Cognitive processes of artistic creation: A field study of a traditional Chinese ink painter’s drawing process

Sawako Yokochi (b031214d@mbox.nagoya-u.ac.jp)
Graduate School of Education and Human Development
Nagoya University, Furo-cho, Chikusa-ku
Nagoya, Japan 464-8601

Takeshi Okada (j46006a@nucc.cc.nagoya-u.ac.jp)
Institute for Advanced Research and
Graduate School of Education and Human Development

Abstract

How are art works created by artists? In this study, we focused on the drawing processes of a Chinese ink painter through a field study and a field experiment. In the field study, we observed processes of fusuma drawing in a temple, and in the field experiment, we asked the painter to draw sixteen pictures (eight drawings in BLANK condition and eight drawings LINES condition). We analyzed those drawing processes and found that: (1) this artist seems to gradually form a global image of the drawing as he draws each part one by one; (2) lines that the audience drew seem to create new constraints for his drawing and force him to create new patterns; and (3) moving his brush in the air before actually drawing lines on the paper seems to serve one of the following functions: Positioning (where to draw), rehearsal (how to draw), and image generation (what to draw).

Introduction

It is widely believed that only talented people can create great works of art. Despite this, the psychology of creativity has demonstrated that ordinary cognitive processes underlie the emergence of images or concepts (Weisberg, 1993). Although creative psychology ought to be interested in such creative cognitive processes, few empirical studies on the artistic creative process have been conducted (Getzels & Csikszentmihalyi, 1976). Among the few studies that have been conducted, some are relatively old and pre-date the information processing revolution that has occurred in the field (e.g., Eindhoven & Vinack, 1952). More recently, studies have used techniques such as interviewing in order to understand the creative process but have neglected on line methods (e.g., Mace & Ward, 2002; Cawelti, Rappaport & Wood, 1992). Despite these efforts, creative cognitive processes are not yet well understood. At this early stage of cognitive study on artistic creation, it seems that multi-method approaches are most appropriate. For example, Getzels & Csikszentmihalyi (1976) have approached creativity from several perspectives by using several test batteries, such as IQ tests, creativity tests, personality tests, and observations and interviews of art-making processes.

Viewing the state of creative study, in the present study, we try to answer the question, “How does a painter create his/her works?” We offer a case study based on observations, interviews, and a field experiment with detailed cognitive analyses of the drawing processes of a Suibokuga (Chinese ink painting) painter.

Method

Subject: Mr. K. is a Suibokuga painter in his early 60’s with about 18 years of experience of painting in that style. He usually draws Sansuiga, which are traditional Chinese landscapes of mountains and valleys, on fusuma (Japanese sliding doors) or folding screens in temples and shrines. He has also exhibited his works at museums in the USA and France in addition to many places in Japan. He has a special style of drawing. He improvises his drawing in front of audiences by incorporating random lines that the audience drew onto blank paper.

Period of observation: This field study was conducted from 1998 to 2001, with a follow-up interview conducted in 2003. We observed his drawing processes and collected substantial on-line data about his drawing. Also, we investigated his drawing processes through conducting a field experiment.

Data described in this paper: In this paper, we focus on the following two data sets in this field study: (1) process data of a fusuma drawing in temple X; and (2) data from a field experiment.

In the temple, spending about one and a half-hour, the painter drew a picture of mountain and river across four fusuma sliding doors. We set up two video cameras from both sides of the fusuma doors to capture his drawing process. After he finished his drawing, we interviewed him about his drawing process. In this case, he did not ask the audience to draw random lines because the master of the temple asked him not to do so.

In the field experiment, we asked him to draw eight pictures created from fifteen random lines drawn by two experimenters (we call this the LINES condition) and eight pictures created on blank paper (we call this the BLANK condition). The themes of the paintings are the four seasons. We asked him to draw two pictures of each season in each condition: spring; summer; fall; and winter. The order of task presentation was counter-balanced by condition. The order of the season for each task was randomized. We recorded the processes of his drawing with two video cameras. He drew three or four pictures in his studio in a day. It took a total five days between June and December to complete the field experiment. Usually it took about 20 to 30 minutes for him to finish a picture. In the third day of the experiment, he reported that he...
could not concentrate on drawing and drew just one picture. In the second day of the experiment he thought a picture in the BLANK condition was not good enough. Therefore he drew another picture with the same theme once more in the final day.

