An Empirical Study of the Student Work Performance Difference between Case-Based Instruction and Didactic Instruction

Li-Shu Lu * Shing-Sheng Guan** Wen-shan Chang ***

*Graduate School of Design, National Yunlin University of Science and Technology, Yunlin, Taiwan.
Department of Digital Media Design & Graduate School of Computational Design, National Yunlin University of Science and Technology, Yunlin, Taiwan, luls@yuntech.edu.tw
** Department of Visual Communication Design, National Yunlin University of Science and Technology, Yunlin, Taiwan, ssguan@yuntech.edu.tw
*** Department of Digital Media Design & Graduate School of Computational Design, Yunlin, Taiwan, wenshan@yuntech.edu.tw

Abstract: The methods of professional teachers panel discussion and experimental study were applied with the goal of understanding the difference between Exhibition design evaluation items and various teaching methods that inspire creativity in student's work performance. Using Exhibition design, students were divided into two groups, the experimental group and control group in which Case-based instruction and didactic instruction were given. The distinction between the two teaching methods and the influence on each evaluation item were compared. The results showed that (1) the evaluation items include design ability and creativity, Vision, space and representation should be revealed in the design ability and the entire as well as conceptual performance should be seen as a creativity; (2)Case-based instruction can strengthen visual applications, display properties, entrance image, drawing presentation and refined mold; (3) the influence of design ability and creativity on the entrance image, refined molds, visual image and plan layout can estimate the whole and concept performance. Consequently, Case-based instruction was recommended for teachers of display design; it not only enhances students' originality, but also can be used as references for the future study.

Keywords*：*Design Education, Case-based instruction, Didactic instruction, Exhibition Design Curriculum

1. Introduction

To nurture creativity, one must first nurture the learning environment and teaching activities of design, and the most critical part regarding design education and instruction is that there must be a way to inspire students'

creativity. Design is a work whose nature is to find and solve problems (Pena, 1987). Designers are often limited by the contents, conditions, time and manpower when they are engaged in solving problems of design. Before they proceed, they often take references from some precedent cases in order to quickly grab some inspirations and create a new design (Maher, 1995). Creativity serves as a key in the problem-solving process. When students meet with any difficulty during the process, they must think of a new way to handle since they cannot achieve that through past experiences and knowledge (Jenmu, 1991; Lu & Guan, 2003). Cognitive psychologists suggest including Case-based Reasoning in teaching since this teaching activity is helpful for solving the problems of design (Shiao & Hung, 2000). Therefore, during design teaching, in addition to the importance of creativity, it is necessary to create an effective teaching model. A more significant issue that is worthy of further study is about how a design teacher integrates design efficiency with creativity and applies this to the design teaching scenario in order to guide students to search for a creative and efficient way to solve design problems, and to nurture more creative talents. In terms of design teaching, most teachers start by case study and then apply the method of scenario analogy to resolve current issues. Many teachers also lecture on project experiences and pass on the knowledge to students as this lecturing process is easier and more convenient to handle. Whether reference cases are provided during the teaching process will affect students' learning efficiency as well as their performance in design creativity. Therefore, this study aims to discuss whether the adoption of case-based instruction (CBI) and didactic instruction (DI) would enhance the performance of students' design works in creativity. In addition, in terms of the evaluation of exhibition design works, most literatures discuss exhibition evaluation from the viewpoint of exhibit planning on the actual exhibition space (Screven, 1976), and there is little discussion on the evaluation of students' post-learning works from the viewpoint of teaching process. The purposes of this study are as follows:

(1) To establish evaluation items for exhibition design works.

(2) To compare whether CBI & DI make a significant difference to the performance of students' Exhibition design works in creative performance.

(3) To discuss whether there is a correlation among the evaluation items.

2. Literature Reviews

Chang (2000) considered that CBI mainly focuses on students. It guides the learner to enter into a learning process of scientific exploration and introspection through diversified potential value-holding cases. Stolovith & Keeps (1991) suggested that Case-based Reasoning (CBR) is applicable to resolving creative issues and professional personnel training, and in the field with incomplete structure. In addition to teaching knowledge and theory, it can also train students' abilities in analysis, critical thinking and problem-solving. Akin (2002) considered that Case-based instruction (CBI) focuses on problems as the core of teaching. It takes relevant cases for analysis and discussion which is helpful for students to further understand the practicality of design, but whether students receive actual help and inspiration for their creativity performance is a question worthy of further exploration. On the other hand, a teaching that mainly delivers lectures is called traditional teaching or didactic instruction (DI). Ever since the beginning of teaching, educators are used to delivering education by giving lectures as the primary method. For students, different teaching methods result in different effects.

