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THE DEVELOPMENT OF A TRAINING MODEL TO ENHANCE INDUSTRIAL DESIGN STUDENT'S PRODUCT DESIGN CAPABILITY

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ABSTRACT

The purposes of this research were to identify and develop an effective training model for enhancing product design capability. The samples were two groups comprising 15 experts and 15 vocational diploma students majoring in industrial design at Rajamangala Institute of Technology, Northeastern campus. Among the research tools used to assess the training models were training model assessment forms-cognitive test, skill test, attitude test, and satisfaction assessment. Data analysis was carried out using means, percentage, and standard deviations. A comparison of training achievements was made using Wilcoxon's signed ranks test.

The result of training model development: components of a training model are training needs analysis, planning (objectives defining, capability listing construction of the training course and construction of assessment forms), training, and training assessment. The result of the search for an effective training model: the model assessment by experts indicated that the newly-developed training model was highly suitable and that training needs analysis, capability listing and training were the most suitable. The achievement assessment indicated that participants scored significantly higher after the training than before the training at 0.01, and the satisfaction assessment revealed that participants were highly satisfied with the training.

Keywords: Training model, capability.

INTRODUCTION

Like other countries, Thailand has become part of the global village, where globalization and fast communication links have helped to create a world without borders. In this world, social and environmental changes have led to fierce economic competition among nations (Nec et al., 1996; Stone,

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1998). To develop the potential to compete, countries must, first of all, develop quality people. Behind quality productivity is a quality workforce that enables countries to compete in the economic system. This correlates to the concept of Pananiramai (2000) that successful development of an economic system hinges on the development of human resources. It is developed human resources that make for a quality workforce. In particular, it is the mid-level workforce that plays a vital role in a country's development, given its susceptibility to new technologies (Office of the National Education Commission, 1995).

For a country to compete, however, not only productivity but also product design capabilities must be improved. For example, the U.S.A., Europe and Japan have enjoyed tremendous economic growth. Paying equal attention to product design and production, these countries have achieved dominance in the economic world. They are all aware that quality products with a good design sell easily and compete against similar products in the market. Rajamangala Institute of Technology, Northeastern campus also recognizes the importance of product design and has produced a number of personnel in this field. With advanced vocational certificates, they work as technicians in the field of product design as product designers, assistants to product designers or foremen. Many are employed in the state and private sectors, while others are independent business owners. Yet, not all graduates possess the qualities expected by enterprises (Suddhabindu, 2000). Similar concerns were revealed in research conducted by King Mongkut's Institute of Technology, Northern campus (1991), Sriprasart (1992), Thailand Development Institute of Technology as quoted by Tornmatat and Rodplong (1992), Office of the National Education Board (1995), and Sitthipong (1997). One problem found in connection with vocational education is that there is either a shortage or a glut of graduates in certain study fields. In addition, the skills of some graduates do not satisfy the demands of business. Once these graduates begin work, they inevitably have a negative impact on the overall production system of the industry. This is a serious problem which everyone must cooperate in solving (Pananiramai, 2000).

The researcher realizes the need to develop graduates with the quality and skills required by enterprises. A training program is the solution because it is a way for participants to develop specific skills. It also helps to improve product quality and the potential to compete (Stone, 1998). To ensure that a training program is effective, it is imperative to have a good training model because it sets a clear direction for the training course. The researcher has, therefore, developed training models, which strengthen the product design capabilities of students enrolling in a vocational diploma program. Guided by the training model, students of industrial design can learn and develop skills and concepts of product design in line with the demands of business. Consequently, the development of a training model to enhance product design capability is a means to produce vocational graduates with the skills businesses demand.

The purpose of this study was to identify and develop an effective training model that enhances vocational diploma students' product design capabilities.

METHODS

Definition

Training model: The method of organizing a training course which was rationally based and examined and modified by experts, consisting of four stages: training needs analysis, planning, actual training, and assessment. The resulting model was tried out to determine the participants' achievement rate and satisfaction with the training.

Capability: List of knowledge and ability supplied by instructors and evaluated by business representatives to ensure that it matched the needs of business.

