

Communication Model of Design Education based on Research into the Creative Thinking Process

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Abstract: The aim of this research is to examine the knowledge acquisition process in design education. In this research, the author indicated a tentative assumption for constructing a 'Learning – Teaching Communication' Model in order to build up the educational programs for the students of the Design faculty, Tsukuba College of Technology (TCT). A unique feature of this research is that it is trying to understand the communication process between educators and students by replacing into co-creative process models. After the consideration, which was based on the results of the empirical studies, a model of the co-creativity in design education was proposed as the outcomes, which was modified and layered on the general model of creative design thinking process. From this model, it became evidently become clear that using metaphors would stimulate the students' creativity in the early stage of the design process.

Key Words: Creativity, Design, Education, Knowledge acquisition, Learning, Model, Thinking process, Visual communication

Introduction

The author would introduce several significant approaches to the study of creativity and produce the relationships with this research. To construct a model of creative thinking process will be a starting point to construct a model of design education, which will be built on the research into the communication process and the co-creativity between the educators and the students.

In this paper, the author described a model of Learning and Teaching in design education, based upon the studies on the creative thinking process in design, which were proposed by Nagai and Noguchi (2001, 2002).

Also, the author aimed to improve the model especially for the hearing impaired students in Tsukuba College of Technology. For that purpose, the author has attempted understanding the structures of the creative thinking process in design.

For considering the design education, it is meaningful to understand about the features on each phase of the creative thinking process in design. Therefore, a model of creative thinking process was modified in order to represent design processes of the students based on time lines.

Second, the learning process of the students was superposed on the time lined process model. In case of creativity, the students' behavior could be compared with the process model in order to infer which phases the subjects were in. Based on the

verification between them, some important elements would be extracted as clues for considering what support could be useful to the students' learning. Also, they could be considerable keys for constructing a model of teaching in design processes.

Third, the learning process model and the design teaching model would be integrated as a communicational model of 'Learning – Teaching process' in design education.

However, the communication model was not completed yet in this study, the author believed that several important elements could be extracted from the design processes based on this model. These elements can be collated with the practical cases of design classes in TCT. For example, the roles of metaphors were emphasized because they had effective functions in the stage of generate semantic meanings, which advanced the design thinking. It is desirable to build up such a logical base because of the feasibility toward the better methodologies of the education for hard of hearing or impaired students, as well as the contribution to meet our expectations.

The author aimed at an educational process model which can be built on the approaches in cognitive science research. These approaches are emphasized in order to elucidate the nature of creativity in design. Furthermore, understanding the structure of the creative thinking process is important for a theoretical base of design education. Therefore, in this paper, the features of design thinking e.g., the problems of 'originality', 'mental imagery', 'insightfulness', and 'design fixation' would be focused on.

3. Background of the research

3-1. Basis of the Creativity Research

It is necessary to take up several significant researches on creativity, which made the base of this research. Practical approaches are usually quoted for research of design thinking. 'Brain storming' by Osborn (1953) is useful for developing the designers' divergent thinking. 'Synectics' by Gordon (1961) is based on the theory of analogical reasoning. Both are fundamentals for the research of the designers' creativity. The characteristics of the artists' creativity were investigated and pointed out by Getzels and Chsizentmihalyi (1978). Recently, research on the creativity tends to be based on the cognitive science and the cognitive psychology. The 'Creative Cognition' (Finke et al.) gives much evidence for studies about creative thinking process.

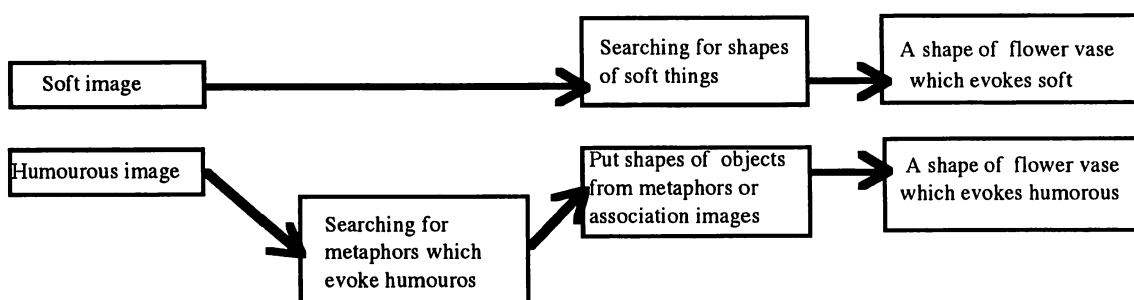


Fig. 1 Simple path model

This model is from an experiment for investigating the student designers thinking process while comparing two different keywords, Soft imaged or Humorous image'. The task was 'Designing a flower vase'.

