using IPA matrix. The average performance score of each competency was set as a benchmark, with scores above the benchmark being considered highly competent while those below were considered less competent. The importance of competency was classified based on Fuzzy Delphi analysis. The average scores of all competencies were set as a benchmark, with scores exceeding the benchmark being considered important while those below it was considered less importance. The competencies rated as importance but with lower- than-average performance scores were considered in need of improvement and incorporated into the competency gaps.

3. Results

3.1. The importance competency of VHS teachers
This study invited twelve experts from the government (Ministry of Culture and Education), academic experts (teacher training institutions), VHS principals, and the distinguished VHS teachers were invited to participate in the Fuzzy Delphi process through a focus group and AHP. Six experts were asked to fill out Fuzzy Delphi questionnaires, and the AHP questionnaires filled by six experts for confirmed the importance score of VHS teachers’ competency. The analysis results revealed that the four aspects to be listed from the most to the least important are: pedagogy competence (0.466), vocational competence (0.300), professional competence (0.172), and technological competence (0.063). Pedagogy competence was the key in teaching and learning in vocational education.

Experts conclude that the pedagogy competency dimension is the most important competence for vocational teachers. Pedagogy competence is related to teaching competence, educating competence, communicative and language competence, self-reflection and improvement competence, administration, didactic knowledge (such as in determining the objectives, contents, methods, media, evaluation, and assessment, etc.), and curricular knowledge based on the industry needs. Technological competence was the least important competence as affirmed by experts. It is assumed that technological competence functions only as additional knowledge and skills in vocational education. Technology is not only an additional aspect but also an important thing as an aid in the teaching and learning activity.

The analytical results (Table 1) show that VHS teachers focus more on pedagogy competency dimension, and the most important competencies domains are: (1) skills in conducting teaching, learning, and practical work (TLP work); (2) mastery of learning principles in vocational education; (3) facilitation of student’s potential development; (4) skills in creating productive learning environment based on industry; (5) conducting evaluation and assessment; (6) curriculum based on industry needs.

| Table 1. Weight Distribution of VHS teachers’ Competencies – Results Obtained from the AHP. |
|---------------------------------------------|---------------------------------|-----------------|-----------|
| Aspect | Competency | Weight | Ranking |
| Pedagogical (0.466) | Skills in conducting teaching, learning, and practical work | 0.131 | 1 |
| | Implementation of principles in vocational education | 0.123 | 2 |
| | Facilitation of student’s potential development | 0.113 | 3 |
| | Learning environment | 0.096 | 4 |
| | Evaluation and assessment | 0.089 | 5 |
| | Industry-based curriculum | 0.086 | 6 |
| | Reflective actions | 0.084 | 7 |
3.2. VHS teachers' performance evaluation

The scores of each rater are combined and put into categories to get total performance scores of VHS teachers. Previous studies and related literature did not suggest the most appropriate categorization for each rater, so the rater was determined according to the panel discussion with the headmasters of the vocational schools, academic experts, and assessors of vocational schools.

In vocational schools, the subordinate and peer rater categories are worth more than the superordinate rater. Evaluation from the subordinate and peer rater is more objective than the superordinate rater. The supervisor rater is worth 25%, 30% for the peer rater, 30% for the subordinate rater, and 15% for the self-rater. The results of vocational teachers’ performances will be presented in Table 2 below.

Table 2. Weight Distribution of VHS teachers’ Competencies – Results Obtained from the AHP.

