A STUDY ON DIFFERENCE BETWEEN CASE-BASED INSTRUCTION AND DIDACTIC INSTRUCTION ABOUT STUDENT'S WORKS PERFORMANCE OF THE EXHIBITION DESIGN

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Abstract: The methods of professional teacher’s 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, the visual imagery, visual application, plane layout, display properties, entrance image, drawing presentation, and refined model 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 model; (3) the influence of design ability and creativity on the entrance image, refined model, visual imagery and plane layout can estimate the whole and concept performance. Consequently, teachers are advised to apply to improve the creative performance of students. It also provides teachers with a reference in instructing students.

Keywords: Case-based Instruction(CBI), Didactic Instruction(DI), Exhibition Design, Design Education

1. Introduction

According to Kathryn McDowell (2002), the Director of City of London Festival, the fundamental approach to continued discovering of creative talents is education. The incorporation of creativity into education is the ultimate way to avoid a creativity dry-out. 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 (Jennu, 1991; Lu & Guan, 2003). Many scholars have explored issues such as case knowledge, case-based reasoning, case-based design (Gero, 1990; Kolodner, 1993). Cognitive psychologists suggest including Case-based Reasoning in teaching since this teaching activity is helpful for solving the problems of design (Shiao & Hung, 2000). Design is a thinking process to allow creativity to flow, as well as an education for professionals. Therefore, CBR is not only a design method in the domain of designs, but also a mature technique in design teaching. It can derive design
answers with efficiency. 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 (Scriven, 1976), and there is little discussion on the evaluation of students' post-learning works from the viewpoint of teaching process. Therefore, this paper intends to further explore the assessed items for the display of design works based on a literature review. To sum up the above research background and motivations, this paper sets out its major research purposes 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. Pestalozzi 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.

Scriven (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.

Based on the above, design is a process of problem identifications to problem solutions in the context of design processing. Therefore, the design of teaching techniques should also center on the development of problem-identifying and problem-solving capabilities of students. Regarding teaching activities, DI refers to the use of oral explanations or questions-and-answers, while CBI is an effective teaching method to encourage the development of problem-solving capabilities. However, neither teaching methods deal with the issue whether the final results have any influence on creative expressions. Therefore, this paper applies both DI and CBI in the actual scenarios of design teaching in order to explore the impacts of such teaching methods on the creative expressions in the final design outcomes in the curricula of exhibition design.

3. Research Method

The research design and flow is divided into four stages. The first stage is the literature review and analysis. The second stage is professional teacher panel discussion, to construct a list of assessed items for exhibition design students. The third stage is a quasi-experiment research method, and an empirical study with teaching experiments in classroom scenarios. The purpose is to clarify the expression variances of the two teaching methods. The experiment design during this stage consists of the research structure, research hypotheses, research targets, research tools and data statistics and analyses. The fourth stage is to perform data analyses with SPSS11.5, and discuss the results (Figure 1).

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. Therefore, this paper first refers to the elements mentioned in literature, initiates open discussions in workshops for professional teachers before finally presenting the list of elements and dimensions of work assessments.

3.1.1 Professional teacher panel discussion

Proceedings of the Panel Discussion

Workshops for professional teachers: This paper integrates the feedback from professional teachers and practitioners via a focus-group meeting designed for professional teachers in order to establish a basis for the list of assessed items for exhibition design works of students.

(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. There are two teachers for visual design, two teachers for space design and one practitioner in exhibition design. There are a total of five participants.

3.1.2 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, as shown in Table 1.
Table 1 Evaluation of exhibition design works

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Design Ability</td>
<td></td>
</tr>
<tr>
<td>Visual imagery</td>
<td>Visual imagery exhibition design activities</td>
</tr>
<tr>
<td>Visual application</td>
<td>Visual application exhibition design activities</td>
</tr>
<tr>
<td>Plane layout</td>
<td>Space allocations and moving line arrangements</td>
</tr>
<tr>
<td>Display properties</td>
<td>Design of display counters for the display of works</td>
</tr>
<tr>
<td>Entrance image</td>
<td>Design of the imageries at entrance of the display space</td>
</tr>
<tr>
<td>Drawing presentation</td>
<td>The expression of all the drawings for exhibition design</td>
</tr>
<tr>
<td>Refined model</td>
<td>Models for design works at reduced scales</td>
</tr>
<tr>
<td>Entire performance</td>
<td>Entire performance of completed works</td>
</tr>
<tr>
<td>Conceptual performance</td>
<td>Conceptual performance of space imageries in display works</td>
</tr>
</tbody>
</table>

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.

3.2.1 Experiment Structure

This includes an explanation about the relationship among control variables, independent variables and dependent variables. The independent variables are CBI and DI. The former is an explanation and analysis of a complete case study and the latter is teaching in the conventional lecturing method. The dependent variables observe whether there are significant variances in the design ability and creative expressions under two different teaching methods, and explore the correlation and interactions between the assessed items of design ability and the assessed items of creativity, the experiment structure as shown in Figure 2.