3-2. Cognitive research approaching design creativity

The author introduced the previous studies by Nagai and Noguchi in order to reveal the relationships with this research. The aim was to understand the creative thinking process in design. Therefore, the design experiments were carried out since 1999. Protocol Analysis and evaluations of the drawing process were adopted in the experiments. Based on the results of the experiments, the authors showed the thinking path models (Figure 1, 2, 3).

The 'Geneplore Model', which was presented by Finke, Ward, and Smith has been frequently excerpted in cognitive science (Figure 4). Geneplore Model represents the relationships with the generative process and exploratory process by being placed on the pre-inventive structure, and put the constraints, which play as an important role

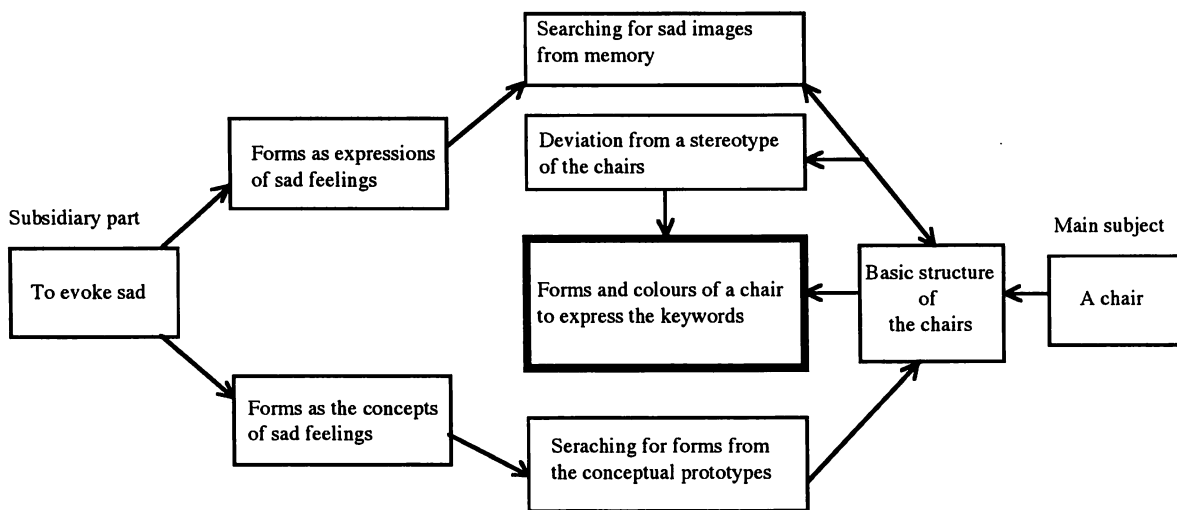


Fig. 2 Path model of student designer

This model is from an experiment to investigate the student designers thinking process from a keyword which is difficult to generate forms.

