

Development of Teaching-Learning Method Using Verbal, Visual Analogy¹ Focused on the Instances of Furniture Design

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Abstract: The objective of study is to suggest using methods of analogy increases one's creative output. An experiment was conducted for the study under three different conditions in which one keyword, keywords, and visual images were given to subjects. Therefore in teaching and learning, more creative output will result if verbal analogy by keywords is given to students with high sketching ability and visual analogy by visual images is given to students with low sketching ability. And educators should guide students with low sketching ability to fully develop one or two of their divergent ideas that are generated so that an evolved idea may be achieved.

Key words: *Creativity Enhancement, Verbal Analogy, Visual Analogy.*

1. Introduction

Education in design prepares students for a technical and professional role. However, in order to enhance the ability for creative design problem solving, as according to Nigel Cross, methodology 'knowing how' should be emphasized rather than 'knowing what', the technical ability. In this respect, an examination of the current design education methodology in improving the critically important creativity is necessary. This work is meant to build upon the previous works [1, 4] and compare the usage of actual analogy in eliciting creativity in design. Therefore, the experiment within this research has been conducted in controlled conditions with the objective of suggesting ways to develop students' creativity through the usage of analogy. The experiment gave students, who are majoring in interior design, a task of designing furniture. All subjects students were given three tasks constrained by: a single keyword, several keywords, and visual images.

2. Literature Review

2.1 Creativity and Creative Thinking

The notion of creativity, the production of creative work that is both original and practical [3] is widely known in design. In a model of creative process, 'preparation-incubation-illumination or insight-verification' the revelation phase of creative idea is 'illumination or insight'. In this phase designer's thinking would encounter creative leap.

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In relevance to creative leap Rosenman and Gero suggested: analogy, combination, transformation, first principle, and emergence [2]. Among them analogy acts as a basis of creative design.

2.2 Analogical Reasoning

Analogy in problem solving is inductive in nature and is used to make new applicable rules by shifting knowledge from source area to target problem. Analogy connects two previously unrelated ideas and allows the two to be interpreted from a new perspective. Thus, analogy depends on recognizing and exploring the similarity between the source and the target in the mapping process. Analogy could produce creative design with novel concept or form by closely connecting source with target, based on prominent characteristic relation. Therefore, analogy is a method that could be very helpful in the phase of concept formation and design.

2.3 Verbal and Visual Thinking

In design, visual language is more frequently used than verbal language. If one uses visual language, such as drawing, diagram, image and etc., in solving design problems, visual analogy activates the right-directed thinking, which leads to the generation of ideas. Verbal analogy is also helpful in solving problem solving [5] because verbal analogies stimulate the left-directed thinking, which then uses verbal language as a clue for a concept or an idea. Therefore, in the experiment conducted in the study, verbal analogies and visual analogies were provided for the subjects.

3. Experimental Study

3.1 Method and Evaluation

(1) Subjects

25 sophomores majoring in interior design voluntarily participated in the experiment.

(2) Design Task and Experimental Conditions

Three tests were conducted once a week from March 11th to March 25th in 2009. The subjects had to design a chair but were put into three different environments. In test 1, only the keyword, 'Fun' was provided. In test 2, 50 keywords related to the idea of 'fun' were provided. In test 3, 16 visual images of 3-dimensional modeling were given in order to examine the effect of visual analogy compared with verbal analogy.

(3) Setting

The tests were conducted in a lecture room with personal work tables. 25 subjects wrote down design concept, sketched idea, and presented final design sketch on A4 papers. An allotted time was 40 minutes for each test.

(4) Assessment

Three design educators occupied as judges and assessed each subject's verbal data and sketches both qualitatively and quantitatively. In qualitative assessment a subject's level was classified into three types: the evolving type (successful level), the divergent type (transitional level), and the poor conversion type (unsuccessful level) according to 'problem solving type by analogy' [1]. For quantitative assessment, there were seven criteria, such as sketching ability, practicality and originality of the furniture designs, for each of the tests conducted. Each criterion was rated one out of five points with five points being the highest. Sketching ability was included in the assessments for looking out whether it has correlation with subordinate items of creativity, practicality and originality or not.

3.2 Analysis Result

3.2.1 Qualitative Assessment

Subjects' verbal data and sketches were analyzed with content analysis (Krippendorff, 1980), and 25 subjects' level was classified into three types. The result of the analysis was as follows: 'evolving type' 24% (6/25); 'divergent type' 64% (16/25); 'poor convergent type' 12% (3/25).

3.2.2 Quantitative Assessment

(1) Inter-Rater Agreement among Judges

Inter-rater agreement among three judges was computed using Pearson's coefficient of correlation with SPSS 12.0 program. Judges' data in seven assessment items had confidence, significance $p < 0.05$ (confidence interval 95%). Seven assessment items based on three judges' rate were relatively compared.

(2) Mean of Evaluation Items

Figure1 represents 25 subjects' relative value in seven different assessment items. Figure2 is overall mean of seven assessment items. The result of the experiment showed that the scores of practicality and originality for test 2 and 3 (P2 & O2, P3 & O3) were higher than the scores for test 1 (P1 & O1). That is the reason why subjects could use various keywords and visual images as clues for design problem solving in test 2 and 3.