3.2.2 Definitions of Independent Variables and Dependent Variables

CBI: Case-based instruction refers to the teaching method where the focus is analyses and discussions of complete cases in a teaching scenario. Explanations are provided to facilitate data collations, analyses and discussions of study groups. DI: Didactic instruction is the teaching method where teachers lead and students follow. The focus of teachers is to complete the teaching according to curricula and schedules. Lectures on theories and principles are given in different teaching units. Students are not involved in data collations, analyses or discussions on any case studies.

Design ability: This refers to the expression of visual imageries, the plane layout of space planning, the design expressions on display tools and abilities in drawing and modelling.

Creativity: This refers to the general expressions and expressions in creative concepts.

<table>
<thead>
<tr>
<th>Control variables</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[Teacher Style and Teaching Environment]</td>
<td></td>
</tr>
<tr>
<td>The Control variables include the teacher background, and the experience, environment, schedule of teaching.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Independent variables</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[Teaching Methods]</td>
<td></td>
</tr>
<tr>
<td>CBI &amp; DI</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[The performance of students' design works]</td>
<td></td>
</tr>
<tr>
<td>Design ability &amp; Creativity</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 2 Experiment structure

3.2.3 Research Hypothesis

(1) There is no significant difference between CBI & DI in terms of the design ability and creativity in students' works.
- Whether there are significant variances in the expression of design ability by students under CBI and DI (Ho: μ1=μ2; H1: μ1≠μ2).
- Whether there are significant variances in the creativity expressions of students under CBI and DI (Ho: μ1=μ2; H1: μ1≠μ2)

(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.
3.2.4 Subjects

The subjects are the students taking classes in exhibition design. There are a total of 34 subgroups, and are randomly assigned into the experiment group and the control group and put under the actual teaching. The experiment divides the static-group comparative design techniques into two teams and different teaching methods are implemented. Each subgroup consists of five students in group A to receive CBI. There are a total of 17 subgroups in this experiment group, and 17 subgroups under group B control group.

3.2.5 Research Tool

The research tool is the assessment table for creative designs, based on literature review and discussion among the focus-group of professional teachers. The assessment contains experiment subjects, scoring standards, scoring methods and steps and tests on the reliability of scorers.

(1) Topic: Take the space design of living merchandise exhibition as an example. Design requirements include the visual imagery planning, plane layout and moving line arrangements for the overall space. Plane requirements include the entrance and imagery wall designs, plane layouts and moving line designs, exhibition tool designs and model productions.

(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. Scoring is in the range of 1 to 100 points based on the professional judgments of teachers. The scoring procedures are as follows: (1) the definition of key issues and formats; (2) numbering of students' works; (3) convening of meetings to give scores and explanations of scoring methods and procedures; (4) assessments by three teachers. The results are the inputs for the list of assessed items for exhibition designs constructed in the focus-group meeting for professional teachers. The final step is to perform a statistical analysis.

(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, as shown in Table 2.

Table 2 Reliability test of evaluators

<table>
<thead>
<tr>
<th>evaluator 1</th>
<th>evaluator 2</th>
<th>evaluators3</th>
</tr>
</thead>
<tbody>
<tr>
<td>evaluator 1</td>
<td>1</td>
<td>.798</td>
</tr>
<tr>
<td>evaluator 2</td>
<td>1</td>
<td>.793</td>
</tr>
<tr>
<td>evaluator 3</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

3.2.6 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

This paper conducts the experiments under CBI and DI on the exhibition design works of students (Table 3).

