



2.4 A Study of Professional Competence for Radiological Technology Department Students in Taiwan Area

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Abstract:

Recently, so many medical institutions established and the increasing use of the high technological medical imaging equipment, it makes radiological technology become the main instrument for the medical diagnostic and radiation therapy. However, the medical radiological technologists play the important role to operate all the related radiological machines. If they do not use the machines adequately, it will increase the patients' radiation absorbed dose. Then, the whole society health may be influenced. Therefore, constructing the professional competence of the medical radiological technologists is an important course.

The purpose of this research are:(1) to construct the index of professional competence with radiological technology students, (2) to discuss the professional competence for the graduates from the department of radiological technology to be the reference for the Ministry of Examination for the license test of radiological technologists, (3) to provide the direction of the radiological technology department development.

Keywords: Professional Competence, Radiological Technology

Introduction:

Ever since 1996, the domestic technical-vocational education system has been conducted the reform practices as the junior colleges which aimed to educating domestic junior (middle) technical talents in earlier years have been reorganized into technical institutes or even into technical universities, with such act making the structure of technical-vocational education system integrated gradually (for students trained under technical-vocational education system, on the other hand, it indicates the wider channel of for technical education). However, what is the position for technical-vocational education? What is the difference of professionals trained under the career and technical education from those educated under general four-year colleges? Currently, domestic technical education system and general four-year college education

have three and six institutes/universities respectively instituted with radiological technology department about which while there is still short of the related research and report featuring educational goal, curriculum planning and issue of position; Yuanpei Institute of Science and Technology (formerly known as Yuanpei Junior College) and ChungTai Institute of Health Sciences and Technology (formerly known as ChungTai Junior College), both under the technical-vocational education system, have instituted the radiological technology program at the five-year program on a basis of the junior college since 1965 to train professional radiological technologists. After both Yuanpei and Chung Tai were reorganized into institute of technology in 1998, the two institutes started to institute the two-year program by offering students graduated from five-year junior college a channel to further their studies and earn bachelor degrees; nevertheless, there still lacks related research and report concerning the educational goal and curriculum design for radiological technology department as well as the issue regarding the position for students graduating from radiological technology department under the technical-vocational education system.

With the change of the society and reform of the educational system, there appears changes for educational goal set by institute of technology as well; technical-vocational education in earlier years aimed to educating students' professional skills required for their future career and guiding them to develop their careers after graduation, and the educational goal for institute of technology and university of technology, however, puts emphasis on offering students holistic education featuring humanistic cultivation and basic academic competency, in hope of further guiding them to pursue an advanced study-oriented academic goal; the issue concerning "If the orientation of educational goal for technical-vocational education, however, would have any effect on the intention by radiological technology education to train students' professional competency?" is still worthy of further discussion.

The professional field of medical radiology covers diagnostic radiology, radiotherapy and nuclear medicine with the entire medical group consisting of radiologist, radiological technologist, nurse, medical physicist, and file personnel, among which radiological technologist who is good at operating radiological instruments or radioactive material to be in great demand; in a retrospection of the development of domestic radiology education, there had no any formal education for this subject from 1951 to 1965 during which radiological personnel were trained under the radiological training class held by National Taiwan University Hospital and Taipei Veterans General Hospital. Not until 1965 and 1966, did Yuanpei Junior College (currently Yuanpei Institute of Science and Technology) and ChungTai Junior College (currently ChungTai Institute of Health Sciences and Technology) start to establish radiological technology department respectively, heralding an era for the formal education of radiological technology in Taiwan, subsequently followed by the radiological technology department by National Yang Ming University, Kaohsiung Medical University, Chang Gung University and Tzuchi Institute with an aim to

