

Construction of a competency analysis model for vocational high schools

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ABSTRACT: In Taiwan, the technological workforce for industry is offered from different governmental departments. Vocational high schools and job training organisations are the main two departments for cultivating workers; however, these two departments seldom keep in touch with each other. But under the factors of financial limitations, achievement requisitions and educational innovation, schools are expected to use their present resources in order to complete their job-training tasks. From this viewpoint, schools need to concern themselves with the contents of courses, competency items, the adjustment or reformation of the teaching and assessment strategies. Therefore, all of them are related to the competency analysis. Content analysis was conducted in order to construct a competency analysis model at a vocational high school in Taiwan to provide them with these instruments while formulating their various tasks. These should be done accurately, quickly and effectively so as to achieve the goal. This mode was carried out systematically through a five phases-analysis, design, development, implementation and evaluation. Hence, the whole procedure brought Total Quality Management (TQM) into full play.

BACKGROUND

Industry in Taiwan has undergone great changes because of the rapid growth of the knowledge-based economy. Knowledge accumulates continuously and is applied effectively. It not only brings about transformation in industrial technology, but also becomes the motivating force for the development of industrial technology. Finally, it also impacts on changes by directly enhancing work activities. Therefore, only high quality technology workforce can ensure the development of the economy. Solow has pointed out that the American economy continuously grows because of the accumulation and enhancement of human resources, including the technological ability [1]. Thus, matching the needs of growth in the national economy and personal career developments have become a long-term concerns for all people engaged in technical and industrial education.

For a long time, the system of the development of Taiwan's technological workforce was divided into two parts: training and education. These belong to two different government departments, and, therefore, they both have consensus. Their major duty is to establish and enhance the fundamental quality of workers for the educational system. The system of mature and practical workforce is implemented through the training system and makes use of skill testing in order to reinforce the impartial quality of occupational competency.

Recently, however, shortages in governmental finances, performance management and the educational revolution have led to expectations that technical and vocational schools take charge of educational and occupational training. Thus, the main purpose of this study was to find out the relation of the competency connotation between technical and vocational education and job training. Its purpose was to develop a curriculum that would meet social needs, and also to plan a

model of competency analysis and verification. This should not only ensure the effective utilisation of educational resources, but also make technical and vocational schools unite job training so as to cultivate the required labour force for the country.

LITERATURE REVIEW

The main aim of the study was to determine an applicable competency analysis model for technical and vocational schools to take charge of job training. This could provide departments at technical and vocational schools with fast curriculum competency assessment. The other aim of this study was school-centred by combining the resources both inside and outside of the school effectively in order to solve problems concerning differences between theoretical and practical elements in the curriculum, the social transition, industry development and existing facilities at school. Collecting and analysing all of the information to develop a competency analysis model to conform to educational demands and training, as well as maintain educational quality, would follow this stage. The core theory will be ascertained in the following discussion.

Classification of Occupation and Education

Use of a competency analysis model would determine the ability standards at technical and vocational schools. Identification of occupation and education classifications would first be required, then followed by an analysis of competency connotation and needs about adequate technical and vocational education and training. Table 1 compiles the descriptions of particular nations and organisations regarding the classification of occupation and education [2-8].

Given this, it is obvious that some nations still do not yet have an educational classification code, although the educational classification, the Dictionary of Occupational Titles (DOT), has

Table 1: The classification of occupation and education in particular nations and organisations.

Nation or Organisation	Education Classification			Occupation Classification		
	Abbreviation	Level No.	Proclamation	Abbreviation	Category	Proclamation
Australian	ASCED	9	-	ASCO	5	1997
Canada	-	-	-	NOC	4	2001
ILO	-	-	-	ISCO	9	2002
Taiwan	-	-	-	DOT	10	2000
USA	-	-	-	DOT; O*NET	9	1991
UNESCO	ISCED	7	1997	-	-	-

been set up and used. The situation nowadays is that there is seldom feedback from job training or technical and vocational education to the DOT or a standard classification of education. This is what needs to be dealt with, mutually understood and coordinated, and faced in the future.

PLANNING THE COMPETENCY ANALYSIS MODEL

In order to accomplish this study, it is essential to understand the characteristics of competency analysis.

