1. INTRODUCTION

This study aims to research how individual sensitivity is expressed through color evaluation and expression based on experience obtained from the environment. The experience is divided into “visual” unconscious experience such as natural environment, and the experience obtained from “design education” in order to understand a difference between those who have design experience and those who do not.

This study analyzes the effects of environmental elements experienced from the past on color expression. Significance of color expression is on representing oneself and communicating with others. This study has analyzed the relation between color expressing behavior and experience factor by observing distinctive acting marks when subjects are coloring as a given task. Specifically, we measured subjects’ behavior while they were expressing colors, using video recording facilities and infrared relation between color expression and experience factor by collecting and analyzing data, applying protocol analysis. Namely, we observed hand gestures or body movements expressed by design experience.

We found out that it is far more efficient to learn color expression by body movement than by seeing. Body movements that fit a certain situation are expected to be a highly efficient learning procedure. From the result that shows the relationship between environmental elements and color expression, we can support that those who have no design experience can colorize like the design-majored. Furthermore, in order to review the possibility to support a coloring design to make a blog and digital media, the study is a means to understand how coloring standard based-on life circumstance and design experience relates with the way to express color when the Non-design experienced makes communications.

2. RESEARCH EXPERIMENT

2.1 Research aim

This research is designated to investigate how the sensitivity to colors affected by individual experience factors, such as living environment and education, can be expressed on the way of evaluation and expression, and examines the differences through a lacquer-coloring experiment on a natural object like a flower. The subjects for the research were divided into two groups depending on whether they have had the education of design and had a tacit experience in their individual living environment. Considering the relevance between the environmental elements and the expression of color from the consequences of the experiment, the researchers have investigated the possibility that those who haven’t had the education of design due to their

Figure 1: Communication of human and environment

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environmental factors are able to express the same colors as those who have had the education of design. The main purpose of this research using the data resulted from the experiment is that when those who haven’t had the education of design make a website, they should improve the communication effect between the designer and the users, considering how coloring factors (environmental element = certain colors fit for natural objects) such as living environment and design education are related to the appliance of colors proper for the purpose of the site.

2.2 Methods

2.2.1 The summary of the experiment

The purpose of this research is to investigate the differences of coloring behaviors according to whether people have had the education of design. Human beings experience various colors through their living environment or education. As a result, they naturally express the information of many colors tacitly stored, especially if the colors represent the environment, feelings, and motions that humans have gone through. At this point, under the same living environment, the relevance between the color-expressing ways and experiential factors, both the Design-experienced group and the Non-design experienced group have been investigated.

2.2.2 The method of the experiment

With unlimited time for the experiment, tools such as Prisma 120 color pencils and painting papers were utilized and the contents of the experiment were recorded by a video camera. The checking items were for the number of color pencil use, the number of the same color, the spent time, the very first place for lacquer-coloring, the order of painting and the color used for main spots.

1) The subjects for the experiment

Subjects: 10 Design-experienced people and 10 Non-experienced people

They all have lived in Tsukuba for over a year under the same living environment. The area of Art and Athletics department in the university is the community for Design-experienced people and Non-design experienced people.

2) The order of the experiment

① Explain briefly the purpose of the experiment to the subjects.
② Explain the method of the experiment and cautions to the subjects.
③ Have them perform the experiment of lacquer-coloring a flower (which can be seen easily around us) and record it by a video camera in order to analyze their behavior.
④ Conduct a sample survey about their personal experience and ask why they have chosen a certain color after the experiment.

3) The experimental material: natural object (coloring a flower)

The number of a color-pencil use, the number of the same color use, the time spent, the very first place of lacquer-coloring, the order of painting, the method of point and the color of most use have been compared and examined.

2.3 Analysis

As a flower is a common natural thing which can be found easily, it is easy to remember all the features of it such as its color and shape. There are mainly three elements of a flower: a bud, a leaf and a branch. In order to analyze more effectively, the bud and the leaf were divided into 11 points.

