DISSERTATION RESUME

TRAINING NEEDS ANALYSIS FOR IDENTIFYING VOCATIONAL TEACHERS' COMPETENCY NEEDS IN ICT EXPERTISE PROGRAM IN VOCATIONAL HIGH SCHOOLS IN BALI PROVINCE

DESSY SERI WAHYUNI
14702269001

EDUCATIONAL TECHNOLOGY DEPARTMENT
INSTITUTE OF VOCATIONAL EDUCATION
FACULTY OF EDUCATION
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Presented as Partial Fulfillment of the Requirements for the Attainment of
Doctoral Degree in Technology and Vocational Education

DESSY SERI WAHYUNI
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ABSTRACT

DESSY SERI WAHYUNI: *Training Needs Analysis for Identifying Vocational Teachers' Competency Needs in ICT Expertise Program in Vocational High School in Bali Province*

The aims of this study to reveal (1) the description of characteristic vocational teacher, (2) the criterion competency, (3) the account of important competency, (4) the description of actual competency performance, (5) the identification of competency gaps, (6) the determination of training priority order, (7) the recommendations regarding with training methods and training organizer

This study employed a mixed method with exploratory sequential combination. The research subjects comprised the Vocational Technical Teachers with ICT expertise program especially for Network and Computer Engineering expertise competence. This study devised competency needs for training program incorporating Training Needs Analysis. The data were collected through FGD, questionnaires and an interview guide. The data were analysed using Fuzzy Delphi method to determine criterion competency by screening process. Analytic Hierarchy Process method was conducted for determining the important competency. 360-degree rater as evaluation teaching performance. Importance Performance Analysis diagram were used for describing the competency gaps. The determination of Training Priority Order based on quadrant in IPA diagram.

The results of this study showed that: (1) Vocational teachers from multiple expertise program are still lack of ICT knowledge and practice mastery especially in network engineering field because they had no ICT educational background. They still look confused and nervous in teaching and practicing in front of the class. (2) criterion competency consists of pedagogy-andragogy aspect with 11 domain areas and 34 sub-domain, professional aspect with 3 domain areas and 7 sub-domain, vocational aspect with 3 domain areas and 8 sub-domain and technology aspect with 4 domains. (3) the order of importance in terms of competency aspect is pedagogy-andragogy with weight of 0.466, vocational around 0.300, professional with weight of 0.172, technology approximately 0.063. (4) the lowest performance in pedagogy-andragogy aspect is

ability in guidance and supervision internship program with 3.19 total performance, Whereas in professional aspect is the competency in application of vocational content with 3.35 total performance, in vocational aspect is competency in networking and collaboration with 2.82 total performance and In technology aspect is ability using and utilizing ICT for self-development with 3.56 total performance. (5) the competency gaps fall into the vocational knowledge & skills, application of content, content knowledge, networking and collaboration, continuing professionalism development and entrepreneurship. (6) TPO based on competencies needs has described in IPA diagram most of training needs is located in vocational and professional aspect. (7) In House Training, specific training, and short courses training were recommended as effective training methods. The training organizers may come from P4TK BMTI, P4TK BOE, Private Institutions, Universities/LPTK, Industry.

Keywords: Training Needs Analysis, Important-Performance Analysis, Training Priority Order, 360-degree rater

CHAPTER I
INTRODUCTION

A. Research Background

Vocational education is considered as the key factor for improving or maintaining the competitiveness of enterprises and national economics (Rauner & Maclean, 2008; Pilz, 2012). Within the vocational track, the vocational schools offer secular academic subjects as well as subjects which focus on technical skills. Vocational education is first introduced at the senior secondary level. Students in their tenth grade may apply for either Vocational High School (*SMK*) to pursue specific vocational education, or General High School (*SMA*) for general secondary level education. SMK is aimed at producing graduates with specialized skills which can be used to enter and compete in the workplace.

Nowadays, the environment for VET is changing, prompting the need for VET teachers and practitioners to extend their existing skills in teaching, learning and assessment (Mitchell et.al, 2006). Another article supports the statement, pointing out how the fast changing workplace interpreted as "megatrends" needs responsive and adaptive teaching workforce (Nijhof & Streumer, 1994). According to the report by SEAMEO VOCTECH, the quality of vocational teachers is still low, as about 14.23% did not have the academic standards and skills in vocational fields (Seameo, 2015). The lack of up-to-date practical work experience and the outdated knowledge and skills of the vocational teachers were perceived as threats to the quality of vocational education and training (Paaso & Korento, 2010). The quality of the teacher 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.

Moreover, the existing of vocational teacher competency standards as known as a descriptive tool that identifies the skills, knowledge, personal characteristic, and behaviors needed to effectively perform a role in the organization or school and help to meet its strategic objectives (Lusia & Lepsinger in Winterton, Delamare, & Deist, 2005), which have been formulated in the Regulation of the Minister of Education and Culture No. 34 Year

2018. Concerning National Standards for VHS Education suggesting that vocational teachers should have pedagogical, professional, social, and personality aspects mandated in the standards. According to Law No. 14 Year 2005 on teachers and lecturers, it is stated that competence is a set of knowledge, skills, and behaviors that must be owned, lived, and mastered by teachers or lecturers in carrying out professional duties and as suggested by Tippelt & Amoros (2003), it should be applied to perform a task or function in accordance with the requirements specified by the job.

Based on the interview conducted by the Head of Program and Data Division, Mr. Moehammad Soleh, at *P4TK* BOE Malang, the following information was obtained.

1. There is no mapping analysis of competency needs which serves as materials selection for providing training for vocational teachers.
2. The references used as the provision of teacher training are the national database (VHS Education Database). National database unfortunately could not provide any specificity regarding the competency needs of vocational teachers.
3. Teacher professionalism is based on the result of *TCT* and *PLPG*.
4. Based on the current government policy designed by the Ministry of Education and Culture, the training needs of vocational teachers are based on the self-assessment with the APL-2 reference. Vocational teachers conduct self-assessment of their respective competency needs. Based on the results of APL-2, it is expected that the teacher has a skill that shows mastery of skills that have been mastered.

The researcher also conducted interview with Mr. Abyong as Head of the teacher association (MGMP) in Computer and Network Engineering (*TKJ*) program. The interview was held in State Vocational High School SMKN 3 Bangli in August 2015. He provided information from the open questionnaire, such as:

1. Vocational teachers still lack the ability in implementing learning strategies which are appropriate to the situation and conditions in accordance with the characteristic of students and learning materials provided by the teachers. Vocational teachers seem to not know how to choose and use the

appropriate learning model, learning method and learning strategies in vocational education.

2. Teachers still do not have enough understanding and experience on how to use ICT as media of learning in the classroom or laboratory activity to support the delivery of learning objectives effectively and efficiently.
3. The lack of ability of teachers to create and plan updated syllabus and lesson plans which respond to the needs of the industry
4. The lack of communication ability in giving feedback in the learning process
5. The lack of ability in planning and preparing the rubric of evaluation and assessment which are tailored to the learning objectives.

From some of the training that has been obtained by vocational teachers more focuses on aspects of pedagogy knowledge while for technical skills aspects still very limited. Vocational teachers needs training which more directed at technical skills in accordance with their vocational subject fields. For example: training in object oriented programming, training in microtik settings using fiber optics, training network servers, training using network software. The training focuses on the improvement of skills only followed by vocational teachers in the city center, for example: SMKN 1 Denpasar, SMKN 3 Singaraja and SMKN 3 Bangli.

Based on the preliminary study above, the researcher tries to summarize the problems in educational and training program implementation held by the government:

a. The implementation of the training was not based on needs analysis, in this case the needs of vocational high school teacher competencies.
b. The time allocation is limited to 10 days for full implementation and thus insufficient to facilitate and improve all teacher competencies.
c. The training did not involve industrial partners (such as: internet service provider, software production, multimedia company, APJI, Aspiluki, Ainaki, etc.) which can provide the real working experience.

d. The quality and quantity of vocational high school teacher are still concentrated in urban areas. As a result, the quality of vocational teachers is not distributed evenly to the rural area.