The Meaning of Competency Analysis

Competency analysis identifies the essential behaviour model for professionals to carry out a task or mission. This behavioural model includes motive, characteristic and skill or knowledge of the fundamental characteristic. Specifically, competency refers to the performance that a person has to implement in order to work effectively, especially when adequately playing a role or undertaking a task/mission. Furthermore, it can be observed and measured [9][10]. Thus, competency is not only the aggregation of knowledge, skills and attitude, but also a dynamic concept of putting action into practice. In particular, it also means to accomplish the purpose and get the outcome under such a specific situation. In order to achieve the goal of technical and vocational education and training effectively, what needs to be done first is an analysis of the content of the competency in education and training, so that the items and standards concerning measuring competencies can be determined.

The Function of Competency Analysis

The implementation of an educational training curriculum should be based on industry demands, and the competency analysis process identifies whether students have attained the competency standards proficiently. The purpose is to let graduates devote themselves to the occupations they have chosen and to cater for the effect of changes in technology within the industrial structure and graduates' skills. The main purpose of competency analysis is to analyse one occupation to help a worker understand the content of work and what knowledge/ attitude he/she should possess.

Industry changes affect adjustments in, and evaluations of, occupation classifications. Thus, technical and vocational education and training should use a suitable competency analysis model in order to establish the competency connotation and standards in every domain. The intention is to find out accurate reference information for course development, instructional design and evaluation targets [11]. Consequently, the development and implementation of a competency analysis model is actually an important requirement for technical and vocational education and training.

RESEARCH DESIGN

Research Methods

Qualitative research was utilised to collect complete and accurate data, with the research methods as follows:

- Literature review: Collect relevant literature and related research, then synthesise the collected data to achieve the following:
 - Explore classifications of occupation and education.
 - Understand the connotation of competency and the meaning of function.
 - Understand the needs of industry and schools.
 - Understand the teaching resources of vocational schools.
- Document analysis: Gather research and documents about competency analyses and carry out a content analysis. Tasks would also entail the following:
 - Understand the tools and research methods of competency analyses.
 - Construct a framework to plan the development of a competency analysis.
 - Conclude the theory of the competency analysis and its operational model.
 - Arrange and synthesise the process of decision-making for checking the competency analysis model.
- Quality Function Deployment (QFD): To investigate the degree of total quality, QFD theory is utilised in every process so as to develop the important fundamental mode. It also provides the basis for amending every step and developing an effective strategy. Customer demands can be identified and transformed accurately and systematically to ascertain the competency analysis model.

Research Sampling and Questions

The collections of the important documents, issues and related research concerning competency analysis cover the observed and analysed sampling in this research [9-14]. The questions in this research are mainly about understanding and using relevant procedures for the method of competency analysis. Further, it is also about determining substantiality in this research.

Research Reliability and Validity

A document analysis was conducted to describe, interpret and compare information obtained in this research. Triangulation was also conducted to enhance reliability. Discussion and

checking of the data with other research members helped isolate discrepancies, giving rise to a new research issue and reinforcing validity.

DIFFERENT COMPETENCY ANALYSIS METHODS

Different competency analysis methods were conducted to evaluate competency analysis. Document analysis was used to investigate the important competency analysis method thoroughly, while also providing an objective, scientific and systematic attitude for the step-by-step implementation, as follows:

- Research findings; competency analysis attaches importance to education. Educational training organisation and related customers also pay much attention to it.
- Related terms for competency analysis include vocation analysis, trade analysis, occupation analysis, job analysis, function analysis, task analysis and operation analysis. There is little difference between the method and skills in the implementation. It is not quite the same as the selective field and there is some difference to the collected data.
- Many various types of competency analysis exist. When operating, the different needs and purposes have to be arranged in pairs or groups.

The operational model of the competency analysis does not have effective and measured steps. One or many kinds of methods concerning competency analysis were used and then combined to assess the competency analysis model. The operational effect still needs to be properly evaluated. DACUM and Delphi techniques are often used with other methods to analyse the competency. Because the *essential competency* and *essential competency for the future* can be collected to construct the connation and standard of competency, the result can provide a complete reference for technical and vocational education and training.

