A Study on the Cognitive Differences between Beginners and Experts Regarding Cooking Processes

Keisuke Ishihara[1], Toshiki Yamaoka[2], Kazumi Tateyama[3], and Chinatsu Kasamatsu[4]

[1] Wakayama University Graduate School of Systems Engineering
930, Sakaedani, Wakayama City, Wakayama, 640-8510, Japan
[2] Wakayama University Faculty of Systems Engineering
930, Sakaedani, Wakayama City, Wakayama, 640-8510, Japan
[3] Institute of Food Sciences & Technologies Ajinomoto Co., INC
[4] Institute for Innovation, Ajinomoto Co., INC
yamaoka@center.wakayama-u.ac.jp

Abstract. The purpose of this study is comparative studies on cognitive process between beginner and expert in cooking. The twelve elements of the cognitive process were extracted. The relationships among elements were cleared by DEMATEL. Finally, we suggested the cognitive models in cooking.

Keywords: mental models, cognitive process, cognitive model.

1   Introduction

When users look at recipe, they use their mental models. If the distance of the mental models between users and designers is too far, the users can't understand the recipe accurately. Therefore, it is important to understand the user's cognitive models and mental models. To investigate user's mental models, it is necessary to consider from various viewpoints the process of constructing a cognitive model. In fact, the areas of interface design, it's often said that the mental models are important to understandable interfaces [1]. Therefore, the purpose of this study is comparative studies on cognitive process between beginner and expert in cooking. In this study, we investigated cognitive model of beginners' and experts' during cooking.
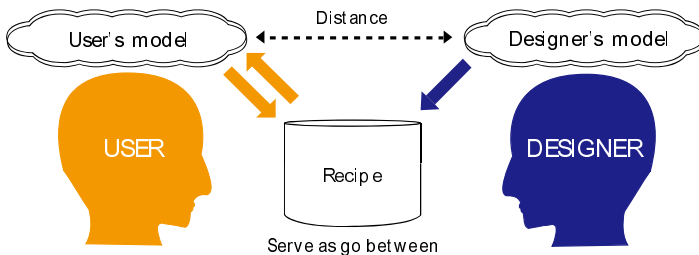
Fig. 1. The interaction between user and designer

2   Method

The participants of this study were fifteen female college students (Mean age 20.07, SD 1.29) and three experienced cookers (Mean age 38.33, SD 4.03).

In the experiment, the protocol analysis and the interview were used to understand their cognitive process. After the explanation for experiment, the participants practiced the protocol analysis. They cooked the same task according to instruction. When they were cooking, their behaviors and utterances were observed by a video tape recorder (Fig. 2, Fig. 3).

Fig. 2. Experiment circumstance   **Fig. 3.** Image of videotaped sessions

3   Result

3.1   Extract of Element in Cognitive Process

The video data of participants' behaviors and utterances were converted into flowcharts. After that, we extracted the element of cognitive process based on Norman's gulf model [1] as a standard. In this result, the twelve elements of the cognitive process were extracted. The proposed cognitive process and elements are outlined below.

A. Look at the recipe: It is the acts to search information for cooking.
B. Goal setting: It is the process that decides on the goal of act.
C. Adapt models: It is process that uses the mental models.
D. Inference: It is the process that forming a notion based on the mental models.
E. Trial and Error: It is the act to structure the mental models.
F. Planning: It is the process that decides on the best way before taking act.
G. Action: It is the act that execute as planned.
H. Ingenuity: It is the act that users exercise their ingenuity for greater efficiency.
I.   Perceive and Interpret: It is the process that perceive and interpret.
J: Evaluation: It is the process that users evaluate the results of object.
K. Recognition of error: It is the cognition that the act was errors or mistakes.
L: Recognition of goal: It is the cognition that the goal was achieve.

3.2   Relationship of Elements of Cognitive Process

The DEMATEL method was used to understand of relationships among the twelve elements of the cognitive process. The DEMATEL is method which the elements structural, data visibility as well as the data's influence relationships can be made clearer from the data's position [2]. The relationships of Students' elements are shown Fig. 4 and experienced cookers' are shown Fig. 5.
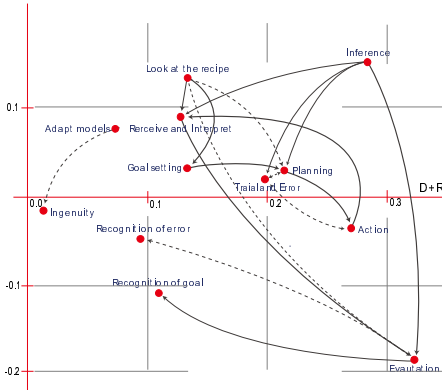