The Government of Indonesia through the Ministry of Education and Culture has made efforts to revitalize VHSs as stated in Presidential Instruction No. 9 of 2016 concerning Revitalization of VHSs. Such an initiative has been carried out through ten strategic steps, including improving the quality of educators, or vocational teachers through revisiting their competency standard (Hadam, Rahayu, & Ariyadi, 2017). Teacher quality development program is the main concern of the Ministry of Education And Culture policy's (Ministry of Education and Culture, 2015). Quality improvement program for vocational teacher can be achieved by giving training which aims to strengthen vocational teacher professionalism. One of the quality developing programs that can be done is by giving the development and improvement of competency through training program. Education and training are parts of personal development planning with approach to lifelong learning because it is hoped that teachers will be motivated to learn for improving their knowledge and skills to keep up with the development in media and technology (OECD, 1996).

Teacher competency improvement is urgently needed to produce good quality graduates so they can have the ability, capability and willingness to compete in the industry and the world of work with others. Training program could become the best strategy for improving of teachers' competency. The Regulation of the Minister for Administrative and Bureaucratic Reforms No. 16 of 2009 defines training as a form of competency improvement. Training program for vocational high school teachers should be tailored to meet their needs to improve their competency as professional educators. Even though Ministry of Education and Culture has done several teacher trainings, they are not preceded by the needs analysis stage. A training which is not based on the needs of teachers has no significant impact on improving teacher competency and is just waste of time, energy and funds (Darling-hammond, Heilig, & Indian, 2005).

B. Problem Identification

The researcher try to describe the problems in educational and training programs conducted by the government. The researcher identified several issues as follows:

1. The existing competency standard of vocational teachers which had been stated in the Regulation of the Minister of Education and Culture No. 34 Year 2018 concerning National Standards for VHS Education is not appropriate with the criterion competency of vocational teachers in vocational school teaching and learning competency. Competency standard of vocational teachers still has no specifically and clearly stated competencies with have to be performed of vocational teachers in teaching, learning and practicing activity, which can be adapted to the needs of workplace.
2. The scope of pedagogy competency standard mentioned in the regulation (Regulation of The Minister of Education and Culture No. 16 Year 2017 and Regulation of the Minister of Education and Culture No. 34 Year 2018) does not yet include some essential principles in the implementation of vocational learning, thus it appears to be the gap between what stated in the regulation and what to expect more in order to address the critical needs.
3. The professional competencies mentioned in accordance with the Regulation of the Minister of Education and Culture No 34 Year 2018 have not included several central things such as vocational knowledge and technical skills of vocational teachers.
4. There is no needs analysis as the preliminary analysis whether by the government or training organizer prior to the implementation of the training programs. The mapping of the state of vocational teachers still have not been done by the government nor training organizer.
5. There is no instruments of teacher performance evaluation based on competency standard of vocational teacher.
6. The implementation of vocational teacher training is still based on the results of the teacher competency test. However, *TCT* results could not yet be used to map the teachers' competency needs.
7. The reference implementation of vocational teacher training is

based on Education Database data. Education Database, the national primary database center, is not able to provide specificities regarding to the needs for vocational teacher competency training.

8. The policy on vocational teachers is associated with the term "teacher learner." In the implementation of vocational teacher training, all teachers were given ten modules in a training package in a limited time allocation.
9. The needs for improving the professionalism of vocational teachers through educational and training program not be tailored with the competency needs of vocational teachers.
10. The limited time of the training is considered very brief as participants are required to learn and master all of the teacher competencies

It can be concluded that teacher quality development program through training policy must have a systematic design and planning based on the teachers' competency needs by the government or training organizer. Needs analysis will help the government or training organizer to make right decision in financial planning program. Successful implementations of training and development programs depend on selecting the right people under the right conditions.

C. Research Focus

Vocational Education in this study focuses on the expertise education in secondary education that is called '*Pendidikan Kejuruan*' in Indonesian language. Vocational high schools referred in this study are vocational high schools in the secondary education level or '*Sekolah Menengah Kejuruan (SMK)*'.

Vocational teachers referred in this study are productive teachers with ICT expertise in computer and network engineering who teach in the Vocational High Schools, or '*Guru Produktif Kompetensi Keahlian TKJ'*. In this study, the researcher has conducted a training needs analysis for determining competency needs of VHS teachers in pedagogy, professional, vocational, and technological aspects. Furthermore, the results of competency needs will used to identify competency gaps and training priority order. The results are recommendations regarding training methods and training organizers based on competency needs.

D. Formulations of the Problem

The focus of research is to describe how the training needs analysis describes the competency needs of VHS teachers and how the results of the needs analysis can be used to make recommendations regarding the needs of training methods, and the organizers. Some of the problems are formulated as follows.

1. What is the situation and condition of vocational teacher in vocational high school in Bali Province for ICT subject field in computer and networking engineering expertise competency?
2. What is the criterion competency of vocational high school teachers?
3. What is the description of the actual competency performance of vocational high school teachers?
4. What is the competency gaps between ideal competency versus actual competency of vocational high school teachers?
5. What is the recommendation regarding training methods and organizers based on the competency needs analysis for vocational high school teachers?

E. Research Objectives

Based on the research questions, the end of this study are resulting:

1. the situation and condition vocational teacher in vocational high school in Bali Province for Technology Information and Communication expertise program,
2. the criterion competency as the ideal performance of vocational teachers,
3. the actual performance as the competency performance of vocational high school teachers in the current condition,
4. the competency gaps between the ideal versus the actual performance of vocational high school teachers, and
5. the recommendations regarding to training methods and organizers based on the needs analysis results. The recommendations can be one of the considerations for Vocational Education Development Centers (VEDCs or *P4TK*) to develop continuing training programs for vocational high school teachers.

F. Significances of the Research

This research is expected to give both theoretical and practical advantages to the Indonesian education system, especially for vocational education.

1. Theoretically, it is expected to contribute to the references in the scientific assessment of the various studies related to needs analysis of vocational high school teachers' competency in order to improve their competency.
2. Practically, some parties are expected to be benefited in terms of the followings.
    a. For VHS teachers, the results of this study can be used as a reference in improving their pedagogy and professional competency continuously and sustainably.
    b. For the involved schools, competent teachers who can make effective learning process are expected to increase, so that the quality of the outputs and outcomes of graduates could compete in the world of work or entrepreneurship and be able to achieve their best careers.
    c. For the government (Department of Education and Culture), the results of this research can be a consideration for planning teacher training programs.
    d. For teacher training institutions, the results of this research can be used as a reference in the selection and the education of instructors or assistants in training programs tailored to meet the needs of materials and practitioners of vocational high school teachers especially in the field of information and communication technology.
    e. For Vocational Education and Development Centers (VEDCs) or *P4TK* as training organizers, the results of this research can be used as a preliminary analysis for choosing contents and themes of continuing training programs tailored to the competency needs of vocational high school teachers
    f. The results of this research are expected to be one of the references for further research related to the development of teacher competency and teaching quality for vocational high school teachers.

CHAPTER II

LITERATURE REVIEW

A. Theoretical Review

1. The Concept of Vocational

The term vocation was heavily tied to its cognate source "vocare" means "calling" or "to call" (David, 1991; Gregg, 2006). Heavily influenced by Martin Luther's use of "*Beruf*" means a calling, vocation came to be seen as that particular task or "calling" for doing something which give value in life (Homan, 1966). Vocation idiomatically as referring to "the type of work one does or the occupation pursues in earning livelihood". The concept of vocation as quest for authentic existence is supported by the existentialist tradition of Heidegger in (Homan, 1966). The concept of vocation is the organizing, existential principle of the concept of work.

Conducting vocational is means to explore the subject of adult learning as a basis for employing their skills, craft to produce something base on human necessity in their life. The term "vocational" related with job and work. Implementation of vocational in education provide criteria, skill, and knowledge related with job and specific task or activity related with work (Rehm, 1989). The pedagogy challenge is to develop and create the implementation of vocational education that will take problems such as the meaning and socially constructed nature of work (Rehm, 1989; Gregg, 2006).