Samples

The samples were two groups comprising 15 experts in all areas concerned: training, research and curriculum development, measurement and assessment, and product design. This was necessary because the training model involved several related components, which were needs analysis, planning, training, and assessment. And the other 15 participants were selected by simple random sampling from among applicants who were vocational diploma students majoring in Industrial Design at Rajamangala Institute of Technology, Northeastern campus.

Procedure

This subject was to identify the components of training model, various training models were studied and analyzed using a systematic approach, with consisted of input, process, and output. The data were used to develop the framework and components for a proper training model. The newly development training model was evaluated by 15 experts using the focus group method, the evaluation tool was a five-level rating scale suitability assessment form, data analysis was carried out using means, and standard deviations. After the model was assessed and modified in line with the experts' recommendation, the modified model was tried out for effectiveness in training achievement and satisfaction on 15 vocational diploma students majoring in industrial design at Rajamangala Institute of Technology, Northeastern campus.

Measures

The measures for this study included (1) training model assessment forms, (2) achievement forms-cognitive test, skill test, attitude test, and (3) satisfaction assessment.

The training model assessment forms were based on a 5-level rating scale, and data analysis was conducted using means and standard deviation. Criteria for the training assessment: the model that scored an average value of high level (mean = 3.51) and over was considered suitable and required no modification.

The achievement forms-cognitive test: a 4-multiple-choice test was constructed to cover the training objectives and subject matter. A point was given for each correct answer, and no points were given for an incorrect answer. The test was examined for its reliability for content by 5 assessment experts and tried out so that the test items would be arranged according to their level of difficulty. Fifty items that obtained the degree of difficulty ranging from 0.20-0.80 and the degree of discrimination of 0.20 or over were incorporated in the standardized cognitive test, which obtained 0.92 for reliability after being tried out for reliability coefficient using KR-20.

Attitude test: a 5-level-rating-scale test was constructed to cover the training's objectives and subject matter and was examined for content reliability by 5 experts. The test was then tried out to determine the discrimination power of each item between top and bottom groups followed by a t-test analysis to investigate the differences. The items selected received a T-score of 1.75 and over. Twenty items were chosen to be incorporated in the standardized test, which was tried out for reliability using Alpha coefficient (A coefficient). A reliability score of 0.79 was obtained.

Skill test: a 5-level rating scale test was constructed to cover the training objectives and subject matter. The skill test was examined for content reliability by 5 experts and tried out for reliability. A reliability score of 0.89 was obtained.

Criteria for the achievement tests: a comparison of training achievement in terms of knowledge, skills, and attitude before and after the training using a Wilcoxon's signed-rank test. The result revealed that the participants scored statistically significantly higher after the training than before the training at 0.01.

Satisfaction assessment form: a 5-level rating scale form was constructed to assess participants' satisfaction with the training. Data analysis was carried out using means and standard deviations. The form was examined by five experts and tried out for reliability using Alpha coefficient (A coefficient). A reliability score of 0.89 was obtained.

Criteria for the satisfaction assessment: the training was considered satisfied when assessment indicated by the average value of high level (mean = 3.51) and over.

RESULTS AND DISCUSSION

The result of the training model development

Components of a training model were (1) input which consisted of training needs analysis, planning with objectives defining, capability listing, construction of the training course and construction of assessment forms; (2) process or training which included the following steps of readiness preparation: preparing trainees' and trainers' manuals, selecting trainers, making schedules, creating training materials, preparing training venues and other facilities and training; (3) output or training assessment, as shown in Figure 1. The result of developing the model of training was a systematic approach to training showing the continuous reaction of factors links the need assessment of training related to planning for training, stages of training and training evaluation. The concept of such training emphasized on using feedback to continuously improve the process of training according to the exist information in order to meet the determined objective of training (Smittikrai, 1999). Beside this, the systematic concept acted as the frame of reference for planning and processing for training.