Regarding the features of design creativity education, Du, Wu (1997) summarized its connotations:(1)creativity stimulation, which is the most charming part in design education, also the most difficult part to get hold of; (2)cultivation of keenness, which cultivates keen sense of perception, observation and aesthetic ability; (3)presentation skill proficiency such as presentation skill and computer-aided design. Designers' creative ideas are presented through using certain tools. Based on the learning principles of creativity and design, this is to emphasize the perceptual and cognitive abilities for inspiration which accords with the teaching ideology of putting emphasis on senses and perceptions that J. H. Pestalozziy and John Frederick Herbart contended. They considered that during a teaching process, students' senses should be in contact with the outside first, and after the impression obtained from the contact is integrated with the original concept one keeps in heart, proper teaching materials are then adopted to stimulate learning motive and creativity.

Screven (1976) proposed the theory and steps of formative evaluation and summative evaluation earlier and later added front-end evaluation and remedial evaluation to the theory to conclude a total of four types of evaluations. Some scholars discussed this through two dimensions, stage evaluation and audience satisfaction evaluation. Stage evaluation: Huang (1997) indicated that the work of evaluation should be conducted in three stages, before, in the middle of and after the idea is fulfilled. They are respectively: (1)Front-end Evaluation；(2)Formative Evaluation；(3)Summative Evaluation. Huang (2002) argued that an exhibition package should include:(1)fine exhibition introductions; (2)harmony between the exhibits and exhibition introductions; (3)good designs including display, well applied colors, charts and lightings. Wu, Guan (2004) considered that the evaluation of an exhibition effect should focus on respective elements including the contents in display, the exhibition pattern, display and moving route arrangement, space design, etc. Viewed from teaching method, CBI is a problem-oriented teaching method. Therefore, either in the process of teaching or designing, CBI is seen by scholars to be an effective teaching method to enhance students' problem-solving ability. However, in terms of design result, there is no mention whether a performance in creativity has been achieved. This study aims to discuss the effect of CBI on the performance of students' design works in creativity as this teaching method is practically applied in the design education scenario.

3. Research Methods

3.1 Establishment of evaluation items to evaluate exhibition design works

AT this stage, the main purpose is to establish evaluation items based on Literature reviews and the results of professional teacher panel discussion.

Proceedings of the Panel Discussion

(1) Preparation: Literature review and issues drafted.

(2) Panel Discussion: Professional teachers led by the host to discuss issues and finalize the establishment of evaluation items.

(3) Information analysis: To interpret the information collected from the panel discussion in an objective manner.

Teachers participating in the discussion

(1) The host: Served by the researcher.

(2) Professional teachers: Mainly from design teachers who ever taught exhibition design related courses for more than five years.

Evaluation items for design works

Based on the conclusion of the professional teacher panel discussion, the evaluation of the exhibition design works is divided into two dimensions, design ability and creativity. The design ability dimension covers items including visual imagery, visual application, plane layout, display properties, entrance image, drawing presentation, and refined model. The creativity dimension covers items of the entire performance and the conceptual performance.

3.2 Design and implementation of teaching experiment

Independent variables include CBI & DI. The former represents the description and analysis of complete cases; the latter represents the general class lectures. Dependent variables are to observe whether there is a significant difference of design creativity performance based on the two different teaching methods, and further to discuss the correlation between the evaluation items of design ability and that of creativity.

Research Hypothesis

(1) There is no significant difference between CBI & DI in terms of the design ability and creativity in students' works.

(2) About the performance of design works, the evaluation items of design ability have relevant effect on predicting the entire and conceptual performance in creativity.

Subjects

Students in the class are divided by heterogeneous nature to obtain an equal distribution of group members with design related abilities. This experiment divided students into two groups, each consisting of 5 students to be given different teaching methods, namely Group A the Experimental Group receiving CBI and Group B the Control Group receiving DI.

Research Tool

(1) Topic: Take the space design of living merchandise exhibition as an example.

(2) Evaluation method: In order to take the consistency in evaluation into account, the works from students receiving CBI or DI teaching methods were mixed together and numbered for evaluation. Scores were given from 0 to 100.

(3) Reliability and validity test: In terms of reliability, consistency was adopted among the evaluators. The evaluation results from the three evaluators were used in the product-moment correlation test. Their reliability scores were between .793～.876 achieving the .01 significant level.

Data statistics and analysis

(1) To understand the Mean and Standard Deviation (SD) scores of CBI & DI works.

(2) Apply t-test to compare the difference of performance in the design ability and creativity of CBI & DI.

(3) To further understand the effect of each variable in the design ability performance on the overall and conceptual performance in creativity.