2. Philosophy of Vocational Education

The emergence of vocational education in Indonesia can be traced to Dutch colonial rule, when various types of specialist schools were introduced for the lower and middle class Dutch nationals in Indonesia (Yew, 2016). Towards the end of Dutch rule (1942- 1945), there were 88 vocational schools in Indonesia with 13,230 students enrolled (Supriadi, 2002). The historical of vocational education is considered as playing a key role in stimulating growth and restoring economic competitiveness and

the future employment and work-related qualities became the main concern of vocational education (Commission of the European Communities, 1993, p. 117). Traditionally, direct preparation for work was the main goal of vocational education (Pavlova, 2009).

Vocational education is the 'provision of materials, activities, and teaching that is designed to prepare people to function, at a specified level, in specific roles in the context of paid employment (Lucas, Claxton & Webster, 2010). The American Vocational Association (Thompson, 1973) stated that vocational education as education designed to develop skills, abilities, understandings, attitudes, work habits, and appreciation needed by works to enter and make progress in employment on useful and productive basis. Then based on (Rojewski, 2009) stated that vocational education is provide education and training service for the workers with mastery in specific skills. (Sudira, 2012) stated that vocational education is senior secondary schools level and the learning outcome is prepare the students ready to enter in the world of work in specific field. UNESCO stated that vocational education is concerned with the acquisition of knowledge and skills for the world of work. The important purpose of vocational education based on Finch & Crunkilton (1979), are: (1) education for continuing live; (2) education to earn the living. According to several of experts definition about vocational education, it can be concluded definition of vocational education is part of the national education system include education and training, both formal and non-formal which aims to identify potential or talents the students, develop and improve their potential talents and be able to adopt and adapt technology and science (up to date knowledge and skills) to become a skills and knowledge so could be used to compete in the world of work.

3. The Theory of Adult Learning

Prior to deepen the meaning of the adult learning, we should need to examine in advance the sense of learning. Because learning is one of the vital human needs in their

endeavor to survive and develop themselves in the life of society and state. Without learning, humans would have difficulty in adjusting to the environment and the demands of life, the lives and livelihoods, which are constantly changing. Uno Hamzah (2012: 138) argues that learning is a process that produces changes in behavior that is done intentionally to acquire the knowledge, skills, and new experiences to a better direction. Furthermore Burton in Syamsu Mappa & Anisah Basleman (1994: 5); Knowles, Hilton & Swason (2005: 12) define *"learning is a change in the individual, due to interaction of that individual and his environment, which fills a need and makes him more capable of dealing adequately with his environment."*

Learning is a change in the individual as a result of interaction with the environment, to meet the needs and make it more able to preserve adequately. This suggests that the behavior in the study is the change, interactions and environment. Knowles, et al (2005:12) states that "*learning is a change in human disposition or capability, which persists over a period of time, and which is not simply ascribable to process of growth."* Learning is a change in the disposition (character) or capability (ability) of human which lasts for long periods of time and not just considers it as the process of growth.

Theories of adult learning is a process that presents a challenge to the concept of intellectual standards, limitations of education conventional standards and theory that restricts education facilities in class. Adult learning is an attempt to find new methods and creating new incentives for learning qualitatively rather than quantitatively. Qualitative method is measurable because participants in the adult learning precisely are aspiring; built not in a rigid, not compromising the authoritative requirements, as well as on conventional education institutions (Lindmen in Knowles et al, 2005: 38).

4. Adult Learning frameworks in Vocational Education

Learning activities in vocational school are often imbedded within various adult learning frameworks. Vocational teachers should have design pedagogy, experiential and situated

learning environment based on industry setting, all of which concomitantly affect their ability. In andragogical and self-directed learning focus on achieve student's competency through vocational education settings (i.e., internship programs, practical work in laboratory, conferences, courses, workshops, etc.). the "where" aspect of self-directed learning (i.e., learning can occur in outside formal vocational education environments through giving small project or homework project). In experiential learning, the learner is active and learners by doing rather than observing. Experience, then, in this framework is closely intertwined with skills performance and not solely with the experience of passively receiving information. Dewey in Roessger (2012) argued that "all principles by themselves are abstract, they become concrete only in the consequences which result from their application". Experiential learning is commonly referred to as "hands-on" experience education, which involves the students in controlled replications of the skills ability, including the manipulation of related instruments and tools. Students are thus given practice opportunities in simulated educational settings, where they are receive teacher's feedback and experience the industry environmental, perceptional sensations, and positive response to improve their skills ability.

The situated learning framework emphasizes the importance of context in understanding adult learning (Lave, 1988; Kang, 2007; Wilson, 1993). In this framework view considers that learning can only understood when considering the practice rather than giving theory conceptual. The situated learning framework has been discussed as a specific guiding framework for formal adult education contexts. Paige and Daley (2009), argue that the situated learning framework can be used more concisely to guide contextually based professional education than experiential learning. Situated learning placing students in real-world environments, where they can perform skills alongside an established expert rather than isolating the skill, however, students also actively take part in activity and are involved in the overall process and community (Roessger, 2012). Fenwick (2000) also argue, details of assumptions situated learning: (a) learning is fundamentally rooted in the

specific situation or environment in which an individual participates, (b) knowledge is not hypothetically stored in the head of the learner as concepts or cognitive frameworks, (c) learning is occasioned by doing and action.

5. Andragogy in Vocational Education

The essential meaning of the concept of andragogy has to do with adults (Forrest & Peterson, 2006; Hase & Kenyon, 2001; M. S. Knowles, 1970; Merriam, 2001; Whitfield, 2011). Andragogy comes from "*andros*", means "man", while "*agein*" means "to lead"; so andragogy means "leading men," which can be paraphrased as "leading adults" (M. S. Knowles, 1970) . The Andragogy is obsolete with adult education learning and practicing in some way or another situation context of learning. It is commonly related with adult pedagogy principles under the name of andragogy from the 1970s (Loeng, 2018). Andragogy as the art and science of helping adults learn, in contrast to pedagogy as the art and science of teaching children (M. S. Knowles, 1970). Pedagogy covered child and youth education. Andragogy can be defined as an strategy approach in teaching and learning activity of education for adults. This approach is aimed at enabling learners to become aware that they should be the initiator of their own thinking of the needs of learning (Loeng, 2018).

In vocational education system requires vocational teacher and students to learn more independently to expertise their skills which is called self-directed learning. Vocational teacher have to andragogy knowledge because VHS is kind of adult education is an attempt to discover a new teaching method in vocational learning setting and create a new strategy approach for learning activity (M. S. Knowles, 1978). The needs of learning and work learning comes from their needs to be readiness in the workplace and for their career orientation. This statement argued by (Loeng, 2017), he stated andragogy was essentially about self-knowledge and include in vocational education. He claimed that, in vocational education, character formation was superior to practical occupational skills and the development of outer, objective skills must not take place independently of the inner formation of human character.

The concept of andragogy is suitable for the implementation in vocational education in VHSs in Indonesia. Several reasons, described by (Knowles, 1980), he explained andragogy in vocational education with a set of assumptions and recommendations concerning planning, directing, guiding, teaching and evaluating adults' learning. Several assumptions as learners mature as follows:

1. Vocational teacher and learner in VHSs have self-concept moves from one of being a dependent personality towards being a self-directed human being;
2. Vocational teacher and learner accumulate a growing reservoir of experience that becomes an increasingly rich resource for learning; and
3. Vocational teacher and learner readiness to learn and practice becomes oriented increasingly towards the developmental changes in workplace roles.

The concept of andragogy is the best concept for the implementation of vocational education. Pedagogy only lies in the way of teaching while andragogy lies in the creativity and innovation of teachers and students for solving the problems in reality case. For example: in vocational subject interest namely "network setting and installation":

1. The concept of the pedagogy: the teacher gives instructions in the form of a demonstration of the process and stages in a structured manner according to industry standards the way to install the network until the network installation is run well.
2. The concept of andragogy: lies in critical thinking when problems in network settings arise. For example there are trouble networks where the network cannot run in accordance with the network design that has been made. In order to solve this problem, students are required to be able to solve this problem with the power of creativity and critical thinking about the causes of the problem and how to solve this problem.