| Aspect                | Domain                                      | Four inventories evaluator | Total |
|-----------------------|---------------------------------------------|----------------------------|-------|
|                       |                                             | Sup | Self | Peer | Sub |       |
| Pedagogy-andragogy    | Student’s characteristics                    | 5.50| 5.44 | 4.54 | 0.00| 5.01  |
|                       | Learning principles in vocational education  | 3.68| 3.64 | 3.08 | 0.00| 3.37  |
|                       | Industry-based curriculum                    | 4.38| 3.96 | 3.56 | 0.00| 3.89  |
|                       | Learning environment                         | 3.60| 3.46 | 3.28 | 3.69| 3.41  |
|                       | Teaching, learning, and training implementation| 4.20| 4.08 | 3.40 | 3.43| 3.78  |
|                       | Guidance and supervision of internship program| 3.24| 3.36 | 3.10 | 3.08| 3.19  |
|                       | Facilitation of student’s potential development| 5.52| 5.18 | 4.96 | 5.63| 5.17  |
|                       | Communication                                | 5.76| 5.56 | 5.10 | 5.57| 5.39  |
|                       | Evaluation and assessment                    | 3.72| 3.62 | 3.58 | 3.96| 3.63  |
|                       | Reflective actions                           | 5.66| 5.52 | 4.80 | 0.00| 5.20  |
|                       | Administration                               | 4.86| 4.56 | 4.42 | 0.00| 4.58  |
| Vocational            | Vocational knowledge and skills              | 2.90| 2.68 | 2.78 | 2.92| 2.84  |
|                       | Entrepreneurship                             | 3.26| 2.70 | 2.68 | 2.87| 2.89  |
|                       | Networking and collaboration                 | 2.96| 3.08 | 2.64 | 0.00| 2.82  |
| Professional          | Content knowledge                            | 4.31| 3.69 | 3.50 | 3.28| 3.67  |
|                       | Application of contents                      | 3.40| 3.37 | 3.14 | 3.51| 3.35  |
|                       | Continuous professional development          | 3.75| 4.06 | 3.59 | 0.00| 3.73  |
| Technological         | ICT for learning instruction                 | 5.68| 5.50 | 5.10 | 5.59| 5.45  |
|                       | ICT for communication                        | 5.42| 5.40 | 5.02 | 5.47| 5.31  |
|                       | ICT for evaluation and assessment            | 5.48| 5.38 | 4.38 | 5.51| 5.14  |
|                       | ICT for self-development                     | 5.30| 5.26 | 4.82 | 0.00| 3.56  |

3.3. Importance-Performance Analysis, IPA
The importance-performance analysis was used to explore vocational teachers’ competency gap. The competency has been determined by using the Fuzzy Delphi and the importance competency by using AHP process and those obtained from four evaluators are analyzed using IPA-matrix. The average performance score of each competency was set as a benchmark, with scores above the benchmark being considered highly competent while those below being considered less competent. The importance of competency is classified based on the analytic hierarchy process analysis. The average scores of all competencies were set as a benchmark, with scores exceeding the benchmark being considered important while those below being considered less important. The competencies above the benchmark was rated important while those below is considered in need of improvement and incorporated into the training needs of vocational teachers.

| Competency Domain                              | Importance | Performance |
|-----------------------------------------------|------------|-------------|
| **Pedagogy Aspect**                           |            |             |
| Student's characteristic                      | 0.060      | 5.010       |
| Learning principles in Vocational education   | 0.123      | 3.370       |
| Industry-based curriculum                     | 0.086      | 3.890       |
| Learning environment                          | 0.096      | 3.410       |
| Conducting Teaching, learning, and training implementation | 0.131      | 3.780       |
| Guidance and supervision of internship program | 0.082      | 3.190       |
| Facilitation of student’s potential development | 0.113      | 5.170       |
| Communications                                | 0.080      | 5.390       |
| Evaluation and assessment                     | 0.089      | 3.630       |
| Reflective actions                            | 0.084      | 5.200       |
| Administration                                | 0.056      | 4.580       |
| **Vocational Aspect**                         |            |             |
| Vocational knowledge and skills               | 0.513      | 2.840       |
| Networking and collaboration                  | 0.278      | 2.820       |
| Entrepreneurship                              | 0.209      | 2.890       |
| **Professional Aspect**                       |            |             |
| Content knowledge                             | 0.323      | 3.670       |
| Application of content                        | 0.447      | 3.350       |
| Continuous self-development                   | 0.230      | 3.730       |
| **Technological Aspect**                      |            |             |
| ICT for learning instruction                  | 0.678      | 5.450       |
| ICT for self-development                      | 0.175      | 3.560       |
| ICT for evaluation and assessment             | 0.089      | 5.140       |
| ICT for communication                         | 0.058      | 5.310       |

The competencies with high importance but low performance score clearly revealed that the vocational teachers’ competency gap falls in domain “vocational knowledge and skills”, “application of content”, “content knowledge”, “networking and collaboration”, “continuous self-development”, and “entrepreneurship”. The figure below shows that vocational teachers in Bali Province focus more on
vocational competency and professional competency, and the six most important competencies are: “vocational knowledge and skills”, “application of content”, “content knowledge”, “networking and collaboration”, “continuous self-development”, and “entrepreneurship”. Of all domains, domain “vocational knowledge and skills” had the lowest performance in this study.

Figure 2. Competency Gaps Analysis of VHS Teachers.

4. Discussion
The purpose of the study is to analyze competency gaps of VHS teachers. Conducting competency gaps analysis using three steps: identify the importance competency, describe the actual competency VHS teachers and determine the gaps through importance-performance matrix (IPA-matrix). To analyze the competency gaps for the VHS, past studies suggest applying the three-fold approach by using IPA matrix [8], [16], [25].