4. Discussion

4.1 Analysis of the performance of design works based on different teaching methods

Difference analysis on design works' design ability performance

According to Table 1, regarding the design ability performance, the average score of CBI is higher than that of DI. There was no significant difference in the performance of visual imagery and plan layout as part of the evaluation of design ability based on the two teaching methods, while there was significant difference in students' performance in visual application, display properties, entrance image, drawing presentation and refined model, as shown in Table 2:

Table 1 CBI & DI, Comparison of design ability's Mean and SD

Dependent variable		Independent variable	N	Mean	S.D.
Vision	visual imagery	DI	51	79.86	7.53
		CBI	51	81.37	7.77
	visual application	DI	51	77.25	7.75
		CBI	51	80.56	6.20
Space	Plane layout	DI	51	75.90	11.05
		CBI	51	79.94	9.84
	display properties	DI	51	77.70	7.99
		CBI	51	80.88	5.97
	entrance image	DI	51	76.98	10.47
		CBI	51	82.43	8.66
Representation	drawing presentation	DI	51	79.54	8.32
		CBI	51	84.13	5.58
	refined model	DI	51	76.47	10.24
		CBI	51	82.47	5.70

Table 2 CBI & DI，t-test of design ability

Dependent variable		Levene' test of equal variance		t-test of equal Mean		
		F	P-value	t	N	significant
visual imagery	Equal variance	0.057	0.811	-0.996	100	0.322
	Unequal variance			-0.996	99.895	0.322
visual application	Equal variance	0.544	0.462	-2.382	100	0.019*
	Unequal variance			-2.382	95.386	0.019
Plane layout	Equal variance	0.322	0.571	-1.948	100	0.054
	Unequal variance			-1.948	98.688	0.054
display properties	Equal variance	0.064	0.801	-2.273	100	0.025*
	Unequal variance			-2.273	92.546	0.025
entrance image	Equal variance	0.214	0.645	-2.863	100	0.005*
	Unequal variance			-2.863	96.599	0.005

drawing presentation	Equal variance	1.486	0.226	-3.268	100	0.001*
	Unequal variance			3.268	87.377	0.002
refined model	Equal variance	11.277	0.001*	-3.652	100	0.000*
	Unequal variance			-3.652	78.287	0.000

**p<0.05

Difference analysis on the creative performance of design works

The scores' Mean and SD obtained from the performance of skill and concept are shown in Table 3:

Table 3 CBI & DI, Comparison of entire and conceptual performance's Mean and SD

Dependent variable	Independent variable	N	Mean	S.D.
entire performance	DI 51		78.23	8.79
	CBI 51		83.86	6.48
conceptual performance	DI 51		79.39	7.63
	CBI 51		84.31	6.29

T-test was conducted on students' design works to identify whether there is significant difference in the two teaching methods. Results of F values through Levene's test are F =0.324, P =0.571>.05; and F =0.738, P = 0.393>.05. Since the p-values are all greater than the significant level of 0.05, the null hypothesis of equal variances is not rejected. Thus, the t-test under equal variances assumption is conducted and the results are: skill t=-3.677., P =0.000<.05; concept t=-3.554., P =0.001<.05, differences of both are significant as shown in Table 4:

Table 4 CBI & DI, t-test of entire and conceptual performance

Dependent variable		Levene' test of equal variance		t-test of equal Mean		
		F	P-value	t	N	significant
entire performance	Equal variance	0.324	0.571	-3.677	100	0.000*
	Unequal variance			-3.677	91.935	0.000
conceptual performance	Equal variance	0.738	0.393	-3.554	100	0.001*
	Unequal variance			-3.554	96.488	0.001

**p<0.05

4.2 Prediction analysis of the performance of design ability and creativity

To discuss the predicted correlation between the seven evaluation items of design ability and the creativity dimension, the multiple regression analysis was applied. Before conducting the multiple regression analysis, Pearson product-moment correlation was applied to obtain the correlation between the predicted variables and the criterion variables. The results shows that the correlation value between the entire creative performance, the conceptual performance and the seven evaluation items of design ability is within the range of 0.31~0.69, which

are in the middle range indicating that the Pearson correlation of the seven evaluation items is within the acceptable range.

Analysis of the entire performance of design ability and entire performance

According to Table 5, the effects of the seven evaluation items of design ability on the entire creative performance carried 72.3% interpretation from the adjusted R square indicating that the regression effect achieved significant level. Then, a post hoc test on individual independent variable was conducted. The results of entrance image (t=8.025, p =0.000<0.05) and delicate model (t=3.146, p= 0.002<0.05) were statistically significant. Result of estimated coefficient indicated that entrance image has the best interpretation with standardized regression coefficient 0.661. The result showed that the higher the score of entrance image, the higher the score of the entire performance. Delicate model is in the second place. Its standardized regression coefficient 0.214 indicated that its score will also affect the score of the entire performance.