educating bachelor-degree radiological technologist, thus helping enhance the whole radiological technology education. Ever since the three junior colleges were reorganized into institute of technology, the urgent issue arising out of a recruitment of students for the radiological technology department in four-year division of the junior college appears as the one that vocational schools (senior industrial and vocational high schools) have not instituted radiological technology program that might impossible to recruit students from the upstream schools directly when conducting the recruitment for four-year division of the junior college. In term of the background of basic medicine for students majoring in nursing and background of electricity for electronics-major students, the three institutes decided to enroll students for radiological technology departments, half from nursing and electronics graduates respectively. Even the practice is still in a probationary stage, planning for the four-year technology program of the three institutes still lacks common consensus. For recent years, many scholars have been delving into general issues concerning radiological technology, with the issues featuring "Survey and Planning for Human Power of Radiological Technologists" (Hsu, Shih-Tsung, 1984), "Survey of Training and Supply for Human Power for Radiological Technology" (Sung, Wen-Chuan et al., 1999), "Analysis of Education, Examination and Employment System for Radiological Technology" (Chen, Fu-Du, 1987), "Development for Medical Science & Pharmacology Education under Technical-Vocational Education System" (Chen, Chao-Yang et al., 2000), "Practice for Students under Cooperative System" (Cheng, Kai-Yuan et al., 2001), and "Advice for Human Power Policy of Medical Radiological Technology" (Chen, Fu-Du, 2001); with regarding to constructing the index of radiological technology students' professional competency, there is still in want of related articles and reports for in-depth discussion.

In sum, if it would be effective to construct and explore into the index of radiological technology students' professional competency, it might guide the planning of development and educational goal for curriculum of radiological technology education correctly.

This research aims to constructing the index of radiological technology students' professional competency, in hope of benefiting to the three institutes in the development of radiological technology department and curriculum design as well as offering reference basis to education training and career planning for domestic radiological technology and national examination for professionals and technologists. This research expects to achieve the following three goals:

- (1) Construct the index of radiological technology students' professional competency.
- (2) Discuss the professional competency those radiological technology students shall be possessed, in hope of offering reference basis for guiding students in their career planning and preparing them in national examinations for professionals and technologists held by Ministry of Examination of Examination Yuan of R.O.C.
- (3) Discuss the professional competency those radiological technology students shall be possessed, so as to offer reference bases covering direction of development,

curriculum planning, employment of teachers with professionalism for radiological technology department and purchase of teaching facilities, etc., in hope of offering reference to the radiological technology departments for the curriculum amendment in the future with the analysis and suggestion of results for the integral research.

Methods:

A series of questionnaires for this research are conducted by employing Delphi Method which adopts methods pooling experiences, opinions and suggestions from experts and scholars, followed by an analysis of all information and data to produce useful results which are served as reference for principles of policy. Delphi Method features an anonymous-correspondence questionnaire that collects, analyze and induce experts and scholars' opinion followed by making one questionnaire, with repeated process in collecting and analyzing all information to achieve the unanimous conclusion. This method works ideally to avoid some factors, such as time schedule and selection of venue, for participants when they must conduct the face-to-face communication and discussion to achieve a unanimous agreement during the traditional policy-making course; help prevent experts from being intervened when filling in questionnaire separately; enhance experts and scholars' sense of participation.

This research takes questionnaire as a major method with its design in conducting survey on 44 subjects including full-time professors of radiological technology from six universities/institutes and radiological technology experts at some hospitals in Taiwan. In open-ended questions, the first questionnaire, "The First Questionnaire in Delphi Method for Index of Radiological Technology Students' Professional Competency" provides experts and scholars with spacious room for thinking. A majority of 44 questionnaires were returned as expected, and, eventually, a total of 34 were collected after numerous follow-ups through telephone that makes a response rate of 77.3%. According to interviewees' opinions collected from the returned questionnaires, index of radiological technology students' professional competency can be classified into three categories: (1) Basic competency, (2) professional competency, (3) humanistic cultivation. Moreover, 69 indexes of professional competency are sorted out to be edited into the second questionnaire, "The Second Questionnaire in Delphi Method for Index of Radiological Technology Students' Professional Competency" which was then mailed to the 34 experts and scholars who returned the first questionnaire; eventually, a total of 30 questionnaires for the second one are returned, making a response rate of 88%, with the experts and scholars' opinions from those 30 questionnaires conducted the preliminary statistical analysis with the SPSS that extends the original 69 indexes of professional competency to 76 ones which are then edited into the third questionnaire, "The Third Questionnaire in Delphi Method for Index of Radiological Technology Students' Professional Competency". Opinions from the second questionnaire and important quantified analysis data are enclosed to the third questionnaire, offered to those experts and scholars who have participated in the third questionnaire to make