Goal of this study: This study describes the drawing process of a Suibokuga painter through a field study. Unlike laboratory experiments, field studies can be problematic with regard to variable control. In addition, since this is a single case study, we also cannot generalize our findings to all artists. However, through field studies such as this, we can propose new hypotheses or offer useful insights with high levels of ecological validity. Especially, in domains where few previous studies exist, starting from field studies can be very useful in order to find important questions and hypotheses and to lead to further research projects that follow realistic and meaningful directions.

Results and Discussion

The following three main features were identified through our field study;

1. The painter seems to form a global image of the drawing gradually as he draws each part one by one;
2. The painter draws pictures in fairly patterned ways. Lines that the audience drew, however, seem to create new constraints for his drawing and force him to create new patterns;
3. The painter often moves his brush in the air before actually drawing lines on the paper. Based on our data analyses, we describe three possible functions of these movements.

Processes of Drawing Images

Mr. K draws his paintings very smoothly and quickly. Although it might look as if he had already formed an image of the entire picture before starting to draw, our analyses of the drawing process and an interview with him revealed that he starts drawing with a local image of the picture. Then, he gradually forms a global image as he draws each part one by one.

When we interviewed him just after he finished drawing fusuma doors in the temple, he said, “Not the entire picture. Starting from here, the pine tree that I first drew, then there and this bridge and here, then the cedar trees above the stairway. Then the roof of the hat. I had an image of only those parts at the beginning” (See Figure 1). It seems that he does not form the entire image before he starts drawing. How can he draw so smoothly without forming the whole image or complete plans in his mind before starting to draw? We analyzed his drawing processes in detail to answer this question.

Figure 2 shows the process of his drawing on the fusuma doors of the temple. The circled numbers on the fusuma doors indicate where and in what order he drew. The circled numbers on the tatami mats indicate where and in what order he moved. We divided the process into five sections based on his movements. The first four sections were segmented when he moved backward to survey the entire picture for more than one minute. The rest of his drawing processes were combined into one section, because he moved backward and forward very often without long pauses. In the first section, he sat on a tatami mat and started drawing a tree on the left-most part of the fusuma door. After he drew the central part of the left fusuma doors for about 22 minutes, he stepped back in order to see the entire picture. Then he started drawing on the second door from the right and paused to observe what he drew many times. When this part of the picture became more formed, he moved backward and looked at the picture occasionally. At almost the end of his drawing in the last section, he moved back and forth frequently, adding a few lines here and there. This analysis of his drawing processes and his interview in the temple suggests that he gradually formed his plans for the painting while he was drawing. Although this is a single case analysis, we observed that he drew the fusuma doors in this way on many other occasions.

Mr. K cannot look at the entire picture without stepping backward when he draws on such big fusuma doors. Although he can take in the entire picture when he draws on a small-sized paper, he still has to spend a certain amount of time planning and monitoring when he draws, even though he can see the entire picture at a glance. Therefore, we measured the duration and timing of pauses in the data from the field experiment in order to infer his planning and monitoring process as while drawing. We divided drawing processes into small cycles. One cycle consisted of the period from his soaking the brush in the sumi ink plate, lifting up, drawing on the paper, and soaking it in the ink plate again. We counted the distribution of pauses by length and found that the frequency drastically dropped above nine seconds. This suggests that there might be some functional difference in pauses shorter than nine seconds and those longer than nine seconds. The frequent occurrence of the shorter pauses probably indicates that he moves the brush from one place to another or ink plate, etc. And, the less frequent occurrence of the pauses longer than nine

Figure 1: Picture on fusuma doors at temple X
seconds would mean that he spent time thinking about the
pictures, planning and monitoring his drawing processes.\footnote{Our criterion gains plausibility from experiments in previous studies. For example, Chase & Simon (1973), with perception and memory tasks in chess, presumed the long time interval while glancing chess pieces placed on the board was needed to combine several chunks, and the short time interval to access to a single chunk. Thus, it is also reasonable to think that the difference of time interval reflects upon the processes of thinking during drawing.}

Table 1: Mean number of pauses (nine or more
seconds) during drawing

<table>
<thead>
<tr>
<th></th>
<th>Whole drawing</th>
<th>First half:</th>
<th>Second half</th>
<th>Before drawing with lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLANK condition</td>
<td>5.0</td>
<td>1.4 : 2.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LINES condition</td>
<td>11.4</td>
<td>5.6 : 5.8</td>
<td>4.5</td>
<td></td>
</tr>
</tbody>
</table>

drawing in each condition, \(t(7) = -2.37, p = .050, t(7) = -1.80, p = .062\) (See Table 1).