(1) Identify the importance competency: the study conducted interviews with experts (academics, industry and VHS teachers) and study literature with several competency standards of VHS teacher. Process screening criteria competencies using Fuzzy Delphi method and determining the importance competency using AHP model [19], [25].

(2) Describe the actual competency: individual analysis analyzed how well VHS teacher is doing the job and determines which competences should be improved. The study adopted 360-degree rater by using different approaches to analyzing the results of self-assessment and assessment by others [16], [24], [26] also stated 360-degree rater is comprehensive approach for conducting teacher performance evaluation, which compared from various source evaluators.

(3) Determine the competency gaps through IPA-matrix: competency gaps or deficiency or discrepancy of teachers competencies [17]. Using IPA-matrix will give the recommendation regarded with training needs of VHS teachers based on their competency’s discrepancies.

Each competency in the VHS was assigned both importance (from Fuzzy Delphi method and AHP model) and VHS teachers’ performance evaluation (from individual analysis) scores, and important and performance analysis (IPA) was used to evaluate VHS teachers’ competency gaps by analyzing the high importance but low performance evaluation scores competency criteria to reveals the VHS teachers’ competency gaps. The analytical results will become the recommendation and suggestion regarded with training needs of VHS teachers based on their competencies needs.

The categories of competency criteria in this study are put in order (from the most important to the
least important). It is in line with [27] stated that the vocational aspect is the main competency of VHS teachers. VHS teacher competencies are the skills to be learned to perform specified occupational tasks. Vocational competence is related to competence in work orientation and technical skills or practical subjects [27]. Furthermore, the AHP results of this study show that the most important competency of VHS teachers is the ability to use and utilize ICT for learning instruction. Research conducted by [9] classifies one important supporting area of competence for VHS teachers is working with technology. VHS teachers should be able to utilize ICT for supporting the teaching quality. Another most important competency in this study is continuing professional development. It is also in line with the results of research conducted by [28] stated that the most important competency of VHS teachers is the ability to keeping up-to-date professionally. However, should ICT training be held for VHS teachers, the approaches to effective ICT education should not be copied from developed countries without adaptations that consider differences in culture, environment, logistical support, and IT infrastructure [29].

Additionally, pre-evaluation introduction, post-evaluation interpretation, and VHS teachers’ fully support were critical to the success of a 360-degree rater. The study conducted 360-degree rater with the anonymous method, however, the sub-ordinate rater returning rate is relatively lower than other source rater; indicates some participants in sub-ordinate rater feel pressure while rating their teachers, sub-ordinate rater comes from pupils in VHS. [14] propose that self-evaluation seems to be more exaggerated than other rating. The study also found that self-evaluation is lower than other rater, and the lowest rating is from peer rater; indicates the competitive atmosphere of VHS may give the effects the performance evaluation.

Previous studies on VHS teachers' competency mostly focused on determining the competency standard of VHS teachers and prioritizing the importance without the quantitative approach analysis, but the most important competency may not be the one that requires the most training needs based on their discrepancies competency [30]. This study found “networking and collaboration” and “entrepreneurship” have the worst performance, but it was less important than the other competencies and will be excluded by training needs. The reason for the lower importance of “networking and collaboration” and “entrepreneurship” maybe that VHS teachers have rarely known the industry surrounded their area covered by their school.

This study validated the importance-performance analysis using a tool to analyze the VHS teachers’ competency gaps. However, several limitations should also be noted. First, the competency gaps identified come from a small sample of VHS teachers in one province which do not apply to other provinces. With more case studies on the IPA-matrix, it becomes easier to confirm the validity of the research methodology. Concerning social and personality competency criteria are excluded, VHS teachers may be slightly different in various types of competency standards in several Asia countries. While these limitations need to be considered in interpreting the findings, this study addresses an important topic that will become increasingly significant in the future. In this article, we developed IPA-matrix, suggested future practitioners to carry out this framework, and applied to the competency develop system for longitudinal tracking VHS teachers’ competency performance. The importance suggestion in this study becomes the future research related to determining the training needs of VHS based on their competencies needs. The training program will be more effective if preceded by the needs analysis-based competencies needs.

References

[1] F. Rauner, *International Handbook of Education for the Changing World of Work* EDITORIAL ADVISORY BOARD: UNESCO-UNEVOC Handbooks and Book series Associate Editors: Editorial Advisory Board:

[2] M. Pilz, *The Future of Vocational Education and Training in a Changing World*, 2012.