them decide if they need to adjust each item, from which consensus index of radiological technology students' professional competency is constructed after a series of integrated collection, arrangement and analysis; finally, a total of 29 questionnaires are collected (achieving a response rate of 96.7%), achieving the whole Delphi Method.

Results and Discussion:

Members of this research then conducted SPSS statistical analysis on quantified items ticked by experts and scholars from those 29 returned questionnaires. Among those 29 interviewees, three with seniority up to five years, five with seniority from 6~10 years, and 21 with a minimum of 10 years of seniority; on the aspect of educational background, two with diplomas conferred by junior colleges, twelve with bachelor degrees, and fifteen with master or doctoral degrees; in terms of occupation, twelve of them are doctors, five are professors, and three are medical physicists in hospitals, and nine are radiological technologists.

Among the twenty four indexes of professional competency listed by Category One Basic Competency in this research, a minimum of 58% (17/29) interviewees think that English, anatomy and cross-sectional anatomy are very important; among the forty seven indexes of professional competency listed by Category Two Basic Competency in this research, a minimum of 52% (15/29) interviewees think that radiation physics, radiation safety, X-ray principle and technology, computed tomography principle and technology, magnetic resonance imaging principle and technology, ultrasound principle and technology, radiological equipment, Anger camera principle and technology, SPECT principle and technology, PET principle and technology, nuclear medicine equipment, external beam radiation therapy principle and technology, brachytherapy principle and technology, treatment planning, radiotherapy equipment, medical image processing principle and technology, quality assurance theory of radiological equipment, quality assurance theory of nuclear medicine equipment, and quality assurance theory of radiotherapy equipment are very important indexes of professional competency for radiological technology students; besides, 52% (15/29) among these interviewees think that psychology is one very important index of competency in the five indexes of professional competency listed by Category Three Humanistic Cultivation in this research.

Results of analysis given above indicate that in addition to complete clinical training, professional knowledge and technology, English and psychology are inevitable for one excellent radiological technology student. As most of radiological technology students would serve in radiology-related departments in hospital in the future, radiological technologists shall be enterprising enough to absorb all kinds of new medical knowledge from a variety of newspapers and periodicals that English competency is required, in addition to the above professional skills; as radiological technologists have great opportunity of facing patients directly during their service in hospitals, the need for them to establish good interpersonality with patients and takes

the concept of “taking patients as your relatives” are significant issue that makes psychology considered by those interviewees as one of indexes of professional competency for radiological technology students.

There still has no related research and report working in in-depth exploration into the construction of the index of radiological technology students’ professional competency, and results of this research can:

- (1) Offer reference to curriculum planning for radiological technology department as well as work as indexes of radiological technology students’ professional competence, in hope of enabling students to possess competency required for their career.
- (2) Offer reference basis for guiding students in their career planning and preparing them in national examinations for professionals and technologists held by Ministry of Examination of Examination Yuan of R.O.C.

This research employs Delphi Method to conduct three questionnaire surveys on selected radiological experts. Even it is a time-consuming task on the edition, delivery, follow-up by telephone and return for the questionnaires as well as some interviewees can hardly fill in three questionnaires patiently that causes the loss of questionnaire, and results of this research are quite satisfactory.

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