This suggests that he plans and monitors his drawing through the entire process of drawing. There were more pauses in the LINES condition than in the BLANK condition, \(F(1, 7) = 19.166, p = .003\). When we focused on the frequency of pauses just before he drew from random lines, we saw about the same frequency of the pauses as a difference between each condition, \(F(1, 7) = 3.163, p = .119\). This probably means that he needs to think about local drawing plans in order to incorporate those random lines into his picture when he creates pictures from random lines.

In summary, it appears that the painter plans and monitors through the entire process of drawing. He first forms a mental image of a small area (creates a local drawing plan), and gradually forms the entire mental image of the picture as he draws each object.

\textbf{Lines as Constraints}

Analyses of the contents and patterns of Mr. K’s drawing suggest that he drew pictures in a fairly patterned way. Through our observation, we found that he drew objects one by one. In the field experiment, he started to draw his paintings from a tree in fifteen out of the sixteen pictures. Then rocks, houses, people and mountains followed. We observed in many other occasions that he drew pictures in the same way. It suggests that he uses some strategies in order to draw certain objects in a relatively stable order in various situations. However, when we interviewed him, he said, “All of the pictures that I created from random lines are more unique and nicer than those created in a traditional way.” What kind of difference is there between both conditions? We investigated the differences in time of drawing and the number of drawing cycles between pictures in the LINES condition and pictures in the BLANK condition (See Figure 3 and Table 2).

First, the mean time of drawing (except for the time of painting shadows or shading ink lines which always occurs at the end of his drawings) was calculated in each condition. In the BLANK condition, the mean time of drawing was about ten minutes (\(M = 640.13\) sec, \(SD = 170.91\) sec), and, in the LINES condition, it was about eighteen minutes (\(M = 1050.38\) sec, \(SD = 199.40\) sec). The time of drawing in the LINES condition was significantly longer than the time of drawing in the BLANK condition, \(t(14) = 3.87, p < .01\) We also counted the number of drawing cycles in each condition and calculated the mean number. The mean number of drawing cycles in the LINES condition was significantly higher than that in the BLANK condition, \(t(14) = 3.91, p\)
Table 2: Differences between the BLANK condition and the LINES condition

<table>
<thead>
<tr>
<th>Measures</th>
<th>BLANK condition Means and (SDs)</th>
<th>LINES condition Means and (SDs)</th>
<th>p of t Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time of drawing( sec)</td>
<td>640.13 (170.91)</td>
<td>1050.38 (199.40)</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Number of drawing cycles</td>
<td>30.0 (8.80)</td>
<td>43.5 (4.92)</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Time of one cycle(sec)</td>
<td>23.3 (7.50)</td>
<td>25.5 (6.85)</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

< .01. These results indicate that it takes more time and more drawing cycles to create new pictures from random lines. This result suggests that these lines somehow influenced drawing. Therefore, we investigated how these lines were used in his drawing. There were fifteen random lines drawn by the experimenter on each paper in the LINES condition. With an average of 9.3 out of fifteen lines, he would create new object starting from others lines. In the other 5.7 instances he incorporated the other’s line into an existing object. Thus, the random lines triggered his drawing process and created new constraints on his drawing.

There seemed to be some differences in terms of quality between pictures in the LINES and BLANK conditions. To check this possibility, we asked twenty undergraduate students to rate their impressions of the paintings using a semantic differential method.

The procedure is as follows: Twenty undergraduates who did not major in art were presented pictures randomly with twelve word pairs of opposite meaning as a paper and pencil task. All words were adapted from adjectives used in the study of emotions when appreciating pictures (Ichihara, 1968) and interviews of the painter. Subjects were asked to rate the pictures based on a seven-point scale for each word pair.

Factor analysis with a principal factor solution was used to create scales across the word pair items. The three distinct factors with an eigenvalue above 1.0 were recovered and the ratio of variance contribution was 65%. These factors were rotated with Varimax and the factor loading was calculated (See Table 3).

Four items are strongly correlated with the first factor, which we term good composition: modulated / non-modulated; well composed / poorly composed; focused / unfocused; and well-balanced / ill-balanced (alpha = .82). The second factor, which we term liveliness, is strongly correlated with the items: lively / dull; static / dynamic; energetic / non-energetic; and powerful / power less (alpha = .77). The final factor, which we term simplicity, strongly correlated with the items: clear cut / mixed up; simple / complex; relaxed / crowded; and light / heavy (alpha = .73).

We conducted a single-sample version of Hotelling’s T² to compare their rating scores of paintings from the two conditions (See Figure 4).