Table 3. Part of the works

<table>
<thead>
<tr>
<th>Student's Works / CBI</th>
<th>Student's Works / DI</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image 1" /></td>
<td><img src="image2.png" alt="Image 2" /></td>
</tr>
<tr>
<td><img src="image3.png" alt="Image 3" /></td>
<td><img src="image4.png" alt="Image 4" /></td>
</tr>
</tbody>
</table>
Difference analysis on design works' design ability performance: according to Table 4, regarding the design ability performance, the average score of CBI is higher than that of DI. The next step is to test whether there are any variances in the design ability expressed by design works of students under two teaching methods. This study performs independent-sample t-tests to validate the compliance with the fundamental assumption of homogeneity. Levene tests are conducted to verify the homogeneity of the variances in overall expressions and conceptual expressions. According to the results in Table 5, the visual images and floor layouts report $F = 0.057, P = 0.811 > 0.05$ and $F = 0.322, P = 0.571 > 0.05$, respectively, not reaching the statistical significance. Therefore, the null hypothesis that variances are equal is accepted. The next step is to review the raw in the hypothesis, $t = -0.996, P = 0.322 > 0.05$; $t = -1.948, P = 0.054 > 0.05$, not reaching the statistical significance. Therefore, the null hypothesis regarding these two teaching methods is accepted. In other words, there are no significant variances in the variances of visual images and floor layouts under these two teaching methods. Levene tests are also performed on other items of design ability, to test whether the variances in overall expressions and conceptual expressions are homogenous. The values for visual applications are: $F = 0.544, P = 0.462 > 0.05$, the values for display tools: $F = 0.064, P = 0.801 > 0.05$, the values for
entrance imageries: $F = 0.214, P = 0.645 > 0.05$), the values for drawing: $F = 1.486, P = 0.226 > 0.05$, the values for modeling: $F = 11.277, P = 0.001 < 0.05$. None of these five items reports statistical significance. Therefore, the null hypothesis that variances are equal is accepted. As far as $P$ values are concerned, the value for visual application is $P = 0.019 < 0.05$, the value for display tools: $P = 0.025 < 0.05$, the value for entrance imageries $P = 0.005 < 0.05$, the value for drawing: $P = 0.001 < 0.05$, the value for modeling $P = 0.000 < 0.05$. These numbers indicate significant variances in visual application, display properties, entrance imageries, drawing and modeling under the two different teaching methods.

**Table 4 CBI & DI, Comparison of design ability's Mean and SD**

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>visual imagery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBI</td>
<td>17</td>
<td>79.86</td>
<td>7.53</td>
</tr>
<tr>
<td>DI</td>
<td>17</td>
<td>81.37</td>
<td>7.77</td>
</tr>
<tr>
<td>visual application</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBI</td>
<td>17</td>
<td>77.25</td>
<td>7.75</td>
</tr>
<tr>
<td>DI</td>
<td>17</td>
<td>80.56</td>
<td>6.20</td>
</tr>
<tr>
<td>Plane layout</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBI</td>
<td>17</td>
<td>75.90</td>
<td>11.05</td>
</tr>
<tr>
<td>DI</td>
<td>17</td>
<td>79.94</td>
<td>9.84</td>
</tr>
<tr>
<td>display properties</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBI</td>
<td>17</td>
<td>77.70</td>
<td>7.99</td>
</tr>
<tr>
<td>DI</td>
<td>17</td>
<td>80.88</td>
<td>5.97</td>
</tr>
<tr>
<td>entrance image</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>CBI</td>
<td>17</td>
<td>76.98</td>
<td>10.47</td>
</tr>
<tr>
<td>DI</td>
<td>17</td>
<td>82.43</td>
<td>8.66</td>
</tr>
<tr>
<td>drawing presentation</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>CBI</td>
<td>17</td>
<td>79.54</td>
<td>8.32</td>
</tr>
<tr>
<td>DI</td>
<td>17</td>
<td>84.13</td>
<td>5.58</td>
</tr>
<tr>
<td>refined model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBI</td>
<td>17</td>
<td>82.47</td>
<td>5.70</td>
</tr>
</tbody>
</table>

**Table 5 CBI & DI, t-test of design ability**

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Levene' test of equal variance</th>
<th>t-test of equal Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>P-value</td>
</tr>
<tr>
<td>visual imagery</td>
<td>Equal variance</td>
<td>0.057</td>
</tr>
<tr>
<td></td>
<td>Unequal variance</td>
<td></td>
</tr>
<tr>
<td>visual application</td>
<td>Equal variance</td>
<td>0.544</td>
</tr>
<tr>
<td></td>
<td>Unequal variance</td>
<td></td>
</tr>
<tr>
<td>plane layout</td>
<td>Equal variance</td>
<td>0.322</td>
</tr>
<tr>
<td></td>
<td>Unequal variance</td>
<td></td>
</tr>
<tr>
<td>display properties</td>
<td>Equal variance</td>
<td>0.064</td>
</tr>
<tr>
<td></td>
<td>Unequal variance</td>
<td></td>
</tr>
<tr>
<td>entrance image</td>
<td>Equal variance</td>
<td>0.214</td>
</tr>
<tr>
<td></td>
<td>Unequal variance</td>
<td></td>
</tr>
<tr>
<td>drawing presentation</td>
<td>Equal variance</td>
<td>1.486</td>
</tr>
<tr>
<td></td>
<td>Unequal variance</td>
<td></td>
</tr>
<tr>
<td>refined model</td>
<td>Equal variance</td>
<td>11.277</td>
</tr>
<tr>
<td></td>
<td>Unequal variance</td>
<td></td>
</tr>
</tbody>
</table>