Thinking path of creative design process

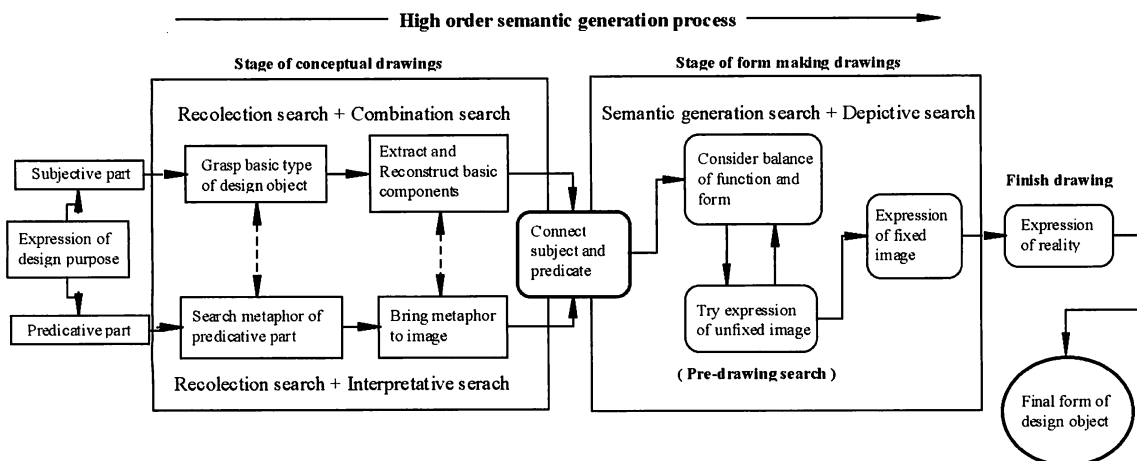


Fig. 3 A model of creative design process

between them. Candy and Edmonds show a model of co-creativity, which was modified from the Geneplore Model as a communication model, 2002 (Figure 5). That model was constructed on the basis of the observation of the artists and the technologists who focused onto their co-creativity, during sufficient days long. These two models are important clues for considering the cases that have been going on in the fields in design education of TCT.

In this research, the author described a study which attempted to reconstruct the model of learning and teaching in the creative design process developed from the general creative thinking process model, upon these models.

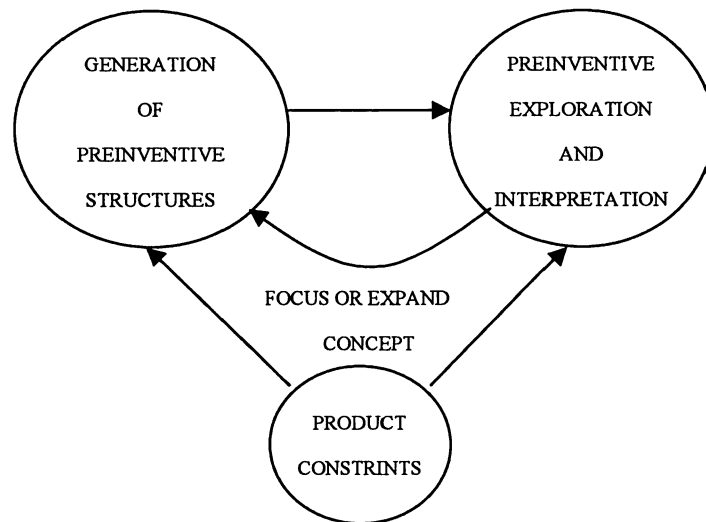


Fig. 4 Geneplore Model, by Finke, Ward, Smith

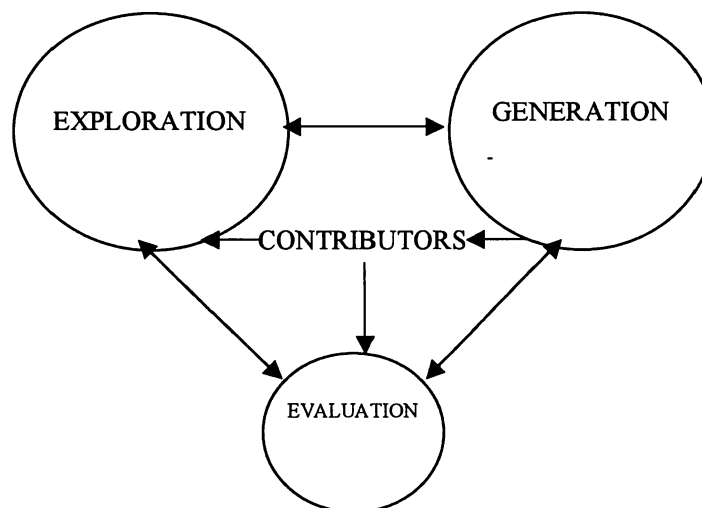


Fig. 5 A model of Creative Activities with Contributors

4. A Model of General thinking process in creative design

4-1. Thinking Path Model

In order to understand the design creativity, Nagai and Noguchi (2000) conducted several design experiments. Based on this empirical research, the authors proposed the thinking path models in design. In this thinking path model, design goal description was separated to understand by the subjects at the beginning of the tasks. Design goal description was recognized as a set of the main part and a predicated part. By giving an unusual keyword to make easy catching for the students' thinking process, the authors extracted the creative thinking paths of the subjects (Figure 6).