Table 5 Regression data of the seven evaluation items of design ability and the entire performance

Statistic value / Variable	Regression coefficient	Standard error	T-value	Partial correlation coefficient	Standardized regression coefficient	P value	R square	Adjusted R square
visual imagery	0.140	0.076	1.851	0.188	0.131	0.067	0.745	0.723
visual application	0.014	0.078	0.178	0.018	0.012	0.859		
Plane layout	0.010	0.067	0.144	0.015	0.012	0.886		
display properties	-0.177	0.094	-1.891	-0.192	-0.156	0.062		
entrance image	0.544	0.068	8.025	0.640	0.661	0.000		
drawing presentation	0.103	0.086	1.188	0.122	0.093	0.238		
refined model	0.199	0.063	3.146	0.310	0.214	0.002		

Analysis of the conceptual performance of design ability and conceptual performance

According to the regression data in Table 6, the effects of the seven evaluation items of power design on the conceptual performance in creativity carried 72.3% interpretation from the adjusted R square indicating that the regression effect achieved significant level (F=33.921, P=0.000). Then, a post hoc test on individual independent variable was conducted. With the criterion of p<0.05, the results of visual imagery (t=4.321, p=0.000<0.05), plane layout (t=2.035, p=0.045<0.05), entrance image (t=4.306, p=0.000<0.05) and refined model (t=5.551, p=0.002<0.05) were statistically significant. A further result of estimated coefficient indicated that delicate model has the best interpretation with standardized regression coefficient 0.377. The result showed that the higher the score of refined model, the higher the score of the conceptual performance. The order is followed by entrance image (with standardized regression coefficient 0.355), visual imagery (with standardized regression coefficient 0.306) and plane layout (with standardized regression coefficient 0.176) which indicated that the scores of entrance image, visual imagery and plane layout will also affect the score of conceptual performance.

Table 6 Regression data of the seven evaluation items of design ability and the conceptual performance

Statistic Value / Variable	Regression coefficient	Standard error	T value	Partial correlation coefficient	Standardized regression coefficient	P value	R square	Adjusted R square
visual imagery	0.295 0.	068	4.321	0.409	0.306	0.000		
visual application	0.024 0.	070	0.339	0.035	0.023	0.736		
Plane layout	0.122 0.	060	2.035	0.206	0.176	0.045		
display properties	-0.163 0	.084	-1.937	-0.197	-0.159	0.056	0.745 0.	723
entrance image	0.263 0.	061	4.306	0.408	0.355	0.000		
drawing presentation	-0.024 0	.078	-0.312	-0.032	-0.024	0.755		
refined model	0.317 0.	057	5.551	0.499	0.377	0.000		

5. Conclusion

5.1 The difference of Case-based instruction (CBI) and Didactic instruction (DI) in the performance of design ability and creativity

This study suggested that CBI can enhance students' performance in their design works. Therefore, this study suggested that exhibition design teachers may apply CBI to enhance the performance in visual application, display properties, entrance image, drawing presentation and refined model. In addition, regarding the entire and conceptual performance in creativity, the average scores of CBI are also higher than the average scores of DI. T-test was conducted to examine the difference of each evaluation item, and the results showed that students' performance in their design works has significant difference between CBI and DI in terms of the entire and conceptual performance in creativity. It is suggested that teachers can apply CBI to enhance students' entire and conceptual performance and their creative performance.

5.2 Correlation between the evaluation items of design ability and creativity

The prediction analysis on the seven evaluation items of design ability about the entire creative performance indicated that the scores of entire performance in creativity can be predicted by entrance image and delicate model. In terms of the conceptual performance in creativity, a prediction analysis on the seven evaluation items of design ability by the regression method indicated that entrance image, refined model, visual imagery and plane layout are the four significant variables. Therefore, entrance image, refined model, visual imagery and plane layout are able to predict the conceptual performance in creativity. These variables can be used as references for teachers to guide students in enhancing their overall and conceptual performance in creativity. In other words, teachers can enhance students' performance in the four evaluation items as mentioned above during the design development process so that their works are more creative.

In summary, this study concluded that the scope of research on different teaching methods and exhibition design works is rather broad. In addition to the current study which emphasizes on the comparison between CBI and DI, there are still many other problem-oriented teaching methods worthy of further study. In terms of the evaluation

of exhibition works, based on the regression analysis on the evaluation of design ability, it is known that entrance image, refined model, visual imagery and plane layout are able to predict the overall and conceptual performance in creativity, but the weight of each evaluation item has not been cleared. It is suggested that future studies may be conducted by following this direction.

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