Problem Solving Styles of the Recruits of Industrial Trainer in Taiwan, Republic of China

Tain-Fung Wu  
National Changhua University of Education  
Taiwan, ROC.

Yeh-Hsun Fey  
Ling Tung College  
Taiwan, ROC.

Abstract
This study examined the relationships between the recruits of industrial trainer problem solving styles and their related variables. The sample consisted of 423 industrial trainers who majored in mechanical program, electronic program, and industrial technology program at universities during the spring semester of 1997. Problem solving inventory was modified to form the research instrument for this study. This study utilizing the statistical techniques in terms of biserial, multi-serial, and serial correlation analysis, found that industrial trainers’ problem-solving styles were not significantly related to their major, grade, learning average, and teaching experience. On the other hand, sex was significantly related to personal control and total score of problem-solving styles. The findings also revealed that departments were significantly related to approach/avoidance style and total score of problem-solving styles.

Keywords: industrial trainer, problem solving, problem solving style.

Introduction
The goal of technological and vocational training is to cultivate competent human resources needed for economic progress and nation-building of the country. It plays a singularly important role in the process of developing national economy as well as people’s livelihood. To accommodate the fast changes in environment, business and industry, the mission of technological and vocational training is getting tougher than before. Therefore, all members within this training system need to develop essential ability in terms of problem-solving, decision-making, technology-applying and career-ready. In other words, it is imperative to teach our trainers the transferring skill, which enables students to adjust themselves, expand knowledge and update technologies in order to solve various problems in their daily life.

Problem solving is one of the most important psychomotor activities of human beings (Driscoll, 1994). It is often regarded as a highly complex, but well-structured process of mental activity. A number of studies indicated that problem solving had a close relationship with curiosity, creativity, and learning style (Armstrong & McDaniel, 1986; Basadur, Wakabayashi, & Graen, 1990; Calvano, 1986; Worthley, 1987). According to Cinnamon and Silverman (1979), people often tried to realize a problem from various aspects and then led to different problem-solving styles. However, before teaching students how to solve a problem, it is necessary to understand how learning behavior is affected by some mental factors such as trainer’s attitude and style.
In the past twenty years, the investigation of problem-solving styles has become the focal research topic in the field of industrial training. Recognizing that the training of the problem-solving competence is one of the major concerns to meet the challenge of the upcoming twenty-first century, the establishment of problem-solving ability is regarded as the central issue in scientific and technological education (Savage & Sterry, 1990). Bhuntuvech (1986) and Lee (1994) suggested that industrial education should focus on how to utilize knowledge, resources, and creativity for solving daily problems. Therefore, understanding students’ problem-solving styles and what factors influence such styles, on one hand, enables teachers to analyze the performance of students not only in classrooms but also in factory. On the other hand, it can provide some suggestion for appropriate teaching and learning strategies, which are able to improve the efficiency and effectiveness, and reach successful learning. As Claxton and Murrell (1987) emphasized, the realization regarding problem-solving styles can serve as a guide relating to the design of students’ learning experience.

Industrial trainers, as the most crucial assistants and guides, should take the major responsibility and make the greatest effort to educate learners how to cerebrate, synthesize, and apply the knowledge and skills acquired from experience, and then to solve their problems successfully. Thus, it’s very important to explore the problem-solving styles of the industrial trainers so as to provide useful information and directions for instruction. Furthermore, such research is desirable to offer meaningful reference not only to the design of proper programs that can fulfill the demands from students, but also to policy-making and further study.

The purposes of this study are to identify demographic variables and how they relate to problem-solving styles. Specifically, through the implementation of problem-solving scale and on the basis of the selected sample, this research explores the extent of the correlation between the three problem-solving scales and several variables including: (a) sex, (b) age, (c) academic score, (d) department, (e) major, and (f) teaching experience.

**Method**

**Research Design**
To obtain in-depth analysis and complete results, correlation research method is adopted for the study. Correlation research makes use of correlation coefficient to measure and explain the relationship among variables from statistical viewpoint (Christensen, 1991). In this study, the main research procedure contains the selection of questions, the selection of sample and instrument, designing of procedure, analysis and explanation of data.

**Population and Sample**
In Taiwan, the following four departments related to industrial education at normal universities
were the major institutions assuming the education of industrial trainer: (a) Department of Industry Education at university I, (b) Department of Industrial Technology Education at university I, (c) Department of Industrial Technology Education at university II, and (d) Department of Industry Education at university III. The population of this study consisted of 1,300 industrial trainers, who were all enrolled in the above-mentioned departments in 1996.

In accordance with the characteristics of the population, 500 subjects were selected by percentage stratified random sampling (Ferguson & Takane, 1989). Specifically, the subjects were selected randomly in proportion to the number of students of each department. In order to ensure the reliability of the data, the sample size of 500 (38.46%) subjects exceeded the minimum required number of 297, which was figured out according to Christersery (1991).

**Instrument**

Problem-solving scale developed by Heppner (1988), the widely used and well validated measure of problem-solving is a standardized self-report inventory consisting of 35 six-point scale items. The scale is divided into three subscales: (a) Problem-Solving Confidence (PSC), (b) Approach/Avoidance Style (AA), and (c) Personal Control (PC).