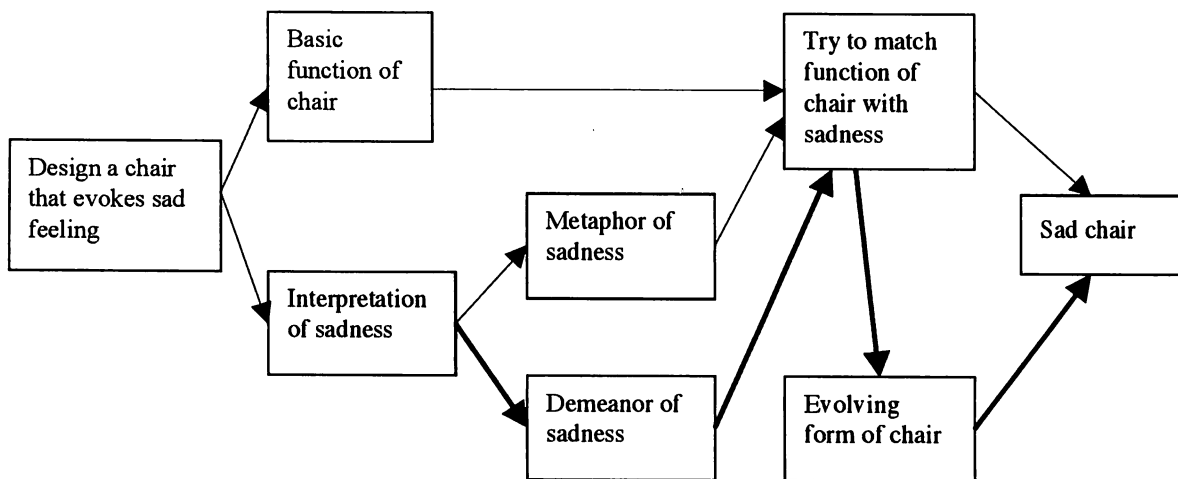


Fig. 6 Thinking path model

4-2. Creative Thinking Process

The results of the experiments, which were conducted by Nagai and Noguchi (2001) were gathered. They showed generated thinking paths of the subjects' thinking processes in designing. The task was 'design a tape dispenser, which is beautifully shaped and evokes a soft image.' The purpose of the experiments was to investigate the subject's creative thinking process in design and to understand details of transforming the process from the keywords to the visual images. In the experiments, several search modes were recognized. The authors identified that the most significant features of designers' creativity emerged in the phase of semantic generation search.

In this thinking path model, the first stage was the searching phase, which corresponds to images in memories. It can be named 'Reconstructive search' and 'Interpretative search' as divergent thinking phases. In this stage, the subjects were trying to recall as many clues as possible and drew them as rough sketches to give senses themselves, temporarily. Then, the subjects could move to the most important stage, named Semantic generative search, for structuring the design objects. There are mainly two stages of the drawings in the designers thinking process. The former one is called Schematic drawing, and the latter one is called 'Expressive drawing' (Figure 7).

