A Method for Supporting Verbalization to Facilitate Observation in Illustration Copy-Drawing

Abstract As digital illustration becomes more widespread, the number of self-taught illustrators who produce "*Doujinshi (self-published print works)*" and post pictures on social media has increased. However, the drawing method used differs depending on the situation, and it is not easy to learn by oneself. It is essential to observe a model closely when drawing, but it may not be feasible for beginners to do it alone. We, therefore, propose an observation method to enhance the beginners' awareness. By verbalizing the features that beginners are not aware of, our approach enables them to make thorough observations independently. We conducted an experimental test to clarify the effects of verbalization for observations and copy-drawings. Then, we found that the proposed method of encouraging verbalization enhanced observations for many beginners and facilitated illustration copy-drawing.

Keywords: Illustration, Metacognition, Observation, Verbalization, Copy-drawing.

1 Introduction

With the spread of image-sharing services on the Internet and the increase in niche artist communities, more and more people are trying to learn illustration by themselves. As of April 2020, Pixiv [1], an image-sharing SNS, has more than 50 million registered users and a total of 78.5 million manga and illustrated works. Moreover, on Twitter, the results of well-known illustrators and amateurs can be seen and shared by millions of users [2]. *Doujinshi*, or *doujin*, are fan-drawn manga based on a licensed manga or animation. Some *doujin* artists work in circles with multiple people, but there are many independent artists, so the threshold for individual creative challenges has become lower. In addition, beginner artists and professional illustrators alike participate in large *doujinshi* conventions such as Comic Market.

Many resources and guides for illustrators, such as using paint tools, are shared on various social networks. It has fostered an environment where one can easily create illustrations independently without attending a vocational school or art classes. However, even though the Internet is rich with resources, it is still tricky for beginner artists to reach their desired level of proficiency on their own. They have to try various practice methods and spend much time drawing to improve their skills and levels.

There are many ways to practice drawing, but one of the most effective for beginners is copy-drawing and sketching objects. However, it is often difficult for beginners to accurately copy-draw an object because they cannot fully visualize its color, shape, balance between facial parts, and location. Beginners who cannot observe or draw an image have the following two problems. First, they are unable to notice that their illustrations are not good. If they cannot see the poor, they will make disappointing

work. In other words, the beginners may have difficulty modifying an illustration drawn by themselves to make it more similar to the object or model. Second, they may not notice the difference between their illustration and the object to be drawn. Thus, they cannot improve if they do not see the complex problems in their drawings or know how to fix them. To solve this problem, beginners need to observe the object closely and compare it with their picture to notice what needs to improve. Even so, it is often not enough to observe and reflect mentally.

In light of the above, we focused on verbalizing the awareness gained from observations. By encouraging beginners to express the observation in words, they can clarify their observation and copy-drawing it. This paper examines the usefulness of verbalizing the observation by investigating how writing out the observation results affects copy-drawing. We will evaluate the drawings and results of copy-drawing in future work and consider what kind of verbalization is necessary for the observation.

Our contribution was to propose a method that enables beginner artists to increase the effectiveness of observation for copy-drawing by promoting verbalization and revealed that it transformed the copy-drawing behavior.

2 Related work

There have been numerous studies on how computers support the creation of reproductions, sketches, and drawings. Many of these studies provide guides and advice during drawing.

Williford et al. [3] created a guide for inexperienced artists that divides a photo by shadow depth and instructs them on how to hold the pen, tilt, and apply pressure at each step. Hennessey et al. [4] proposed a system that automatically generates tutorials for 3D objects to support sketching. Dixon et al.'s [5] method support sketching by recognizing human facial photographs and presenting contour lines as guides. Lee et al. proposed ShadowDraw [6], which predicts what the artist is trying to draw from their strokes and offers a guide in the form of a shadow. Matsui et al. proposed DrawFromDrawings [7], which estimates a drawing and presents it as a candidate, making it possible to transcribe that part to the part which the user drew while changing the fusion rate. Iarussi et al.'s method [8] supports copy-drawing by presenting the outline and skeleton information of the subject in a photograph along with grid lines based on the object. Fernquist et al. [9] proposed a system that presents a tutorial for copy-drawing a drawing step by step, such as line art and coloring, and determined that they could achieve more balanced copy-drawing with the guide. Xie et al.'s method [10] extracts the line art and grayscale from a portrait photograph to be drawn and creates a guide for beginners based on the extraction. However, the disadvantage of such methods is that people do not think and draw for themselves by relying on pictures-guide or candidate.