Kearns in (Darwin, 2015) further identifies the four sustaining foundations in vocational education practice as being: (1) learning to learn skills based on industry needs; (2) motivation and desire for learning; (3) confidence to keep learning throughout life and (4) personal mastery. All the practice need andragogy concept for practicing and teaching. The difference in assumptions between Pedagogy and Andragogy is described as follows:

Table 1: The Assumptions of Pedagogy and Andragogy

Regarding	Andragogy	Pedagogy
Concept of the learner	The process of maturation for a person to move from dependency toward increasing self-directedness. a. The vocational teachers have a responsibility to encourage and nurture this movement. b. Learners have a deep psychological need to be a generally self-directing, although dependent in particular temporary situations	The role of the learner is, by definition, a dependent one. The teacher is expected by society to take full responsibility for determining what is to be learned, when it is to be learned, how it is to be learned, and if it has been learned
Readiness to learn	Learning programs should be organized around life-application categories and sequenced according to the learners' readiness to learn. a. Vocational teacher has a responsibility to create conditions learning environment and provide tools	Learners are ready to learn whatever society (especially the school) says they ought to learn, provided the pressures on them (like fear of failure) are great enough. Most

	and procedures for helping learners discover their "needs to know." b. Learner have to ready to learn something when they experience a need to learn it in order to cope more satisfyingly with real-life tasks or problems	learners of the same age are ready to learn the same things. Therefore, learning should be organized into a fairly standardized curriculum, with a uniform step-by-step progression for all learners.
Orientation to learning and practicing	Learning experiences should be organized around competency-development categories. Learner and vocational teacher are performance-centered in their orientation to learning. a. Vocational teacher have to more practicing skills ability rather than theory delivery in classroom. b. Learners see vocational education as a process of developing increased competence to achieve their full potential in life. Learners want to be able to apply whatever knowledge and skill they gain	Learners see vocational education as a process of acquiring subject-matter content, most of which they understand will be useful only at a later time in life. Accordingly, the curriculum should be organized into subject matters units (e.g., job sheet, syllabus, courses) which follow the logic of the subject (e.g., the structural content from easy to difficult or from

	today for getting job and their career life.	simple to complex learning material). Learners are subject-centered in their orientation to learning.
Role of learners' experience	a. Vocational teacher should have variety teaching strategy in vocational education such as: experiential learning techniques (practicing skills in laboratory/workshop, discussion, problem-solving cases, simulation exercise) b. Learners grow and develop they accumulate an increasing reservoir of experience that becomes an increasingly rich resource for learning. Learners attach more meaning to learnings they gain from experience than those they acquire passively.	The experience learners bring to a learning situation is of little worth. It may be used as a starting point, but the experience from which learners will gain the most is that of the vocational teacher, the textbook writer, the audiovisual. Vocational teacher only give transmittal techniques such as lecture assigned reading, presentations.

Source: (M. S. Knowles, 1970)

6. The Professional of Vocational Teacher in VHS

We also know that the success of our vocational programs depends upon the right kind of teachers in possession of the right of occupational competence (Panitz, 1975). The professional of vocational teachers is based on three levels of expertise : the mastery of subject knowledge, knowing how to teach this knowledge and knowing the teacher's role in the educational system (Bekale Nze & Ginestié, 2011). Vocational teacher in Vocational high school consists of two parts: instructional in vocational theory and practical training or practical work (Varga, 2000). Mastery of subject knowledge is divided into mastery to the concept of mastery, related with concept, structure and theory of the concept and mastery to the vocational teaching subject, related with expertise with practical teaching subject. Mastery of subject knowledge is about having knowledge relating to the reference areas for the discipline field. Knowledge about the teachers profession, knowledge about didactic transposition which links each area of taught knowledge to its epistemological reference.

Mastery of subject knowledge is not only about the mastery of concept of the content but the most important think is knowledge about vocational subject including, teachers have to know about working knowledge, mastery and expertise in technical skills related with vocational teaching subject (Andersson & Köpsén, 2017). Mastery about how to teach knowledge, handling the teaching of this subject knowledge relies upon several different kinds of skills, such as teaching strategy (choosing how to adapt the most proper method for students according to the available resources), create the learning media/teaching scenario (organize tasks given to students and how to deliver the content into practice with regard to the knowledge that is to be taught), choose the interaction and communication with students in the classroom (structuring and organizing teaching scenarios until learning is as effective as possible). Mastery about a teacher's role in the educational system states about social role's teachers to the act of teaching students in classroom, including guidance, supervising the students, active participation in the professional community and

active to follow several training, seminar to integrate teaching skills.

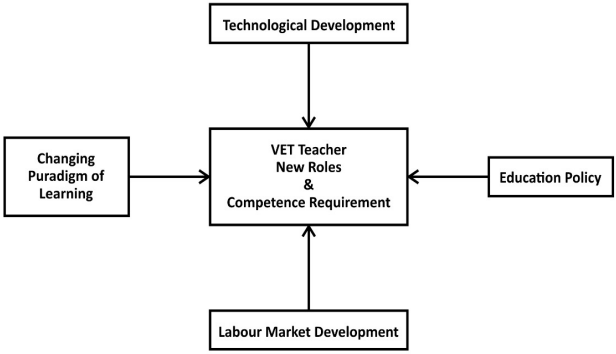

Figure 1: Factors Causes The Changes of Vocational Teachers Competency

a. Vocational Teachers Competencies Standard

Competencies standard of vocational teachers is understood as normative or evaluative based on which of the actions of teachers as professionals are appraised in determining their performance. Vocational teachers competency standard is a prerequisite to effective teaching and learning because its relationship to students learning outcomes (V. Education, Tun, Onn, & Pahat, 2017). The most important task of vocational teachers is to enable the teachers to prepare their students for the modern society and world of work not only for today but also for tomorrow. Hence, they need to relate teaching and learning to this world of work contextual. Teachers now need to teach higher-order thinking skills and use a learner-centered constructivist approach which necessitates changing the mindset of teachers and adding skills such as ability in use and utilizing technology and sustainable development to their repertoire (Manley & Zinser, 2012).

Vocational teachers criterion competency is divided into four major components: (1) pedagogy-andragogy competency; (2) professional competency; (3) vocational competency; (4) technology competency. Vocational teacher must be knowledgeable in the objectives of education, subject content,

utilizing ICT, teaching strategies and assessment. By mastering knowledge and understanding, teachers can build confidence and improve performance of professional duties to maintain effectiveness. The implementation of knowledge and understanding of the standard will ensure the professional quality of teachers remains at a high level and stays relevant to developments in education. Adoption technology competency (mastery in use and utilize ICT) in vocational education as one of the main levers for the enhancement of the vocational teachers professional (Köhler, 2017).

7. Needs Analysis

a. Needs Analysis Concept and Definition

Needs is a gap between existing conditions and the ideal or optimal condition or desired condition (Borg & Gall, 2007). Needs is different with desires and expectations, expectations is not kind of needs. Its statement supported with Rosset (1987) states that Needs analysis as systematic study of a problem or innovation, incorporating data and opinions from varied sources, in order to make effective decisions or recommendations about should happen next. The same statement also stated by Watkins (2007), needs are simply the differences between your current achievements you're your desired accomplishments.

8. Competencies Needs Analysis

Competencies needs analysis is the most fundamental requirements for planning the training program. If the program does not meet participant's needs, the results of evaluating might be disastrous (*Kirkpatrick, L & Kirkpatrick, D*, 2007). 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, attitudes required for conduct teaching and learning in a classroom action that should be possessed by teachers as a form of professional teacher. A competency of vocational teacher is linked to action and has to be identified as teaching standard by government. Government

and education sector department are the best party to identify the competencies required for the teaching quality of vocational teacher.

The information that competencies needs collected involves identifying what are 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 needs usually involves three kinds of element as the parties that involved in vocational education development program. Three parties include: (1) industry; (2) government; (3) teachers.