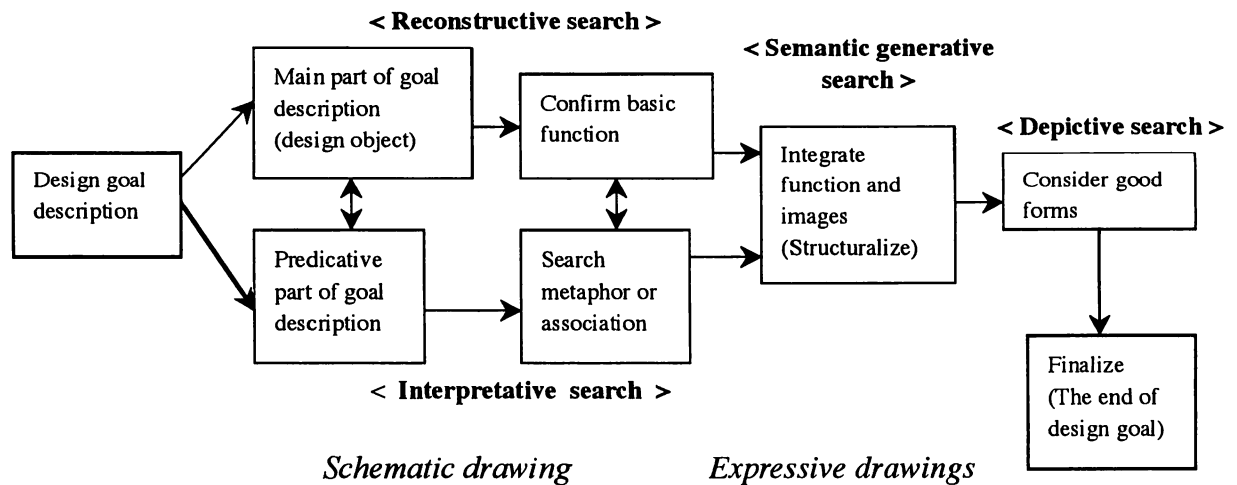


Fig. 7 General Thinking Path Model of Creative process in Design

4-3. Design Learning Process

In this research, the author tried to re-describe the Path Model from the subjects' viewpoints. To examine the model, the protocol data of the experiments were analyzed again and the features of each phase were realized. For example, metaphors associating the predicative part of the keywords often used at the phase of 'Interpretative search', which was the early stage in the process.

The author indicated that it was needed to replace the other objective viewpoint on the model and examined it from the angle of design education. Educators' viewpoint can be considered as having the common objectivity. Consequently, the phases in the model would be represented and described more generally, because the category was a more abstract one.

4-4. Learning-Teaching interaction process from case studies

Through the looking at the creative thinking path model again in order to discover new indications, the author paid attention to the first stage of thinking in which the subjects search for the images divergently. An assumption for design education was found out based on the results of the analyzing data from the subjects' protocols and interviews. When the students thought to understand the design goal description on dividing the keywords into the main part of goal description and the predicative part of it, they tried to confirm the basic function, which should be realized. Also, they search for the metaphors or relationships, which correspond to the keywords. The former part is recognized as the design object. In the case of the experiments of Nagai and Noguchi 2000, the subjects recognized the word that was a chair as the design object on the design tasks. The task was 'designing a chair which evokes sad feelings'.

Smith, Ward, and Schumacher (1991) tested the effects of providing fixating examples on idea generation in a creative production task in which there was not a specific, hidden solution. The result was that the two groups, in the fixation condition and in the control condition, generated approximately the same average number of designs. The group, which had seen the examples, was far more likely to generate ideas that contained the features of the examples.

4-5. A model of design education from the viewpoint of communication process

These results were applied to the communication model of design education, and it becomes a very important key when we understand the design process concretely. It can be considered that if educators show the examples of design to the students when they developed schematic reasoning, it can be effective to the students' creativity. It is consulted what timing in design process will be effective when the educators show some visual examples to the students. If the students are in the phase of schematic reasoning, it can be effective to develop the students' creativity. But, on the other hand, when the educators show the examples to students before they make framework, could be restricts their idea from freethinking.

It is also considered to be valuable planning of education based on the model and it is important thing for supporting to the students design thinking.

As the outcomes of the research, a model, which represents the communication process between the students and an educator, is proposed (Figure 8).