DEVELOPMENT OF THE COMPETENCY ANALYSIS MODEL FOR TECHNICAL AND VOCATIONAL HIGH SCHOOLS

A document analysis was conducted in order to construct a competency analysis model for technical and vocational high schools. The conclusions are as follows:

- When most of the competency connation or standards of competency analysis were identified, the classification of occupation is usually of first concern, while the educational classification is seldom used. The model of this research referred to both of these classifications.
- The aim of a competency analysis is to detect the required competency connation for work. It is used for technical and vocational education and training to establish new, and adjust the existing course content. It provides a reference point in drafting teaching and assessment strategies.
- The operation of a competency analysis model needs to link up with education, industry and even students' active participation to plan effective competency connation. Continuous use of a quality policy helps in understanding customers' needs regarding working ability. It is also used to improve changes in educational training resources to ensure the operational model's quality.
- The competency analysis model of this study is based on systematic theory and incorporates concepts of quality management and customer focus. It is divided into five

phases, namely: analysis, design, development, implementation and evaluation.

Figure 1 shows the mission process of every phase, namely:

- Analysis: A document analysis, observation and interview were conducted to undertake a needs analysis of educational training for customers, industry and students.
- Design: The main purpose was to draw up an operational plan and select participants to design a proper working environment.
- Development: Quality management analytical tools, such as DACUM and Delphi, were used to assess competency in order to ensure customers' needs were being met and to induce a competency connation catalogue.
- Implementation: The results of the implementation guide adjustments in teaching resources and the instructional programme framework, assessment standards, instructional strategies, and record the process information.
- Evaluation: To check and evaluate the competency connation and demand standards for providing feedback.

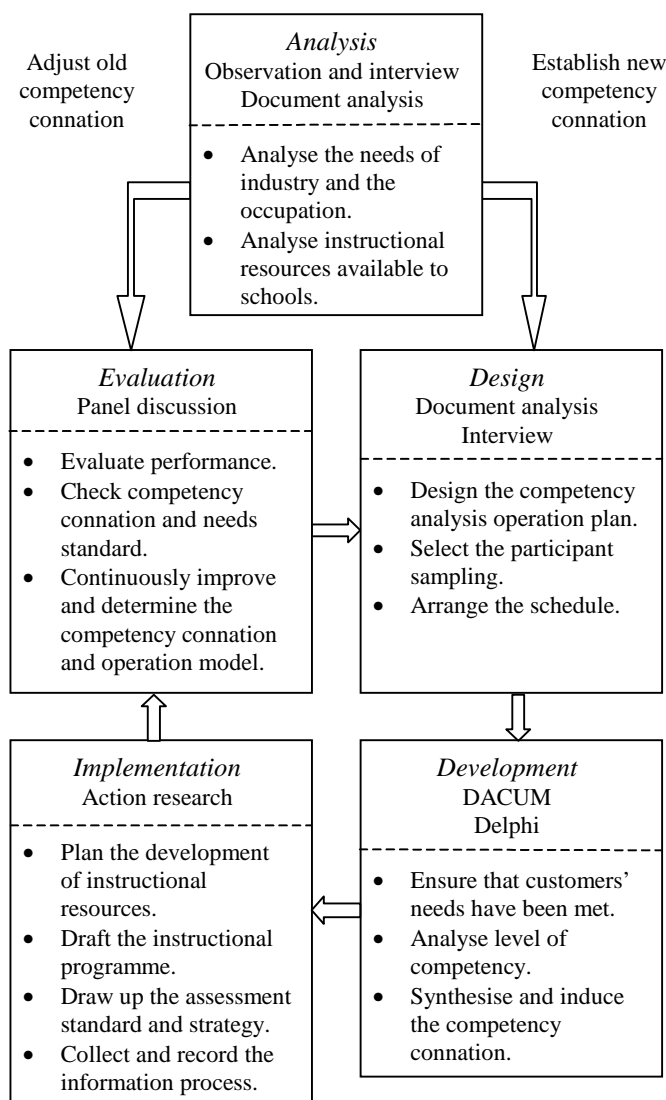


Figure 1: Competency analysis model for technical and vocational schools.

SUGGESTIONS

Based on the above findings, the following suggestions are made to users of this competency analysis model:

- The *competency analysis model for technical and vocational schools*, which has been developed in this research, can be used to help adjust and establish curricula and competency connotation when occupation training is held at a technical and vocational school. It may be quicker and more effective to finish establishing the necessary competency connotation and catalogue.
- Use of this model should be in accordance with the principles of Total Quality Management (TQM). The selection of educational resources at schools, industry representatives and education curriculum experts should follow fixed steps. Utilising full communication and discussions, customers' needs should be analysed to be the reference point for occupational training.
- The competency connotation of this study should be practical and useful. Thus, the manufacturing requirement of industry and students' learning ability can be met and existing educational resources and facilities at schools can be offered and achieved.
- The framework of the teaching and assessment strategy for educational training should be the basis for competency analysis. This can then be systematically finalised so that it can be used effectively.
- The competency connotation of this study can provide schools and industry with job descriptions and job specifications as a reference in performance evaluations.
- Educational and occupational classifications should be used for competency analysis. These two classifications can be combined properly in order to arrange a suitable educational environment and learning strategy.