9. Training Needs Analysis (TNA)
   a. Definition of TNA

      Planning is the first step of the training management cycle. At the planning stage, the steps are divided into two: (1) conducting training needs analysis and (2) conducting training planning. So training needs is the first step before conduct planning of training program. TNA is the method for determining training needs of organization or school management.

      TNA is the method of determining what training is required to fill the gap and what training needs exist so that training can be developed to help the organization accomplish its objective (Brown, 2002). While Barbazette (2006) said more simply, TNA is the process of collecting information about an expressed or implied organizational need that could be met by conducting training. This statement also stated by Sorenson (2002), TNA determines the needs for training, identifies what training is needed, and examines the type and scope of resources needed to support a training program.

      From several definitions of TNA, It can be concluded that TNA is method to analyze the gaps through describe and analyze of existing condition vs. desired objectives and outcomes in organization, determining training needs, what training is required to fill the gap so the organization have clear understanding of the problem and must consider the

best solution. Following given an analogy of the need an organization.

10. Fuzzy Delphi Technique

Delphi technique is based on respondent's views. In this technique, verbal expressions are used to measure views. Verbal expression have limitations to reflect fully respondent's mental latencies. For example, the phrase "importance" for A who is a stringent person is different with phrase "high" for B (Habibi & Sarafrazi, 2015). if a crisp number were used to quantify both individual's views, the result would have been skewed. In other words, although the expert's competence and mental abilities are used for decision-making, the quantification of experts' opinions cannot completely reflect the human thinking style. (Wu & Fang, 2011) also stated related with the problems of the conventional Delphi method are that opinions from the experts might not easily satisfy the standard of convergence; the survey would often need to be repeated several times until the acceptable standard is achieved, which might result in high expense of the capital and time; and with the decrease of response rate.

11. Analytic Hierarchy Process

The Analytic Hierarchy Process (AHP) introduced by Thomas L. Saaty in 1977 (Lin & Chuang, 2012) as a robust and flexible technique for supporting priority setting and improving decision-making (Luu, 2018). AHP fundamentally works by developing priorities for multi-criteria evaluated by decision-maker (DMs), stakeholders or experts who are involved in the decision priority-making process in a given field (Dewan in Luu, 2018). The pairwise judgement scoring is based on the rule of (Saaty, 1987) with 9-point scale from 1 to 9. The AHP is performed in this study using three main steps (Horng & Lin, 2013; Krejˇ, 2017; Luu, 2018):

a. Construct a hierarchical decision priority model
b. Develop a paired comparison matrix for criteria or sub-criteria of the decision priority models as in Eq.

(1) based on expert's judgement and reciprocal judgement axiom

c. Obtain the relative importance or weights of criteria (competency/domain) and sub-criteria (sub-competency/sub-domain)

12. Vocational Teachers Performance Evaluation with 360-Degree Rater

Vocational teachers assessment plays an increasing role in the case of teacher's teaching and learning. The primary methods of evaluation competences are as follows: (1) evaluation on working ability (McClelland, 1973). This evaluation is based on a complete picture of the teachers, which should be seen from multiple perspectives, like the vocational teachers ability and skill in pedagogy-andragogy, professional, vocational and technological competencies. (Grant in Shyan & Lin, 2013) proposed that when assessing competency-based training needs, gap analysis involves comparing performance with stated intended competencies by self-rate, peer-rate, supervisor-rate and subordinate-rate.

This study employed 360-degree rater to evaluate vocational teacher's competencies in pedagogy-andragogy, professional, vocational and technological competencies. Four evaluation form were developed based on vocational teachers competencies standard (standard competency standard of vocational teachers) to evaluate pedagogy-andragogy, professional, vocational and technological vocational teacher's competencies including self-rate, peer-rate, subordinate-rate, supervisor-rate. Each item will rated on a scale ranging from one to seven. The combined results of the four rater demonstrated the vocational teacher's evaluation in each competency. The scores from each rater will combined and weighted to produce an evaluation score for each teacher. In the previous studies and related literature did not suggest the most appropriate weighting for each rater, so each rater, based on the focus group discussion with academics expert and vocational school principal was assigned a weighting reflecting vocational teachers evaluation consideration. The weighting of supervisor-rate 25%, the peer-rate 30%, self-rate 15%, and subordinate-rate was 25%.

13. Importance Performance Analysis

The concept of IPA was introduced in 1977 by Martilla and James. Essentially, the idea of IPA comes from the expectation on important competency criteria and the judgement of actual performance. Thus, IPA focuses on the gap between importance competency and the actual competency or vocational teachers performance in existing conditions.

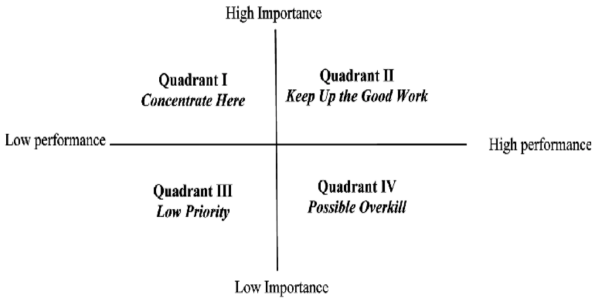

Figure 2: The Original IPA Framework
Source: Martilla and James (1977)

B. Conceptual Framework

In this study will propose training needs analysis as a method for determine competencies needs of vocational teachers. TNA is process of collecting data for describe what competencies needs for training program planning and implementation. There are three stages in TNA: (1) task analysis; (2) individual analysis; (3) organizational analysis.

In this study will proposed mixed method as research methodology. The first order in this study uses qualitative methods and the second order in this study uses quantitative methods. The combination of the two methods of data is continuously, the results of the first phase of the study (the results of qualitative research) will used as a continuity process with the second stage (quantitative research). With the combination of qualitative and quantitative methods, variations in the combination method emerged. Qualitative methods is used for determine the competency standard. Quantitative methods is used for determine the importance competency and the actual competency.

The goals of this research are: (1) describe the standard competencies of vocational teacher for computer and informatics Engineering subject field in network engineering expertise program; (2) determine the importance competency; (3) determine the actual competency of vocational teacher; (4) describe the gaps between importance competencies and actual competencies; (5) determine training priority order based on competencies gaps and; (6) describe the recommendation regarding with method of training program, the organizer of training program based on training needs of vocational teacher for computer and Informatics Engineering subject field. Based on the explanation above, following given the conceptual framework which shows the series of action the researcher intends carrying out in a research study. Conceptual framework will define the concepts within the problem of the study (Adom, Hussein, & Joe, 2018).

Figure 3: Conceptual Framework

CHAPTER III
RESEARCH METHOD

A. Research Approach

This study using a mixed method. Mixed method is a research method that combines qualitative and quantitative methods to be used together in a research, so as data obtained is more comprehensive, valid, reliable and objective (J. Creswell & Pioano Clark, 2007; J. Creswell & Plano Clark, 2011; J. W. Creswell, 2014). The variation of the mixed method used in this study is a multiphase combination. According to (J. Creswell & Plano Clark, 2011; J. W. Creswell, 2014; Almalki, 2016) stated multiphase combination in mixed methods research, it involves a first phase of qualitative data collection and analysis as the first qualitative phase and followed by quantitative data collection and analysis as the second phase and the ends of phase using qualitative analysis to make interpretation regarded the results in second phase.

The function using mixed methodology in this research is elaboration and purpose, which is for providing richness and detail of competency criterion of vocational teacher in domain competency and sub-domain competency. Elaboration is the one of the function of using mixed method, which more specifically and clearly criteria analysis (Greene, Caracelli, & Graham, 1989).