The knowledge embodied and that we cannot express in words is called physical knowledge. We use it empirically but cannot easily explain it in terms of tacit knowledge. Both types are difficult to verbalize and take time to learn. Suwa et al.'s study [11] presents the theory of metacognitive verbalization, i.e., attempting to put into

words the experience and consciousness one performs effectively as a tool for acquiring physical knowledge. Suwa et al. have carried out various practical studies on this theory to support the acquisition of physical knowledge acquisition. Results have shown that verbalizing indeed promotes the mastery of learners' skills [12].

3 Method

In order to bring one's picture closer to the target when copy-drawing, it is necessary to discover problems by noticing the bad points of the illustration through observation. However, even if a beginner observes, simply thinking does not lead to sufficient observation, so a method for encouraging observation is necessary.

As mentioned in the related research, many studies support a drawing screen, but it is essential to observe and draw by oneself. We aim to provide a support method that enables beginners to interpret the subject (copy-drawing target), encourages observation, and leads to imagination and consideration. We focused on verbalization as a method for discovering problems. By applying the verbalization support mentioned in the related research to the observation during illustration, the beginners can perceive the drawing target more clearly by increasing their awareness during observation and becoming more aware of what they notice. We clarified the effectiveness of this method through an experiment involving beginner artists to determine the effect of verbalizing the awareness of observation while copy-drawing.

The transition diagrams using the system based on our method are as follows (see Fig. 1):

Step 1. A user takes a picture or inputs an image of a target of copy-drawing into the system.
Step 2. The system instructed the user to observe the image and asked the user to verbalize its features.

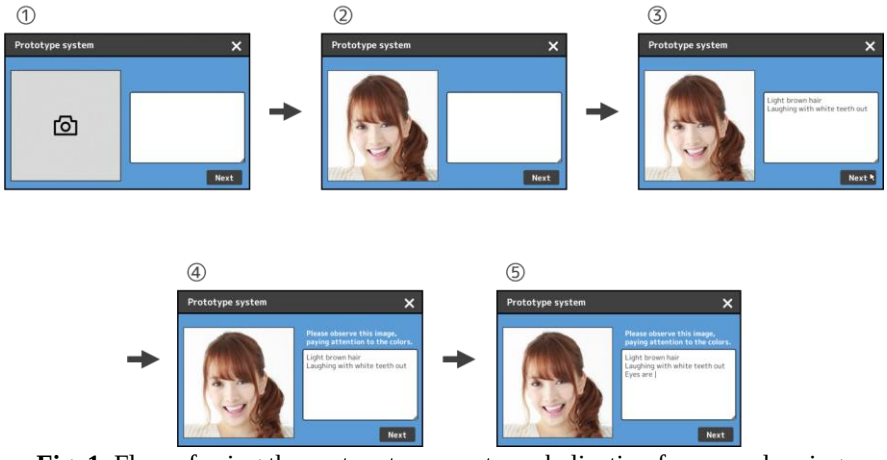


Fig. 1. Flow of using the system to promote verbalization for copy-drawing.

Step 3. The user inputs several features of the target image while observing. Then, the user presses the Next button when the user thinks the user has observed enough.
Step 4. The system checks whether the features that the user verbalized are enough or not. If the observed features are not enough as verbalization, the system guides verbalizing and moving to Step 3.
Step 5. When the user has written down all the necessary features, it will move to the copy-drawing mode.