The total score of the problem-solving scale is obtained by summing up the scores of the three subscales. It is noticeable that lower total score represents greater self-confidence, stronger tendency to deal with problems, and higher personal control. In other words, low total score represents that the behavior and attitude of the subject are significantly correlated to effective problem-solving evaluated by himself (herself).

Considering the reliability, validity, different environment, and respondents’ full comprehension toward the problem-solving scale, semi-formal decentering techniques, examination of experts, bilingual technique, and pretest were used to ensure the feasibility of the instrument. The results showed that the instrument measured subjects’ responds consistently. In addition, through experts’ full discussion and rigorous review during the whole process, it is believed that the instrument also has content validity.

**Data Analysis**

The data from the completed questionnaires were coded and analyzed using the Statistical Package for the Social Sciences (SPSS). Both descriptive statistics and inferential statistics were computed for data analysis in this study. The descriptive analysis in terms of mean, standard deviation, and distribution of respondents by demographic variables was used to present and analyze respondents’ answers for each subscale and total scale. Point-biserial correlation, multi-serial correlation, and contingency coefficient were used to test whether the correlations among independent variables were significant at the .05 level.
Results
Of the 500 questionnaires distributed, 452 of them responded, out of which 29 were dropped for incomplete information or obvious errors in answering the scale. This left 423 usable copies and yielded a response rate of 84.6%.

In order to explain the industrial trainers’ problem-solving styles, their scores were compared with the standardized scale norm (Heppner, 1988). The results of the analysis show norm group had higher PSC (male, M=24.7; female, M=25.7) and higher PC (male, M=17.4; female, M=18.2). Regarding approach/avoidance style, male subjects in this study were more positively face the problem than male in norm, while female subjects responded displayed less positive attitude toward problem comparing female in norm. For the total scale (TOT), the norm group showed more positive evaluation on problem-solving style (male, M=88.7; female, M=88.4) than research group (male, M=94.4; female, M=98.8).

The results of this study revealed that male subjects (M=17.98) performed better than female subjects (M=19.44) in PC. Age and PC had a negative relationship which showed the oldest group had the highest level of PC. Concerning departments, subjects of the Department of Industrial Education of University I tended to have the best evaluation in AA and TOT.

It was found that problem-solving style had no significant correlation with major, grade, academic score, and teaching experience. Sex was significantly and positively related to PC and TOT at the .05 level of significance. The correlation between age and PC was significant beyond the .05 level. The findings of this analysis also revealed that departments had significant relation with both AA and TOT.

Discussion and Suggestions
Discussion
The results of this study indicate that male subjects are superior to female in, both in overall problem-solving ability and attitude. The findings are consistent with those of Heppner (1988) and Wheatley et al. (1991).

Based on this study, it is found that the older generally have better personal control for ability while facing problem. It is coherent to Cornelius and Caspi’s (1987) findings that human’s problem-solving skill in daily life tended to be enhanced as he or she grew. The findings also supports Cutright’s (1986) viewpoint that education is the best indicator of problem-solving style. more positive tendency toward problem.

Suggestions
According to the findings of this research, three suggestions are presented as following:
Firstly, although many important factors such as environmental changes, learner’s aptitude, intelligence, interest, and motivation have been taken into consideration during the process of educational reform, the key element affecting learning achievement problem-solving style has not been paid sufficient attention.

Therefore, the recruits of industrial trainers should be instructed to learn how to collect related information to solve problems and use effective high-order thinking skill for making decisions properly by means of various activities such as group learning, direct discussion, role playing, brain storming, peer training, and quality circle. In addition, it is very essential to provide ample opportunities and environment to cultivate abilities of communication, co-operation, relearning, and problem solving.

Secondly, in the aspect of teachers and educational administrators, it is suggested that teacher-centered instruction should be changed to student-centered instruction. Teachers ought to play guides and assistants that share resources and data with students, clarify problems, integrate previous learning, and find out the most appropriate way to solve problem. Apparently, for the purposes of assisting teachers and students to develop new teaching/learning strategy and improving training quality, policy effectiveness, and learning achievement, it is imperative to inculcate problem-solving ability not only in trainers, but also in all staff in training institutions as well as officials in educational authorities.

The findings of this study indicated that the overall problem-solving ability of the recruits of industrial education was lower than the norm developed in other country. Thus, it is necessary to develop and implement curriculum with problem-solving training from kindergarten in order to cultivate all citizens with problem-solving ability from childhood.

Thirdly, in the aspect of future research, several suggestions are presented according to the findings of this research.

1. Besides the demographic variables in this study, other variables that may affect problem-solving style deserve to be investigated.
2. It is suggested to conduct further study with regard to the comparison of linear composition correlation between problem solving and other variables.
3. Further exploration concerning this topic can be made through quality research and can be compared with the results of this study.
4. If fund and time permit, it is suggested to conduct the similar research for all population instead of sample in order to investigate whether the correlations between problem-solving style and demographic variables resemble those of this research.
References