1) The process of the experiment

The time spent for the experiment was 14 minutes and 47 seconds on average for the Design-experienced people and 13 minutes on average for the inexperi-
enced people. The former group gave a more description, which led to spending more time.

As seen in the Figure 4, the Design-experienced group in expressing colors, showing stronger feelings and using more kinds of colors.

2) The first place of coloring the flower

Out of the 11 coloring spots of the flower, 7 Design-experienced people colored the number 1, the big bud, followed by the branch and the leaf. In case of the Non-design experienced people, there were 4 people coloring the number 11, the branch, which was the most number, followed by the number 1, the big bud and the leaf.

As seen in the result of the Figure 5, the Design-experienced people were inclined to begin coloring the elements in the center while there were 7 Non-design experienced people who started to color the number 11 and 7, which means it was examined that they were inclined to start coloring from the spot nearest to themselves.

3) The use of colors by using color pencils

With the experiment of coloring the flower, the number of color use and the number of color repetition were compared. The average number of color use was 13.6 for the Non-design experienced people and 18 for the Design-experienced people. The number of color repetition was 7.5 and 2.5 respectively.

From video data of the experiment in the Figure 7, it was confirmed that the number of color use by the Design-experienced people was higher with more expression of color. They seem a little color pencil usage and same color usage than Non-design experienced group. However, for the non-experienced people, the number of color use was only 13.6 which were fewer than that of the Design-experienced group, and it was found out that with the combination of a couple of colors, they colored one point (for example a leaf) and repeated the same coloring pattern. Since the leaves of the flower...
accounted for the most of the picture all over, the green kinds such as Olive Green(1.5BG1.2/1.7) and Dark Green(3.6YR2.8/0.5) were used most.

Figure 9 is the color usage when the subject colored the flower using a colored pencil. The experiment was carried out under the condition same as previous test like figure 8, measuring 'Munsell Color Value' subject actually colored with colored pencil. The illumination of laboratory is normal fluorescent lamp and table's lux was measured by color illuminometer (Konica Minolta, CL-200). The condition of lux is EV:347.51X, X:3623, Y:3675 and 4×4cm square was colored compactly using a colored pencil which is same as subject used. We measured colors with handy Color Meter (Nippon Denshoku, NR-3000, Calibration board D65/2" X:85.91, Y:90.22, Z:96.03) and the evaluated result is HV/C on the Figure 9.

4) The comparison of the coloring order.
The Figures 10 and 11 are the data of the subjects’ coloring order. Each flower element 1 to 11 on the coloring paper had a different color to be distinguished easily. The horizontal shaft is the number of the subjects’ coloring and the vertical shaft is the number of each subject.

In case of the design-experienced people as seen in the Figure 10, most of the subjects chose the number 1 for the very first coloring spot. In the meantime, the non-experienced people, as seen in the Figure 11, chose the number 11 most. Judging from the results, the design-experienced people were inclined to confirm the most important element in the whole picture, while 4 of the experienced people seemed to consider important the element which was nearest to them. Looking at the black border of the Figures 10, 8 of the Design-experienced people were inclined to color the number 1 for the very first coloring spot and rearrange the area at the end.
However, most of the Non-design experienced people colored the area for the last coloring spot rather than for the first coloring spot with only 1 time coloring.

Figure 8: A scene of measuring colored degree

Figure 9: Color usage when coloring the flower

Figure 10: Coloring order of design experienced

Figure 11: Coloring order of Non-design experienced people
That is, as a common result, 9 Design-experienced people and 8 Non-design experienced people were inclined to color the element number 1, followed by the number 2. The number 1 and 2 are the bud. And as for color use, they chose one color pencil and repeated coloring once to twice.

According to the data of flower-coloring order experiment, the Design-experienced people had a tendency to repeat and rearrange coloring from the most important element. On the other hand, the Non-design experienced people were rather a one time-one problem solving type. Compared with the data of color use, they used 2 or 3 kinds of colors when coloring an element like a leaf, showing the same pattern for the rest of leaves.