[3] A. Fuller, “Vocational Education,” in *International Encyclopedia of the Social & Behavioral Sciences: Second Edition*, 2015.

[4] L. Moran and G. Rumble, “Vocational education and training,” in *Vocational Education and
Training through Open and Distance Learning, 2004.

[5] C. W. Sandroto, B. Prihatin, D. Riyanti, and M. T. Warmiyati, “Entrepreneurial Intention and Competencies of Vocational and High School Graduates in Indonesia,” Soc. Sci. Humanit. S, vol. 26, pp. 225–236, 2018.

[6] P. Grollmann, “The quality of vocational teachers: Teacher education, institutional roles and professional reality,” Eur. Educ. Res. J., 2008.

[7] P. Sudira, “Metodologi Pembelajaran Vocational: Inovasi, Teori dan Praksis,” in UNY Press, 2018.

[8] C. Lin and L. Z. Chuang, “Using Fuzzy Delphi Method and Fuzzy AHP for Evaluation Structure of the Appeal of Taiwan’s Coastal Wetlands Ecotourism,” pp. 347–358, 2012.

[9] F. Caena, “Teacher Competence Frameworks in Europe: policy-as-discourse and policy-as-practice,” vol. 49, no. 3, 2014.

[10] L. Darling-hammond, J. V. Heilig, and A. Indian, “Does teacher preparation matter? Evidence about teacher certification, teach for America, and teacher effectiveness,” no. April 2014, 2005.

[11] J. D. Angrist and V. Lavy, “Does teacher training affect pupil learning? Evidence from matched comparisons in Jerusalem public schools,” J. Labor Econ., 2001.

[12] Y. Estriyanto, “The Missing Productive Vocational High School Teacher Competency Standard in The Indonesian,” J. Tech. Educ. Train., vol. 9, no. 1, 2017.

[13] A. Rosset, Training Needs Assessment. 1987.

[14] J. S. Horng and L. Lin, “Training needs assessment in a hotel using 360 degree feedback to develop competency-based training programs,” J. Hosp. Tour. Manag., vol. 20, pp. 61–67, 2013.

[15] C. F. Seifert, G. Yukl, and R. A. Mcdonald, “Effects of Multisource Feedback and a Feedback Facilitator on the Influence Behavior of Managers Toward Subordinates,” vol. 88, no. 3, pp. 561–569, 2003.

[16] J. Shyan and L. Lin, “Journal of Hospitality and Tourism Management Training needs assessment in a hotel using 360 degree feedback to develop competency-based training programs,” J. Hosp. Tour. Manag., vol. 20, pp. 61–67, 2013.

[17] H. Jeou-shyan, H. Hsuan, L. Chih-hsing, L. Lin, and T. Chang-yen, “International Journal of Hospitality Management Competency analysis of top managers in the Taiwanese hotel industry,” Int. J. Hosp. Manag., vol. 30, no. 4, pp. 1044–1054, 2011.

[18] A. Habibi and A. Sarafrazi, “Fuzzy Delphi Technique for Forecasting and Screening Items,” no. July, 2015.

[19] “New Paradigm for Education Reforms: Globalization, Localization, and Individualization,” in New Paradigm for Re-engineering Education, 2005.

[20] A. Özdañoğlu, “Comparison of AHP and Fuzzy AHP for The Multi-Criteria Decision Making Processes,” pp. 65–85, 2007.

[21] “Analytic hierarchy process,” in Multi-Criteria Decision Analysis: Methods and Software, 2013.

[22] T. L. Saaty, “What is the Analytic Hierarchy Process?,” in Mathematical Models for Decision Support, 1988.

[23] L. G. Smith, “The development and implementation of 360 Degree Feedback® for administrators of a K-12 public school district,” 2000.

[24] C. Wu and W. Fang, “Combining the Fuzzy Analytic Hierarchy Process and the fuzzy Delphi method for developing critical,” pp. 751–768, 2011.

[25] A. B. Dagal and R. Zembat, “A Developmental Study on Evaluating the Performance of Preschool Education Institution Teachers with 360 Degree Feedback,” vol. 5, no. 6, pp. 220–231, 2017.
Bank, no. June. 2015.

[28] R. A. Manley and R. Zinser, “A Delphi study to update CTE teacher competencies,” pp. 488–503, 2012.

[29] M. Laanpere, K. Pata, P. Normak, and H. Põldoja, “Pedagogy-driven design of digital learning ecosystems: The case study of Dippler,” in Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 2012.

[30] M. Grosch, “Developing Competency Standard,” pp. 279–287.