The first order in this study uses qualitative methods and the second order in this study uses quantitative methods, and the third order uses qualitative methods. In qualitative method will using complimentary and expansion analysis design. Complimentary and expansion normally called replication extension analysis design in qualitative method. In qualitative research will conduct determining of criterion competency of vocational teacher by using complementary and expansion design analysis namely replication existence (Greene et al., 1989; Madey, 2008). The researcher conduct determining criterion competency of vocational teachers by seeks elaboration, increase interpretability, comprehensive

clarification, increase the detail of criteria competency, seeks to extend the breadth and in-depth range of criterion competency using several source of method (literature study analysis, FGD and interviewing) . The criterion competency in this study still refers to the existing literature review and ministerial regulations by providing additions and comprehensive analysis related to the competence of teachers in vocational education. By using replication existence, will resulted the framework of criterion competency which more enrich and provide depth comprehensive and detail of domain and sub-domain criterion competency of vocational teacher.

In quantitative method will using needs analysis with FDM for screening the importance criterion competency and AHP for calculate the importance of criterion competency. With the combination of qualitative and quantitative methods, variations in the combination method emerged (Byrne & Humble, 2007). The methods characteristic of mixed method represents the degree to which the qualitative and quantitative methods selected for a given study are similar to or different from one another in form (Campbell & Fiske in Greene et al., 1989). Variation of the combination method in this study were given the same degree between the first phase (qualitative research), the second phase (quantitative research).

The results by using mixed method in this study is "no integration", both analyses and interpretation will conducted separately (Greene et al., 1989); the combination of the two methods of data is continuously, the results of the first phase of the study (the results of qualitative research) will used as a continuity process with the second stage (quantitative research).

The steps of this research will follow each stages in Training Needs Analysis using qualitative and quantitative method. Following the explanation of each steps in this research:

1. First Step → qualitative method
   How to determine the criterion competency?: this step will conduct identifying, analysing, determining criterion competencies of vocational teacher in computer and informatics engineering. criterion competencies is

knowledge and skills related on teaching and learning of vocational teacher. The researcher start to conduct qualitative analysis through reviewing and analysing several competencies of vocational teacher in another country, and the result is draft of standard competencies standard of vocational teachers. Continued with conduct draft validation with expert judgment through FGD. The expert judgment includes: (1) Academic expert from institutions; (2) Headmaster of vocational high school; (3) Vocational teachers; and (4) Industry expert. The result of first step is criterion competency of vocational teacher

2. Second step → quantitative method
   How to determine the importance competencies aspect and domain or what should be of vocational teachers do in teaching and learning activity?: evaluate the importance using AHP as method to evaluate importance competency. Evaluate the importance of vocational teacher will conduct using AHP questionnaire (pairwise comparison method). The result of the second step is importance competency of vocational teacher.
3. Third step → quantitative method
   how to describe the actual performance of vocational teacher?: evaluate actual or existing competency evaluation of vocational teacher using evaluation performance 360 degree-rater as method for evaluates the vocational teachers competency. In this step will conduct using evaluation instrument. The result of this step is the actual evaluation competency of vocational teacher.
4. Fourth step → quantitative method
   evaluate and analyze competency gaps between importance competency and actual competency through IPA diagram. The result of fourth step is gaps or deficiency or discrepancy of teachers competencies.
5. Fifth step → quantitative method
   Not all gaps that resulted on steps before are overcome by develop training program. Training could only overcome gaps, which are caused by behavioral factors such as lack of knowledge, skills and attitude. It is necessary to set a

training priority order based on IPA diagram. The result of fifth step is training priority order.

6. Sixth step → qualitative method
make the recommendation regarding training method, training material, training organizer.

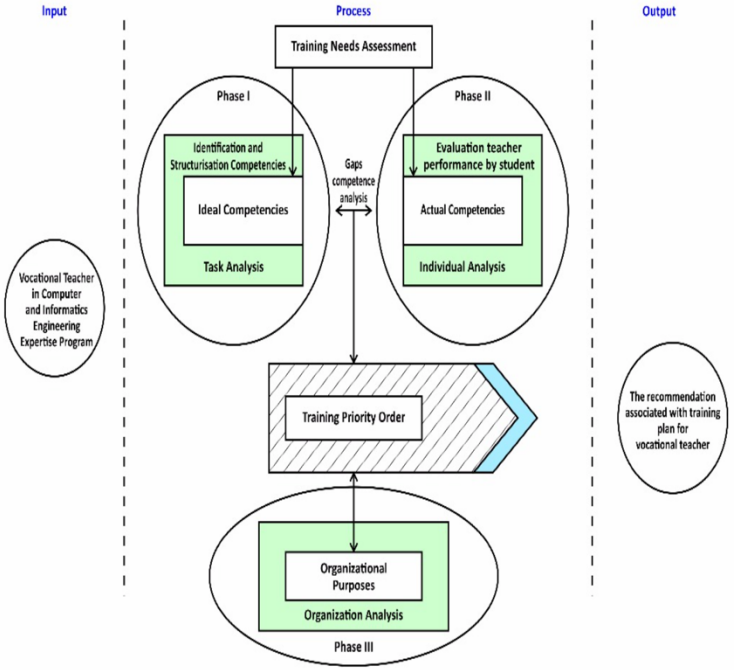

Figure 4: Research Phase

CHAPTER IV
FINDINGS AND DISCUSSION

A. Findings

1. The Criterion Competencies of Vocational Teachers

Vocational high school teachers should have pedagogy-andragogy knowledge and skills, professionalism related to their teaching competence in delivering the vocational subject, vocational knowledge and skills, and capability in utilizing technology in their job and life for conducting incremental improvement and continuous professional development (Arifin, Rasdi, Anuar & Omar, 2018; Juhásová, 2014; Lucas, Spencer & Claxton, 2012; Nessipbayeva, 1987). The competency framework of vocational teachers propose four aspects, such as pedagogy-andragogy, professional, vocational and technological competency. Each aspect will include several domains and each domain is divided into sub-domains. Pedagogy-andragogy competency aspect includes 13 domain areas and 34 sub-domain criteria. Besides, Professional competency aspect includes 3 domain areas and 7 sub-domain criteria, while vocational competency aspect includes 3 domain areas and 8 sub-domain criteria, Lastly, technological competency aspect includes 4 domain areas.

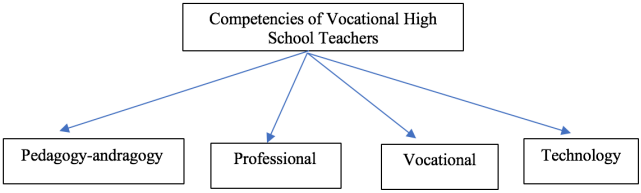

Figure 5: The Initial Construct of Vocational Teacher Competencies

Based on the literature review, the initial domains and sub-domains for this study are illustrated in Figure 16. For this purpose, the competency framework of vocational teachers are presented as follows. They include (1) pedagogy-andragogy

competency, (2) professional competency, (3) vocational competency, (4) technological competency.

a. Fuzzy Delphi

After studying the opinions collected through the focus group discussion for the adjustment of the domain and sub-domain competence framework of vocational teachers, the domain and sub-domain items are screened using a Fuzzy Delphi technique. With Fuzzy Delphi technique, the repeating time for the survey can be reduced, and thus the time and capital used can be decreased. In the Fuzzy Delphi algorithm for screening, an appropriate fuzzy spectrum should be developed first for the triangular fuzzy number and the fuzzification of respondent's linguistic expressions. Fuzzy Delphi will screen the criteria in domain and sub-domain competence hierarchy. The competence hierarchy in this study proposes four aspects including:

1) Pedagogy-andragogy aspect with 13 domains and 44 sub-domains
2) Professional aspect with 3 domains and 7 sub-domains
3) Vocational aspect with 3 domains and 9 sub-domains
4) Technological aspect with 4 domains

Table 2 . The Criterion Competencies of Vocational Teachers

Aspect	Domain	Sub-Domain
Level 1	Level 2	Level 3
Pedagogy-andragogy	Student's characteristics	Student's learning style
		Student's vocational character

		Student's characteristic in the cognitive, physical, emotional, social, and attitude contexts
	Learning principles in vocational education	Mastery in learning principles of vocational education
		Implementation of learning principles of vocational education
		Demonstration and repetition of teaching skills
		Cues, objectives, and related questions
	Curriculum based on industry	Development learning media (*perangkat pembelajaran*) based on industry
		Teaching material selection and structure
		Design of evaluation and assessment