Figure 3: Picture in the BLANK condition (top) and picture in the LINES condition (bottom)

The mean scores of good composition and simplicity in the BLANK condition were significantly higher than those in the LINES condition, F5 (1, 159) = 93.83 and 28.47, respectively. This result indicates that pictures in the BLANK condition are well composed. Also, because there is a high amount of white space in these pictures, it creates the impression of simple picture. The painter draws the BLANK pictures with the style of traditional Sansuiga paintings. On the other hand, the mean score of liveliness in the LINES condition was higher than that in the BLANK condition, F (1, 159) = 4.15, p < .05. This result indicates that pictures in the LINES condition were characterized by liveliness and were dynamic. Thus, the character of LINES pictures is different from traditional Sansuiga paintings.

Mr. K also thinks that this way of drawing is more exciting than the traditional way. When we interviewed him asking why he wanted to draw from random lines, he answered:

“Creating from random lines, I have to incorporate the others’ world into my world... I have to use them with my lines...Seriousness! I enjoy playing this game in earnest. There is not just myself. I get serious about drawing in this way. Yes. I am highly motivated with this way.”

Thus, these lines seem to create new constraints for his drawing and force him to create new patterns.

Roles of Hand Movements in Drawing Processes

From our observations in the field studies, we noticed that the painter moved his brush in the air very often before he actually drew lines on paper. We wondered why he did so.

This kind of hand movement is not unique to this painter. For example, Henry Matisse moved his brush in a similar way in the video, “Matisse: Voyage”. When we talked with researchers in architectural design and in art education, they agreed with us that painters or designers often draw in the air before they draw on paper. This kind of hand movement is not even unique to painters. Sasaki & Watanabe (1983) also found that when writing Kanji characters, Japanese people often moved their fingers in the air. They interpreted this phenomenon to mean that
Table 3: Result of Factor Analysis (Varimax rotated factor pattern)

<table>
<thead>
<tr>
<th>Good composition</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>SMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modulated--Non-modulated</td>
<td>.70</td>
<td>.27</td>
<td>.05</td>
<td>.57</td>
</tr>
<tr>
<td>Focused--Unfocused</td>
<td>.80</td>
<td>.11</td>
<td>.13</td>
<td>.67</td>
</tr>
<tr>
<td>Well-balanced--Ill-balanced</td>
<td>.80</td>
<td>.11</td>
<td>.16</td>
<td>.67</td>
</tr>
<tr>
<td>Well-composed--Poorly-composed</td>
<td>.79</td>
<td>.07</td>
<td>.15</td>
<td>.66</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liveliness</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lively--Dull</td>
<td>.13</td>
<td>.86</td>
<td>-.03</td>
<td>.75</td>
</tr>
<tr>
<td>Static--Dynamic</td>
<td>.06</td>
<td>-.65</td>
<td>.28</td>
<td>.50</td>
</tr>
<tr>
<td>Energetic--Non-energetic</td>
<td>.20</td>
<td>.85</td>
<td>.13</td>
<td>.77</td>
</tr>
<tr>
<td>Powerful--Power less</td>
<td>.42</td>
<td>.62</td>
<td>-.31</td>
<td>.65</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Simplicity</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear cut--Mixed up</td>
<td>.56</td>
<td>-.15</td>
<td>.63</td>
<td>.72</td>
</tr>
<tr>
<td>Simple--Complex</td>
<td>.29</td>
<td>-.16</td>
<td>.62</td>
<td>.49</td>
</tr>
<tr>
<td>Relaxed--Crowded</td>
<td>.37</td>
<td>.20</td>
<td>.70</td>
<td>.67</td>
</tr>
<tr>
<td>Light--Heavy</td>
<td>-.15</td>
<td>-.18</td>
<td>.75</td>
<td>.62</td>
</tr>
</tbody>
</table>

Contributions | .410 | .319 | .271 |

Figure 4: Mean scores of three factors in each condition. Error bars represent 1SD.

The percentage of the drawing in each section is about the same between the two conditions. In the beginning section, the percentage of the drawing in the BLANK condition was 60% and that in the LINES condition was 56%. In the middle section, the percentage of drawing in the BLANK condition was 35% and that in the LINES was 36%. This indicated that Mr. K often draws in the air at the beginning and middle of drawing cycles. Thus, it would be reasonable for us to assume that drawing in the air has some important functions in drawing processes since they occur before the painter actually draws on paper.