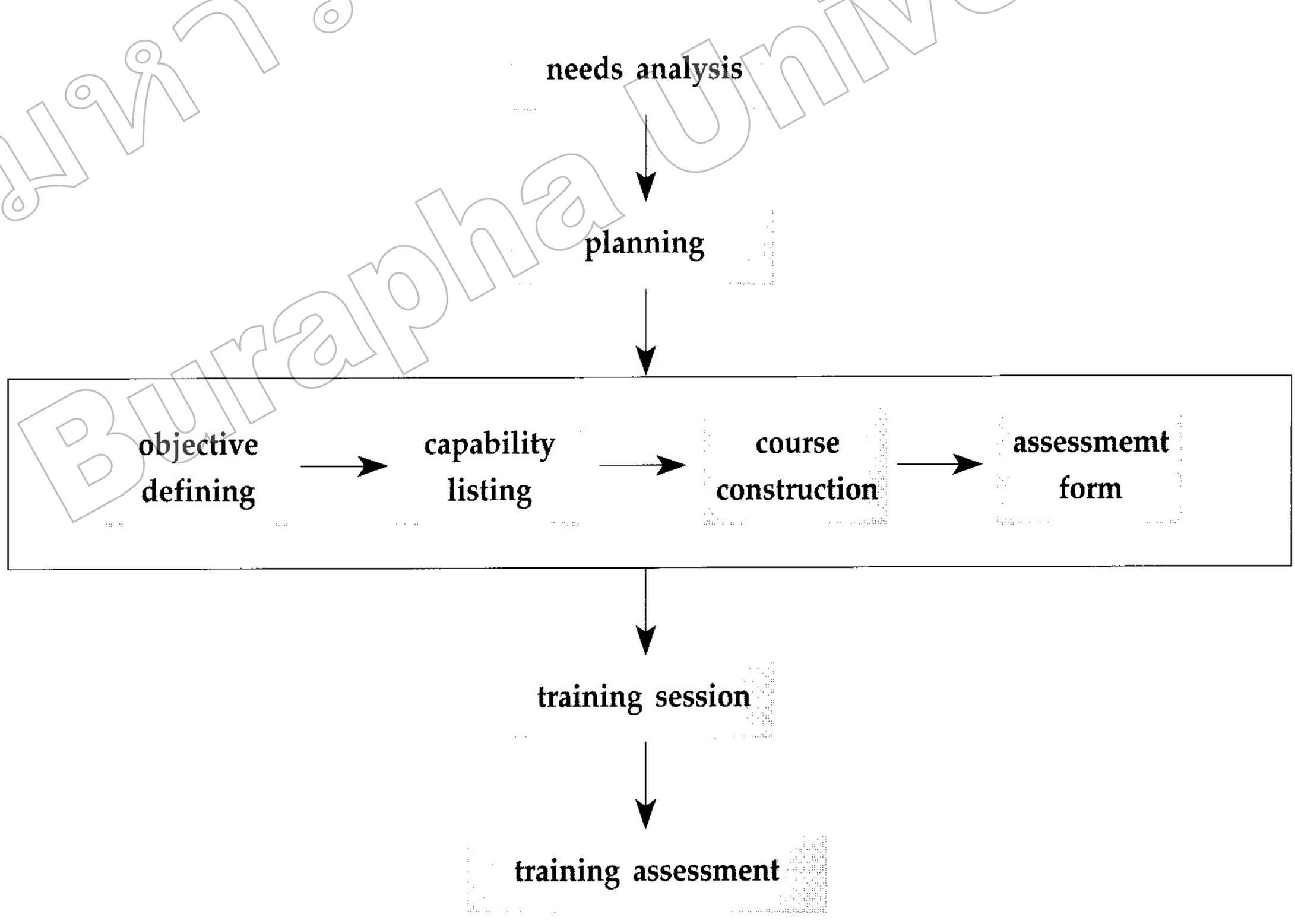

Figure 1. A training model to enhance product design capabilities of vocational diploma students.

The result of the search for an effective training model

The model assessment by experts indicated that the newly-developed training model was highly suitable, and that training needs analysis, capability listing and training were the most suitable, as shown in Table 1. This is because each component and each stage of the training model were practical and could be carried out sequentially-one step at a time. This practicality contributed to experts' conclusion that the training model was highly suitable.

Table 1. Average Value (AV) and Standard Deviation (S.D.) against suitability of training format, according to specialists.