	Learning environment	Industrial environment in learning and practical work activity
		A productive and effective learning experience
	Teaching, learning, and training implementation	Effective and efficient teaching and learning
		Productive practical work
		Safety standard in laboratory
		A situational and transactional decision in teaching, learning, and training activity
		Resources and instructional learning media
	Guidance and supervision of internship program	Internship program arrangement
		Internship program management
		Internship program evaluation

	Facilitation of student's potential development	Development of student's creativity
		Development of student's confidence
		Support and motivation for students
	Communication	Communication strategy
		Effective and emphatic communication
	Evaluation and assessment	Pretest for analyzing the student's prior knowledge
		Development and validation of test instrument
		Evaluation and assessment technique
		Analysis and utilization of the student's learning result s
	Reflective actions	Reflection on the learning process
		Improvement of learning activity
	Administration	Administration of learning and training activity

		Administration of student's learning progress
Professional	Content knowledge	Mastery in the major concepts of vocational subjects
		Mastery in content structure
	Application of contents	Development of oriented, connected and integrated content with industry context
		Development in industry and relevance to the content
	Continuous self-development	Continuous reflection on performance
		Willingness to develop own specialization area
		Improvement in teacher professionalism by utilizing the results of reflection
Vocational		Working knowledge
		Technical skills

	Vocational knowledge and skills	Job and career development counseling
	Entrepreneurship	Management production-based learning
		Integrated enterprise in the learning activity
	Networking and collaboration	External link with industry
		Working community competence
		Collaboration with internal school
Technological	ICT for learning instruction	
	ICT for communication	
	ICT for evaluation and assessment	
	ICT for self-development	

1. The Importance of Vocational teachers' Competencies

This research employs the Analytic Hierarchy Process (AHP) to identify the importance of each domain in the aspects of vocational teachers' competencies. The analysis results reveal that the four aspects to be listed from the most to the least important are: pedagogy-andragogy competence (0.466), vocational competence (0.300), professional competence (0.172), and technological competence (0.063). Pedagogy-andragogy competence is the key in teaching and learning in vocational education.

Table 3. Weight Distribution Competencies of Vocational Teachers

Aspect	Weight	Ranking
Pedagogy-andragogy	0.466	1
Vocational	0.300	2
Professional	0.172	3
Technological	0.063	4

Experts conclude that the pedagogy-andragogy aspect is the most important competence for vocational teachers. Pedagogy-andragogy 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 is 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.

2. Competency Gap Analysis using Importance–Performance Analysis

The importance-performance analysis will be used to explore vocational teachers' competency gap for the purposes of TNA. The competency has been determined by using the analytic hierarchy process and those obtained from four inventory evaluators are analyzed using importance–performance analysis (IPA). The average performance score of each competency is 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 are set as a benchmark, with scores exceeding the benchmark being considered important while those below being considered less important. The competencies above the benchmark is rated important while those below is considered in need of improvement and incorporated into the training needs of vocational teachers.

Table 56. Importance – Performance Analysis Result Evaluation

Competency Domain	Importance	Performance
Pedagogy-andragogy 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
Con 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

With the above importance and performance scores, IPA is used to explore the vocational teachers' competency gap. Figure 17 depicts the result. The competencies with high importance but low performance score clearly reveals that the vocational teachers' competency gap lies in domain "entrepreneurship", "continuous self-development", "networking and collaboration", "content knowledge", "application of content", and "vocational knowledge and skills". Based on Figure 17, the result of IPA is divided into four quadrants:

a. "*Keep up the good work*" in quadrant I: the competency domains placed in this quadrant have high importance and high performance. It indicates that vocational teachers have good professionalism in the competencies and show good performances. The competencies in quadrant IV are competencies related to the utilization of ICT for learning instruction.
b. "*Possible overkill*" in quadrant II: the competency domains placed in this quadrant have low importance and high performance. It suggests that vocational

teachers master and implement the competencies well. Competencies in quadrant II are: (1) communication; (2) ICT for communication; (3) ICT for evaluation and assessment; (4) reflective actions; (5) facilitation of student's potential development; (6) student's characteristic identification; and (7) administration.

c. "*Low priority*" in quadrant III: the competency domains placed in this quadrant have low importance and low performance. Even though the competency domains have low importance, efforts to improve the competencies through the training program for vocational teachers are emphasized. The competency domains also influence the teaching quality of vocational teachers. Competency domains in quadrant III include: (1) industry-based curriculum; (2) evaluation and assessment; (3) industrial environment in learning and practical work activity; (4) guidance and supervision of internship program; (5) mastery in learning principles in vocational education; (6) teaching, learning, and training implementation ; and (7) ICT for self-development.
d. "*Concentrate here*" in quadrant IV: the competencies in this quadrant have high importance but low performance. This quadrant has become the focus of improvement plan and implementation through training programs. To be a professional teacher, vocational teachers should have the competencies in this quadrant to improve the teaching quality. Most of the competency domains in this quadrant come from professional and vocational aspects. Competencies domain in quadrant IV include: (1) entrepreneurship; (2) continuous self-development; (3) networking and collaboration; (3) content knowledge; (4) application of content; (5) vocational knowledge and skills; and (6) continuous self-development.

IPA is used to explore vocational teachers' competency gap. Figure below shows the result. The competencies with high importance but low performance score clearly reveals that the vocational teachers' competency gap lies 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" has the lowest performance in this study.

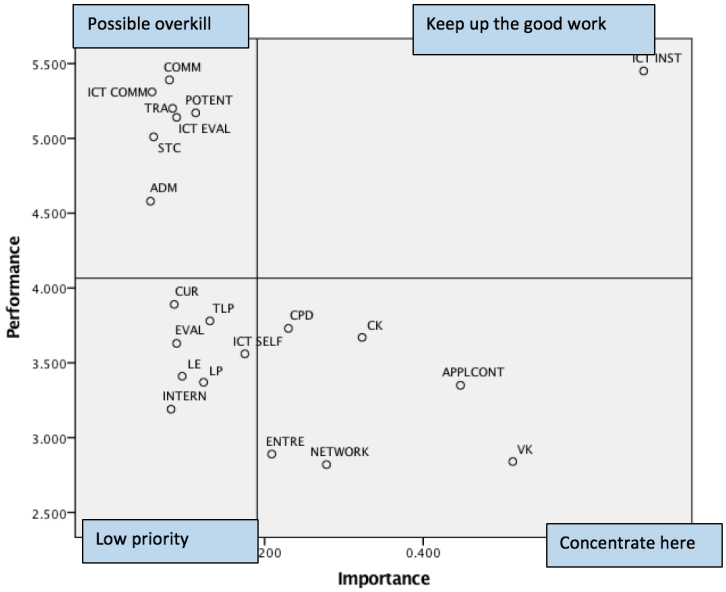

Figure 6. Competency Gaps Analysis of Vocational Teachers

1. Training Priority Order

The determination of training priority order (TPO) is based on the importance–performance analysis (IPA) results. Training needs for vocational teachers are focused on quadrant IV (concentrate here) and quadrant III (low priority). The important competencies with lower-than-average performance scores are considered in need of improvement and are incorporated into the training needs of vocational teachers' competency improvement.

A. First Order Training Priority in quadrant IV (Concentrate Here)

Areas with competency gaps in quadrant "concentrate here" is the first priority in vocational teachers' training needs, the second priority is quadrant "low priority", the third priority is areas in quadrant "possible overkill", and the lowest priority is the area marked with "keep up the good work".