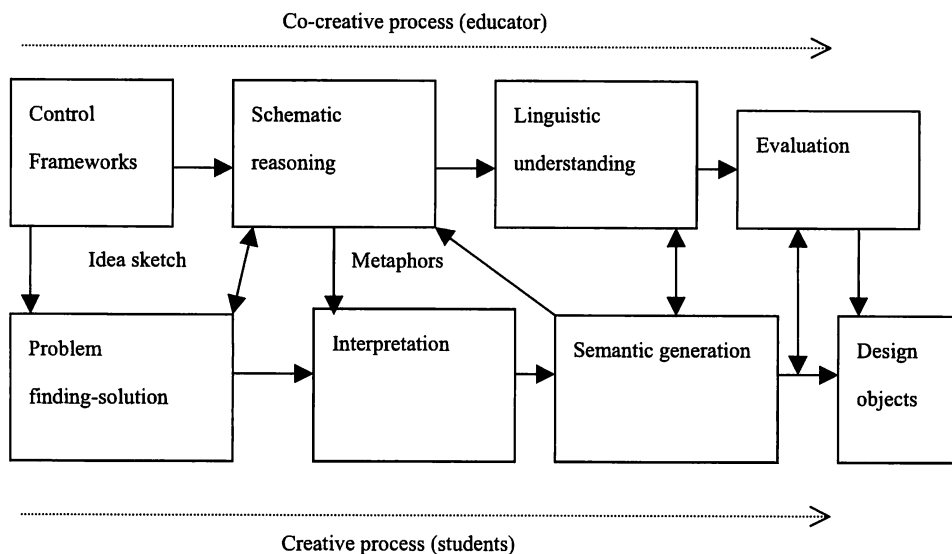


Fig. 8 Communication model of design education

The author would like to indicate that the teaching meant the communication process with the students, and then it would be possible to be considered as a co-creative process. In other words, design education can be considered as supporting the students' knowledge acquisition process of designing. To have a consciousness of that, the educators can make effective support, such as how to become free from the design fixation when the students need to develop ways of thinking. Modeling the students' creative thinking is profitable to confirm what matters of importance are on each stage of their learning processes.

The reason of the importance of constructing a model of learning and teaching is to understand features of the construction of the creative thinking process and it would be useful to support human creativity in design work.

Also, the reason why it should be based on the thinking process model is to understand that for the features of the human creativity important fundamentals for the design knowledge should be made. In order to consider about the design education,

especially on the education to hearing hard or impaired student, the communication process should be considered as a co-creative process. Educators should understand what is expertise in design from a more abstract viewpoint.

Conclusion

- (1) For considering the design education, it is meaningful to understand about the features on each phase of the creative thinking process in design.
- (2) For understanding the creative thinking process in design, the previous studies by Nagai and Noguchi were introduced in order to reveal the relationships with this research.
- (3) Therefore, a model of creative thinking process was modified in order to represent design processes of the students based on time lines.
- (4) Finally, a tentative assumption model was proposed for constructing a base of 'Learning – Teaching Communication' Model in order to build up the educational programs for the students of the Design faculty, Tsukuba College of Technology–TCT.

Reference

- 1) Boden, M.: The creative mind: Myth and mechanisms, Basic Books, New York, 1991.
- 2) Candy, L and Edmonds, E.: Modeling co-creativity in art and technology, Proceedings of the 4th Creativity and Cognition Conference, C&C02, ACM Press, 2002
- 3) Candy, L. and Hori, K.: Creativity and Cognition Comes of Age C&C02 Conference Report, 2002
- 4) De Bono, E.: New think: the use of lateral thinking in the generation of new ideas, Basic Books, New York, 1975.
- 5) Ericson, K.A. and Simon, H.A.: Protocol analysis, The MIT Press, Cambridge MA, 1984.
- 6) Finke, R.A., Ward, T.B. and Smith, S.M.: Creative Cognition, The MIT Press, Cambridge MA., 1992
- 7) Finke, R.A. and Slayton, K.: Explorations of creative visual synthesis in mental imagery, Memory and Cognition, 16, 252-257, 1988.
- 8) Gardner, H.: Art, mind, and brain: A cognitive approach to creativity, Basic Books, New York, 1982
- 9) Getzels, J.W. and Csizentmihalyi, M.: The creative vision: A longitudinal study of problem finding in art. Wiley, New York, 1978
- 10) Gordon, W.: Synectics: The development of creative capacity, Harper & Row, 1961
- 11) Nagai, Y and Noguchi, H.: How designers transform keywords into visual images, Proceedings of the 4th Creativity and Cognition Conference, C&C02, ACM Press, 2002
- 12) Nagai, Y and Noguchi, H.: How designer Think with Keywords in design Process?, Bulletin of the 5th Asian Design Conference, International Symposium on Design Science 2001, pp55-CD index 76
- 13) Osborn, A.: Applied imagination. Charles Scribner's Sons, New York, 1953