Assessment items	AV	S.D.	Level of suitability
1. Needs analysis	4.66	0.48	highest
2. Training model design			
2.1 objective defining	4.13	0.74	high
2.2 capability listing	4.60	0.50	highest
2.3 training course construction	4.20	0.86	high
2.4 assessment form construction			
2.4.1 cognitive test	3.93	1.09	high
2.4.2 attitude test	3.93	0.88	high
2.4.3 skills test	4.20	0.86	high
2.4.4 satisfaction assessment	4.46	0.63	high
3. Training	4.53	0.51	highest
4. Assessment	4.40	0.63	high
Total	**4.30**	**0.76**	**high**

4.51-5.00 = highest agreeable 3.51-4.50 = highly agreeable 2.51-3.50 = moderately agreeable
1.51-2.50 = agreeable, low 1.00-1.50 = agreeable, very low.

The achievement assessment indicated that participants scored statistically significantly higher after the training than before the training at 0.01, as shown in Table 2. Because of this study of training achievement, the training model assessed by experts was used by following the determined stage of training, beginning with the need analysis, planning, training, and evaluation. And this training was for a small number of students, all of them had an equal chance to learn, both theoretically and practically. According to Baldwin and Williams (1988), learning by doing is an effective way of learning; the trainee's knowledge, skills and attitude could be changed and improved (Newman and Newman, 1983). According to Uaphua (1994), Chumrum (1995), Tongnuch (1999), Sornketsarin (2000), and Srisuwan (2002), trainees' knowledge, abilities and attitude related to the training course will be improved after completion of the training. Accordingly, cognitive, skills and attitude improvements in the subject trained were noted in the participants after the completion of the training.

The satisfaction assessment revealed that participants were highly satisfied with the training. The components that received the highest degree of satisfaction were training content and its suitability to participants, activities that stimulated learning, activity participation, instructors' presentation skills, and knowledge obtained from the course. The survey indicated a high degree of trainee satisfaction with the training. The components receiving the highest degree of satisfaction were course content and its suitability to participants, activities that stimulated learning, activity participation, instructors' presentation skills and knowledge obtained from the course. Because the researchers' basis for developing the training course came from the instructors' capability listing which was then assessed by business representatives, and examined by experts in course development, the resulting training course turned out to be very suitable to the participants and to meet the needs of business. Another conducive factor was to restrict the number of participants to 15, and as a result, each was given an opportunity to practice-the belief that real practice would enhance participants' development and motivation.

Table 2. A comparison of training achievements was made using by Wilcoxon's signed ranks test.

	Pre-test		Post-test			
Achievement assessment	**AV**	**S.D.**	**AV**	**S.D.**	**t**	**p**
Knowledge	28.93	3.08	28.4	4.25	3	<.01
Skills	2.47	1.10	3.60	0.69	16	<.01
Attitude	3.97	1.17	4.16	1.02	11	<.01

This research found that the training model that enhanced product design capabilities for vocational diploma students majoring in product design was highly suitable. The comparison of achievements revealed that participants scored higher after the training than before. Participants' degree of satisfaction with the training was also high. However, this training model should not be considered a panacea. Success in fact depends, on the one hand, on presenters/instructors who are knowledgeable, skilled and effective in presenting the topics, and on the other hand, on motivated and attentive participants. Another major factor is the number of participants. There were only 15 participants in this training course so that everybody would have a chance to practice and receive adequate attention. This would ultimately boost the rate of their improvement and achievement. Participants' satisfaction with the training was also a critical factor because, without it, the training course's effectiveness would suffer. Given the limited period of time, the only possible way to evaluate participants' cognitive ability, skills and attitude was by means of test papers and assessment forms. Some skills might not have been developed during the training. It is, therefore, recommended that a follow-up assessment be made after the training in order to enhance the effectiveness of the training course curriculum.

This newly developed training model is geared specifically towards enhancing product design ability; thus, it should be adjusted to fit the objectives and subject matter before being tried out with other vocational occupations. Further research and development should be carried out to develop the capability listing for training in every other vocational occupation so that training meets the set objectives. There should be research and development in self-learning media to be integrated into this newly developed training curriculum so those students can learn and do research independently. This is a learning model for the future.

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