Next, we focused on the relationship between pauses and drawing in the air. The percentage of pauses with drawing in the air in the BLANK condition was 59% and that in the LINES condition was 86%. This suggests that he often moves the brush in the air in order to think about drawing plans to incorporate lines into his picture. Furthermore, in the LINES condition, the percentage of pauses with drawing in the air, when he added on to others’ lines, was 97% and when he drew without adding lines to others’ lines was 59%. These results suggest that by moving the brush in the air, he generates a mental image to facilitate incorporating others’ lines.

In order to further investigate the function of the drawing in the air, we interviewed him about his drawing process while showing a video record of his drawing a Sansuiga picture. While watching a part of the videotape in which he was drawing in the air, he said to us, “I might be checking how I feel when I touch the brush. Umm... Is this my habit? I always do this, don’t I... I may move my hand in the air to rehearse my brush stroke... I always draw in the air before starting to draw on the paper. This seems to be my habit, doesn’t it? Although I do not draw any actual objects on the paper, through drawing the form in the air, I can judge if the balance of the objects is OK. I have never realized my habit before you pointed it out. But, now I noticed it...”

This quote tells us that he probably moves his hands in order to plan how to use his brush and actually draw the image of objects in his mind. This is a quite reasonable candidate function of this hand movement. But, we need to be careful before making any conclusions on this issue based on the data from this field study. It would be, however, worth proposing some plausible hypotheses for future research. At this moment we propose the following
### Table 4: Percentage of drawing in the air in three different sections

<table>
<thead>
<tr>
<th></th>
<th>Beginning section</th>
<th>Middle section</th>
<th>End section</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLANK condition</td>
<td>19.1</td>
<td>11.0</td>
<td>1.5</td>
</tr>
<tr>
<td>condition</td>
<td>(60%)</td>
<td>(35%)</td>
<td>(5%)</td>
</tr>
<tr>
<td>LINES condition</td>
<td>29.0</td>
<td>18.5</td>
<td>4.0</td>
</tr>
<tr>
<td>condition</td>
<td>(56%)</td>
<td>(36%)</td>
<td>(8%)</td>
</tr>
</tbody>
</table>

three functions as good candidates. First, by drawing in the air, the painter decides where to put the brush on the paper. We call this positioning. Second, the painter rehearses his brush movement so that he can draw smoothly. This is related to how to draw. We call this rehearsal. Third, by drawing an object in the air, the painter generates a mental image of what he plans to draw next. We call this image generation.

We could not confirm these hypotheses with this field study, because we could not control variables systematically. Further studies are needed to investigate the roles of drawing in the air.

### General Discussion

This study focused on a traditional art, Chinese ink painting. Mr. K has an enormous amount of knowledge of the painting style and draws pictures using this knowledge. However, knowledge is not enough to create new pictures improvisationally and smoothly. When he drew the picture in temple X, he went backward to look at the entire picture. Also he occasionally covered this picture in progress with his hands to narrow down the space of focus. That is, he limited the drawing space to make planning or monitoring the picture easier. Thus, he could gradually form a mental image of a picture as the actual drawing on the paper progresses.

Knowledge and skills accumulated in years of expertise enable an artist to create artworks fairly quickly and smoothly. It seems that each brush of drawing evokes a local image of Siubokuga in Mr. K’s memory. He creates his pictures combining those images based on certain rules that he learned from books or his experience. This process is highly effective when producing certain kinds of artwork.

On the other hand, artists often become bored while producing similar works too many times. When bored, artists want to try something new to stimulate their artistic motivation. In this Siubokuga painter’s case, the method of asking the audience to draw random lines and incorporating them into his own picture is one such example. Creation of new patterns in artistic works seems to emerge through artists’ intentional manipulation of constraints in a creation process. We found that even in a case of traditional art, artists sometimes conduct this kind of manipulation intentionally.

Artistic creation requires hands-on activities. Just having an image or a concept is not enough. In order to implement an image or a concept into an actual artwork, an artist needs to use his/her body. Sasaki et al. (1983) suggested that people would imagine the figure of Kanji characters by moving their hands. In the study of embodied representation, Barsalou (1999) has argued that sensorimotor processes, such as body movement, could affect the cognitive processes. Similarly, body movement in artistic creation, such as moving a brush in the air, also seems to play an important role in creative processes. In this way, artistic creation is a highly embodied process.

We could not make strong conclusions with this field study, since we could not control variables systematically. In addition, because this is a single case study, we also cannot generalize our findings to artists. However, we believe that our findings offer an essential first step towards future studies of the process of artistic creation from cognitive perspectives. We are currently conducting other studies regarding the creative process of Japanese contemporary artists in order to uncover potential similarities and differences between traditional and contemporary arts in an effort to generalize our hypotheses.

### References