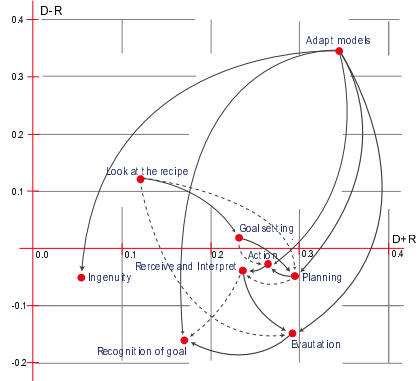**Fig. 4.** DEMATEL data of beginners   **Fig. 5.** DEMATEL data of experts

Result of DEMATEL method of students (Fig.4) showed that the main flow were "Look at the recipe"→ "Goal setting"→"Planning" →"Action"→"Perceive and Interpret"→ "Evaluation"→ "Recognition of goal" , "Inference"→"Planning" or and "Inference"→"Evaluation". In particular, "Look at the recipe" and "Inference" was most important elements for students.

On the other hand, Result of experienced cookers (Fig.5) showed that "Adapt models" was most important elements for students. However, the main flow "Look at the recipe"→ "Goal setting"→"Planning" →"Action"→"Perceive and Interpret"→ "Evaluation"→ "Recognition of goal" were same as students.

4   Discussion

The result of this study shows that the students checked certainly the recipe before performing. Also the results of interviews proved that they didn't have the experience and knowledge of cooking. To cover these disadvantages, they were depending strongly on the recipe and inference based on their mental models. We think that beginners depend on the recipe stronger than experts'. Beginners structured mental models by recipe and their selves' inference to cover experience and knowledge. If beginners could only receive the information without errors, they can easily understand the process.

On the other hand, experienced cookers were cooking using their mental models that were constructed from the experience and knowledge at all cooking process.

Because they understood what to do next, they were able to understand the meaning of cooking process. Their differences have an enormous influence on the cooking process. Compensated beginners' mental models with recipes are most important things for them to cook without mistake. In finally, based on the relationships of elements, we would like to suggest the cognitive model between beginner and expert in cooking process as shown in Figure 6. We think it is possible to analyze the meaning of the cooking action if use this model. To determine the reason for the errors from each stage designers, it can lead the quality improvement of recipe design.
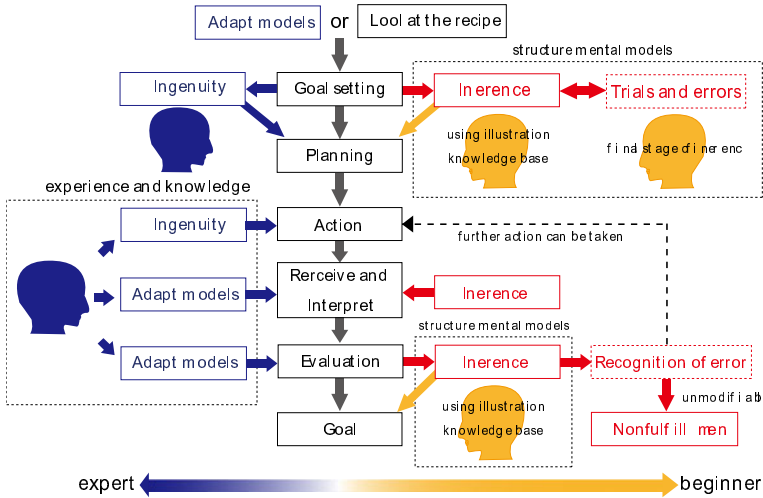

Fig. 6. The cognitive model between beginner and expert in cooking process

5 Conclusion

The purpose of this study is comparative studies on cognitive process between beginner and expert in cooking. The model of cognitive process between beginners and experts were showed by fig.6. The model of fig.6 can be used to determine the reason for the errors from each stage. In order to narrow the distance between User's model and Designer's model, designers should design using this model.

References

1. Norman, D.A.: Psychology of Everyday Action. In: The Design of Everyday Things, pp. 45–46. Basic Book, New York (1988)
2. Lee, Y.C., Hu, H.Y., Yen, T.M., Tsai, C.H.: Kano's Model and Decision Making Trial and Evaluation Laboratory Applied to Order Winners and Qualifiers Improvement. Information Technology Journal (7), 702–714 (2008)