**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 6. The average scores of overall expressions and conceptual expressions in the creativity dimension show that the CBI is significantly higher than DI. Independent-sample t-tests are conducted on the scores of design works under the two different teaching methods in order to validate whether there are any significant variances. It is necessary to confirm whether the variances of the two populations are equal, before the t-tests, Levene tests are performed to verify whether the variances of overall expressions and conceptual expressions are equivalent. The values are $F = 0.324, P = 0.571 > 0.05$ and $F = 0.738, P = 0.393 > 0.05$, respectively, not reaching statistical significance. Therefore, the null hypothesis that variances are equal is accepted.
T-tests are performed to validate the hypothesis that variances are equal. The values for overall expressions are \( t = -3.677, P = 0.000 < 0.05 \) and the values for conceptual expressions \( t = -3.554, P = 0.001 < 0.05 \). Both sets of numbers reach statistical significance. Therefore, the null hypothesis that there are no variances in the two teaching methods is rejected. In other words, there are significant variances in overall expressions and conceptual expressions under the two teaching methods, as shown in Table 7.

### Table 6 CBI & DI, Comparison of entire and conceptual performance’s Mean and SD

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Independent variable</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>entire performance</td>
<td>DI</td>
<td>17</td>
<td>78.23</td>
<td>8.79</td>
</tr>
<tr>
<td></td>
<td>CBI</td>
<td>17</td>
<td>83.86</td>
<td>6.48</td>
</tr>
<tr>
<td>conceptual performance</td>
<td>DI</td>
<td>17</td>
<td>79.39</td>
<td>7.63</td>
</tr>
<tr>
<td></td>
<td>CBI</td>
<td>17</td>
<td>84.31</td>
<td>6.29</td>
</tr>
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</table>

### Table 7 CBI & DI, t-test of entire and conceptual performance

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Levene’s test of equal variance</th>
<th>t-test of equal Mean</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>P-value</td>
</tr>
<tr>
<td>entire performance</td>
<td>Equal variance</td>
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<tr>
<td></td>
<td>Unequal variance</td>
<td></td>
</tr>
<tr>
<td>conceptual performance</td>
<td>Equal variance</td>
<td>0.738</td>
</tr>
<tr>
<td></td>
<td>Unequal variance</td>
<td></td>
</tr>
</tbody>
</table>

**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 show 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 8, 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. Refined 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.

Analysis of the conceptual performance of design ability and conceptual performance: According to the regression data in Table 9, 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 refined 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 8 Regression data of the seven evaluation items of design ability and the entire performance**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Statistic value</th>
<th>Regression coefficient</th>
<th>Standard error</th>
<th>T-value</th>
<th>Partial correlation coefficient</th>
<th>Standardized regression coefficient</th>
<th>P value</th>
<th>R square</th>
<th>Adjusted R square</th>
</tr>
</thead>
<tbody>
<tr>
<td>visual imagery</td>
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<td>0.140</td>
<td>0.076</td>
<td>1.851</td>
<td>0.188</td>
<td>0.131</td>
<td>0.067</td>
<td></td>
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<tr>
<td>visual application</td>
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<td>0.014</td>
<td>0.078</td>
<td>0.178</td>
<td>0.018</td>
<td>0.012</td>
<td>0.859</td>
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<td></td>
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<tr>
<td>plane layout</td>
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<td>0.144</td>
<td>0.015</td>
<td>0.012</td>
<td>0.886</td>
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<td></td>
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<tr>
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<td>0.094</td>
<td>-1.891</td>
<td>-0.192</td>
<td>-0.156</td>
<td>0.062</td>
<td>0.745</td>
<td>0.723</td>
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<tr>
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<td>0.544</td>
<td>0.068</td>
<td>8.025</td>
<td>0.640</td>
<td>0.661</td>
<td>0.000</td>
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</tr>
<tr>
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<td>0.086</td>
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<td>0.093</td>
<td>0.238</td>
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<tr>
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<td>0.063</td>
<td>3.146</td>
<td>0.310</td>
<td>0.214</td>
<td>0.002</td>
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</tbody>
</table>

**Table 9 Regression data of the seven evaluation items of design ability and the conceptual performance**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Statistic value</th>
<th>Regression coefficient</th>
<th>Standard error</th>
<th>T-value</th>
<th>Partial correlation coefficient</th>
<th>Standardized regression coefficient</th>
<th>P value</th>
<th>R square</th>
<th>Adjusted R square</th>
</tr>
</thead>
<tbody>
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<td>0.295</td>
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<td>0.409</td>
<td>0.306</td>
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<td>0.339</td>
<td>0.035</td>
<td>0.023</td>
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<td>0.408</td>
<td>0.355</td>
<td>0.000</td>
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<td></td>
</tr>
<tr>
<td>drawing presentation</td>
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<td>-0.032</td>
<td>-0.024</td>
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<td>0.499</td>
<td>0.377</td>
<td>0.000</td>
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</table>

5. Conclusion
5.1 The difference of CBI and 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 refined 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.

6. References