5) The characteristic comparison of the path of flow

The data of coloring order was established on the base of the experiment for the lacquer-coloring patterns of the subjects. Using the coloring order data, the numbers of color scheme elements were tied with a string to be shown visually. As seen in the Figures 11, 12 was Pink means twice of repetitions and orange means three times of repetition. All the Design-experienced people showed the repetition of the path of flow more than once, and 6 of the subjects repeated the path of flow more than 3 times. In the result, since there were many going-and-coming back strokes with the similar color, which led to the path of flow on the left upper part with a curved line. There were 7 subjects who performed the repetition between the element 1 and 2.

In case of the Non-experienced people, there were 8 people showing the going-and-coming back action, and the number of behavior was less than half of that of the Design-experienced people. The cause of their going-and-coming back action between two elements

![Figure 12: Coloring the path of flow of Design experienced people](image)

![Figure 13: Coloring the path of flow of Non-design experienced people](image)
seemed to be that they just look similar, like that of the Design-experienced people. The form of the path of flow was mostly a zigzag pattern.

RESULT

This research has been conducted to verify the hypothesis that individual experience about certain colors creates a distinctive subjectivity. As experiential factors, design education experience and living environment were investigated to find out if they give any influence on the way they express colors. The main purpose of this experiment is to improve the communication between the designer and the users by having both the sides sympathized with each other.

• The results of the research
1. As for the number of usage color, the Design-experienced people showed a small individual difference, expressing various and ample superficial feelings.
2. Controlling the hand power holing the color pencil, they colored the picture using right freshness and luminosity of the colors.
3. The Design experienced people examined the whole mood of the picture by moving their body. At the same time, their path of flow was longer than...
that of the other group. On the contrary, the Non-design experienced people hardly moved their body and performed coloring the lacquering picture in one time-one problem solving way rather than examining the whole picture. Also, the relevance between the elements was found lower.

4. The Design-experienced people started to color the part (the bud) which they considered the most important to balance the harmony of the whole picture in the first place, and then colored the rest parts (the leaf) and arranged the first place again to improve it markedly. In addition, from the interview with the subjects, there were many cases that saw two leaves under the bud located in the center of the picture.

The education Design-experienced people, in order to balance the whole harmony of the picture, started coloring the lacquering picture after judging the importance of elements and color reflected by their experience and considering such details as the number of strokes and color use. They also rearranged the picture by controlling tone intensity and balancing its mood after completing the lacquering picture.

However, the Non-design experienced people started to lacquer the picture from the element related to or located nearest to them, and were inclined not to lacquer the picture.

CONCLUSION

This research is to verify the differences of behavioral characteristics in expressing the colors influenced by the experience factors and to consider the possibility of the communication effect by using the findings. Consequently, the Design-experienced people, compared to the Non-design experienced people, planned the coloring considering the whole part rather than each element, moving his body or keeping the path of flow. Also, it was found that using one main color on the base they matched the balance examining the whole picture.

Besides, they used various colors and made it possible to express various feelings by controlling the hand skill. Even though it was not measured in this experiment, it is assumed that in choosing certain color pencils and expressing their feelings, the subjects will make differences through their vision. To tell about the probability, a more specific experiment is needed, applying the experimental methods conducted for this research. Since the Design-experienced people seemed to consider the harmony with the mood of the picture, moving their head and hand, it is predicted that more accurate results will come out if their motions are measured with their head and hands mounted with sensors.

Finally, this research focused on the behavioral characteristics related to the relevance between color and experience. According to the research, when a color is recognized by people, experimental environment as well as living environment makes differences. There should be another experiment about how such factors as light intensity, the subjects’ propriety of perception and their previous experience impact on the way they recognize certain colors. In conclusion, it is recommended that with the results from this research, another research about the visual feel should be conducted as well.

REFERENCES