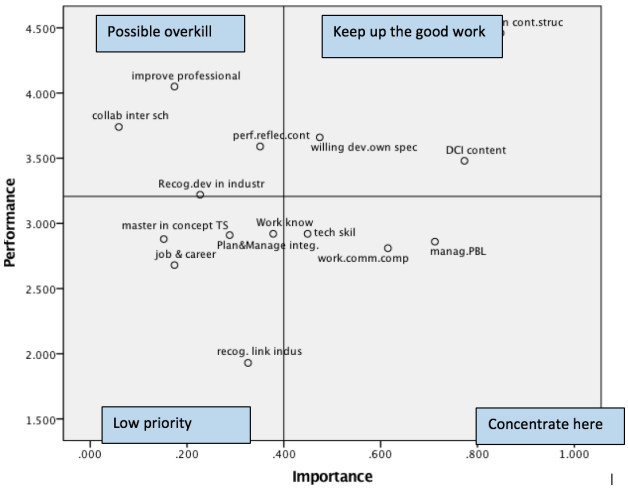

Figure 7. IPA Diagram in Quadrant IV (Concentrate Here)

The details of the first priority training needs to improve vocational teachers' competencies are as follows: (1) production based learning management, (2) working community competence, and (3) technical skills. The second priority training needs are: (1) external link with industry, (2) working knowledge, (3) integrated enterprise in learning activity, (4) mastery in the major concept of vocational subject, and (5) job and career development counselling. The third priority training needs include: (1) mastery in content structure; (2) willingness to develop own specialization area; (3) development of oriented, connected, and integrated content with industry context; and (4) development in industry and relevance to the content. The lowest priority or the fourth priority training needs cover: (1) continuous reflection on performance, (2) improvement in teacher professionalism by utilizing the results of reflection, and (3) collaboration with internal school.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

Concerning the research data and findings, seven conclusions can be drawn as follows:

1. The teacher characteristics in the vocational secondary schools in Bali Province are:
   a. The number of adaptive and normative teachers is higher than that of the productive teachers, especially in the Computer and Network Engineering program. Mostly, the productive teachers from the ICT program have to teach the students of Multimedia program. Consequently, the number of vocational teachers in Computer and Network Engineering program is considered low. To overcome this problem, the government has issued dual expertise policies.
   b. Dual expertise vocational teachers mostly come from non-ICT academic background. The government policy creates a problem related to teachers' vocational knowledge and skills. They do not master vocational subjects and do not have skills related to occupations. Dual expertise teachers are allowed to teach in Computer and Network Engineering program if they have joined one-month training, although it is impossible for mastering all knowledge of Computer and Network Engineering area only in a month. In its implementation, the dual expertise policy creates problems in the teaching activities in class or laboratory.
   c. There is a very significant difference in the teacher quality in urban and rural schools. It is caused by several factors: (1) minimum facilities and infrastructures related to the laboratory instruments and equipment; (2) quality of the student input; (3)

limited information access on training program and policy; (4) limited contact with industry partners.

2. The criterion competency of vocational teachers include (1) pedagogy-andragogy aspect; (2) professional aspect; (3) vocational aspect; and (4) technological aspect. In each element, there are several domains. The pedagogy-andragogy domain consists of (1) abilities to identify student characteristics; (2) mastery of learning principles in vocational education; (3) abilities to develop an industry-based curriculum; (4) abilities to implement learning environment; (5) abilities to conduct teaching, learning, and practical work; (6) mastery of guidance and supervision in internship program; (7) abilities to facilitate students' potential development; (8) communication skills; (9) evaluation and assessment skills; (10) abilities to take reflective actions; and (11) administration skills. The domains in the professional aspect include (1) content knowledge mastery; (2) mastery of the application of content; and (3) abilities to conduct continuous self-development. Furthermore, the domain in the vocational aspect covers: (1) vocational knowledge and skills; (2) entrepreneurship skills; and (3) networking and collaboration skills. Next, the domain of the technological aspect includes abilities to use and utilize ICT for learning instruction, evaluation and assessment, communication, and self-development. Each domain also consists of several sub-domains. The detail of sub-domain can be found in Appendix IX.
3. The important competencies of vocational teachers are described as follows.
    a. The most to the least important competency aspects are: (1) pedagogy-andragogy aspect (0.466); (2) vocational aspect (0.300); (3) professional aspect (0.172); and (4) technological aspect (0.063).
    b. The most to the least important domains in the pedagogy-andragogy aspect are: (1) abilities to conduct teaching, learning, and practical work (0.131); (2) mastery of learning principles in

vocational education (0.123); (3) abilities to facilitate students' potential development (0.113); (4) abilities to implement learning environment (0.096); (5) evaluation and assessment skills (0.089); (6) abilities to develop an industry-based curriculum (0.086); (7) abilities to take reflective actions (0.084); (8) mastery of guidance and supervision in an internship program (0.082); (9) communication skills (0.080); (10) abilities to identify student characteristics (0.060); and (11) administration skills (0.056).

c. The most to the least important domains of the vocational aspect include: (1) vocational knowledge and skills (0.513); (2) networking and collaboration skills (0.278); and (3) entrepreneurship skills (0.209).

d. The most to the least important domains of the professional aspect are as follows: mastery in the application of content (0.447); (2) content knowledge mastery (0.323); and (3) abilities to conduct continuous self-development (0.230).

e. The most to the least important domains of the technological aspect comprise abilities to use and utilize ICT for the learning instruction (0.678), continuous professional development (0.175), evaluation and assessment (0.089), and communication (0.058).

4. The actual competency performance of the vocational teachers is described as follows:

a. The three lowest performances of the vocational teachers in the pedagogy-andragogy aspect evaluation are: (1) mastery of guidance and supervision in an internship program (3.19); (2) mastery of learning principles of vocational education (3.37); and (3) abilities to develop an industry-based curriculum (3.41). Whereas, the highest performance in pedagogy-andragogy aspect is communication skills (5.39).

b. The lowest performances of the vocational teachers in the professional aspect are: (1) mastery in describing and explaining the content application (3.35); (2) content knowledge mastery (3.67); and (3) abilities to conduct continuous professionalism development (3.37).
c. The lowest performances of the vocational teachers in the vocational aspect are: (1) networking and collaboration skills (2.82); (2) vocational knowledge and skills (2.84); and (3) entrepreneurship skills (2.89).
d. The lowest performances of the vocational teachers in the technological aspect are abilities to use and utilize ICT for self-development (3.56), evaluation and assessment (5.14); communication (5.31); and learning instruction (5.45).

5. IPA is used to explore the competency gaps of vocational teachers. Examining the competencies with high importance but low performance score clearly reveals that the vocational teachers' competency gaps fall into the vocational knowledge and skills, the application of content, content knowledge, networking and collaboration, continuous professional development, and entrepreneurship. All of the competency gaps are located in Quadrant IV (Concentrate Here).
6. The training priority order based on the competency needs has been described in the IPA diagram in Quadrant IV (Concentrate Here), most of the competency needs are in the vocational and professional aspects. The details of training needs of the vocational teacher competencies in the first priority are: (1) mastery of management production-based learning; (2) working community competence; and (3) technical skills. The second priority of training needs of vocational teachers consists of: (1) abilities to develop external links with industry; (2) working knowledge; (3) planning and management of integrated enterprise in learning activities; (4) mastery of the

major concept of vocational subjects; and (5) job and career development counseling skills. The third priority of vocational teachers' training needs covers: (1) content structure mastery; (2) willingness to develop his/her area of specialization; (3) development of oriented, connected, and integrated vocational contents with an industry context; and (4) industry development and relevance to the content. The lowest priority of the vocational teachers' training needs includes (1) continuous performance reflection; (2) improvement in teacher professionalism by utilizing the results of reflection; and (3) collaboration with internal schools.

7. The recommendations for the training methods and organizers of a program are elaborated as follows. This study recommends conducting an In House Training (IHT), specific training, and short course training with effective training methods. The training organizers are those assigned from *P4TK BMTI, P4TK BOE,* Private Institutions, Universities/*LPTK* Institutions, and industries.

B. Recommendations

1. Training organizers have to conduct a competency needs analysis before planning and implementing an effective and efficient training program regarding time and cost aspects.
2. Training program and materials should be developed based on the competency needs of vocational teachers.
3. Directorate Technical and Vocational Education should focus on the training program implementation based on the competency needs of vocational teachers
4. The government should provide a flexible policy for *P4TK* to plan and manage a training program for vocational teachers and should not instantly change the education policy, especially for vocational education.
5. The government should intensify networking with industry partners, SMEs industry, and make a clear regulation to manage cooperation between the government and industry.

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