Suggestions for future research include:

- The competency analysis model in this study has been developed by document analysis. The method of practical verification may be used in a future study. Otherwise, schools or departments may be selected to act as case studies and in order to aid in experimental research to strengthen the completeness of this study.
- The competency analysis model of this study is mainly focused on the current Taiwanese education at technical and vocational schools, given current resources. The operation of this model can provide schools with a reference point in adjusting departments, when planning the connotation of curricula and holding occupational training effectively. However, the effectiveness of this model's use needs to be ascertained further with regard to on-the-job-training in industry.
- This study's focus was on the development of a competency analysis model in technical and vocational schools, although the establishment of a competency standard still needs to be researched further.
- The findings of this research have revealed that an occupational classification dictionary has already been made, but an educational classification dictionary has not yet been made in some countries. The classification,

importance, linkages and value of competency analysis still lacks related research with regard to issues concerning these two classification dictionaries. This also can be a subject of further research.

REFERENCES

1. Solow, Q.M., *Growth Theory: An Exposition*. Oxford: Oxford University Press (2000).
2. Employee and Vocational Training Administration, *The Occupation Classification Dictionary of R.O.C.* Taipei: Department of Statistics, Council of Labour Affairs Executive Yuan (2000).
3. Trewin, D., *Australian Standard Classification of Education (ASCED)*. Canberra: Australian Bureau of Statistics (ABS) (2001).
4. Australian Bureau of Statistics, *Overview of ASCO (2nd edn)* (1997), [http://: www.abs.gov.au/ausstats/abs@nsf/0/](http://www.abs.gov.au/ausstats/abs@nsf/0/)
5. Department of Labor (DOL), *Dictionary of occupational titles (4th edn)*. Occupational Categories, Division, and Groups (1991). [http://: www.oalj.dol/public/dot/refrnc/dotcate.Htm](http://www.oalj.dol/public/dot/refrnc/dotcate.Htm) (2002).
6. Human Resources Development Canada (HRDC), *Edition 2001 of the National Occupational Classification (2001)*, [http://:www.hrdc-drhc.gc.ca/noc](http://www.hrdc-drhc.gc.ca/noc)
7. Labour Statistics Database (LABORSTA), *International Standard Classification of Occupations (ISCO-88)* (2002), [http://:laborsta.ilo.org/appl/data/isco88e.html](http://laborsta.ilo.org/appl/data/isco88e.html)
8. United Nations Educational, Scientific, and Cultural Organization (UNESCO), *ISCED: International Standard Classification of Education (2002)*, http://www.uis.unesco.org/en/act/act_p/isced.html
9. Shang, C.W.K., *Singapore's experiences in developing and implementing competency-based training*. *Proc. Conf. on Competency-Based Training*, Taipei, Taiwan, (2000).
10. International Labour Organization (ILO), *What Is Competence?* (2002), [http://:www.iol.org/public/englesn/region/ampro/cinterfor/complab/xxxx/1.htm](http://www.iol.org/public/englesn/region/ampro/cinterfor/complab/xxxx/1.htm)
11. Casey, D., *Method and procedure for developing competency standards*. *Proc. Australia-Taiwan Seminar on Competency Based Training*, Taichung, Taiwan, 3-15 (1999).
12. Gonczi, A., Hager, P. and Oliver, L., *Establishing competency-based standards in the professions*. Canberra: Department of Employment, Education and Training (1990).
13. Norton, R.E., *SCID systematic curriculum and instructional development. Workshop Manual*. Center on Education and Training for Employment, Columbus: The Ohio State University (1991).
14. Chao, C-Y., Liu, T-H. and Liu, S., *Skills competency analysis and certification for mechanical programme teachers in vocational high schools*. *Proc. 3rd Baltic Region Seminar on Engng. Educ.*, Göteborg, Sweden, 123-127 (1999).