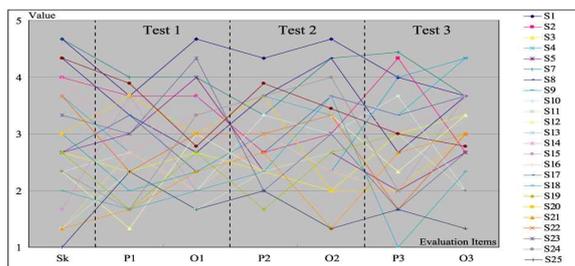


Figure.1 Subjects' relative value in 7 items

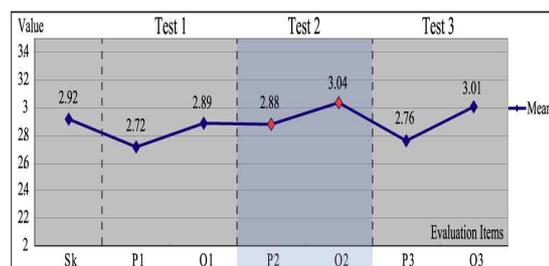


Figure.2 Mean of 7 items

(3) Cluster Analysis

Sketching ability statistically correlated with all assessment items. The two clusters were classified by hierarchical cluster analysis according to the scores of sketching ability.

Since cluster 1, subjects with high sketching ability, scored above 3 points in all means of practicality and originality (P1 & O1, P2 & O2, P3 & O3), these subjects have higher possibility of achieving creative results in any of the three tests. Verbal analogy by various keywords like test 2 is more effective for subjects in cluster 1. On the other hand, cluster 2, subjects with lower sketching ability, has lower possibility of getting creative results in any of the three tests. Nevertheless, verbal analogy by keywords as in test 2 served to improve the subjects' practicality while visual analogy by visual images as in test 3 served to improve the subjects' originality. When the methods of analogy have been individually sorted according to the high scores of practicality and originality effective methods of analogy for 21 subjects could be divided. Table 6 shows effective using methods of analogy by quantitative analysis and type of problem solving by qualitative analysis. On the matter of the most effective using method of analogy, 50% of the subjects in cluster 1 benefited from verbal analogy of test 2, and almost 50% of the subjects in cluster 2 benefited from visual analogy of test 3. In addition, 50% of the subjects in cluster 1 generated ideas of evolving type, and almost 70% of the subjects in cluster 2 generated ideas of divergent type.

Table 1. Using methods of analogy and type of problem solving according to cluster

Cluster		Effective using method of analogy			Type of problem solving by analogy		
		Test 1- a keyword	Test 2- keywords	Test 3- visual images	Evolving	Divergent	Poor conversion
1	Subject's No.	S2, S7	S1, S6, S8, S22	S4, S14	S1, S4, S6, S7	S2, S8, S14	S22
	Percent	25% (2/8)	50% (4/8)	25% (2/8)	50% (4/8)	37.5% (3/8)	12.5% (1/8)
2	Subject's No.	S5, S20, S23	S10, S16, S18, S24	S3, S9, S13, S17, S19, S21	S5, S23, S24	S3, S9, S10, S13, S16, S17, S18, S19, S20	S21
	Percent	23.1% (3/13)	30.7% (4/13)	46.2% (6/13)	23.1% (3/13)	69.2% (9/13)	7.7% (1/13)

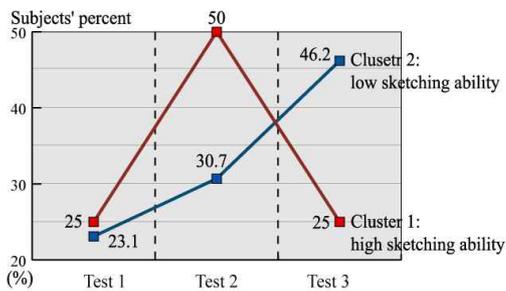


Figure. 3 Using methods of analogy

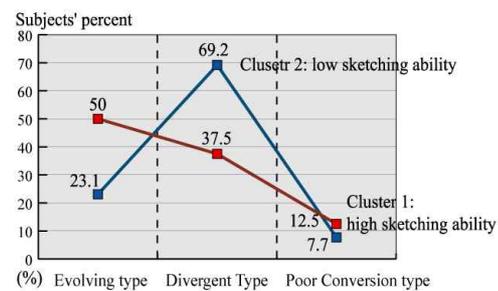


Figure. 4 Type of problem solving by analogy

4. Conclusions

According to the results of this study, providing various keywords is more effective in producing creative designs for students with high sketching ability. On the other hand, students with low sketching ability would have lower possibility of achieving creative results via such verbal analogies. Nevertheless, verbal analogy by keywords is still effective for increasing the practicality of the design and visual analogy is effective for enhancing their originality. Also 50% of the students with high sketching ability generate ideas of evolving type, and 70% of students with low sketching ability generate ideas of divergent type. If educators apply these results in teaching-learning method, it will be more effective to use verbal analogy by keywords for students with high sketching ability and to use verbal, visual analogy for students with low sketching ability. And educator should guide students with low sketching ability to evolve one or two among divergent ideas.

5. References and Citations

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