This system provides a verbalization guide for features that the beginner user has not noticed by observing and helps the user to gain new awareness. We assumed that by repeating steps 3 and 4, users (beginners) could understand what they could not get when observing by themselves.

In particular, this paper deals only with the verbalized part of the proposed method, and we conducted an experimental test to clarify its effectiveness.

4 Experiment

We conducted an experimental test to investigate the things beginners notice when observing and verify whether they become more aware by verbalizing them or whether the points saw or specificity change.

In this experiment, we compared our method with a baseline method. Our method and the baseline method are as follows:

- **Our method:** A participant copy-draws a target image after its observation with verbalization. In this verbalization, we asked the participant to write his/her observations on a blank sheet.
- **Baseline method:** A participant copy-draws a target image after its observation without verbalization.

We also prepared two images as copy-drawing targets (see Fig. 2). The observation targets were two images of women's faces. We chose women's faces as observation targets because they contain a combination of various three-dimensional shapes, such as eyes, nose, and the flow of hair. In addition, since the images had many distinct features, we felt that any differences between the drawing and the original painting would be more noticeable.

In this experiment, we selected the order of our method and the baseline method randomly and copy-drawing targets randomly for each participant. In addition, we asked participants to try copy-drawing using the selected method in a day and using another method the next day. After each copy-drawing, we asked the participants to answer a questionnaire about their observations and copy-drawings.

To copy-draw, we prepared “ClipStudio Paint Pro” as drawing software. Then, we explained the usage of the drawing software and allowed participants to practice for 5 minutes. The software has a G-pen, opaque watercolor brush, eraser, eyedropper, layer operation, undo and redo function. We also allowed other functions. The software was limited to minimize differences and simplify analysis.

We first asked the participants to observe a subject image (selected copy-drawing target image) for 5 minutes by the selected method. Then, if participants use our method, we provide a blank sheet to them and instruct them to carry out the experimental task while writing down their findings from the observation and drawing. After the 5 minuites observation, we asked participants to do copy-drawing the target image.

We conducted a questionnaire immediately after participants completed each copy-drawing task. We handed the observation paper to the participants using the baseline method and asked them to write down their findings during observation and drawing. Participants filled out the observation form in a random order to avoid the order effect.

Apart from the observation time, we set the drawing time limit to 55 minutes for control and notified the participants at 30, 45, and 50 minutes.

In this experiment, we recruited 11 university students as participants (A to K). The device used was a Wacom MobileStudio Pro 16, a liquid crystal pen tablet, and the drawing software was ClipStudio Paint Pro. The questionnaire contained the following items.

(Q1) What were you careful about when observing?
(Q2) What did you draw with particular care?
(Q3) What were you trying to express?
(Q4) What was difficult?
(Q5) Please write a comment freely

We conducted the questions to investigate the following specific factors. Q1 targeted the places that the participants felt they were paying attention to; Q2 asked about

Fig. 2. Targets of copy-drawing ((a) left, (b) right).

awareness while drawing; Q3 asked about features that the participants tried to express, and Q4 asked about the parts they could not express due to lack of technique and time.

In addition, a second questionnaire was conducted several days after the experiment so that participants could forget what they had observed and objectively view the copy-drawing. The questionnaire contained the following items.

(Q7) How satisfied are you with the quality of the drawing?
(Q8) How well did you copy-drawing the subject?
(Q9) Compare the subject with your picture. How similar are your drawing and the sample?
(Q10) Where are the similar parts?
(Q11) Do you feel unhappy with the result?
(Q12) Where is the feeling of strangeness?
(Q13) Where and how would you fix it?

Q7 to Q9 were 7-point Likert scales, Q11 gave two choices, and the rest were open-ended. To evaluate whether they reflected the awareness from the observation, we determined the evaluation criteria from the participants' questionnaire responses, and we considered whether they could express their attention as a picture.
We show the evaluation criteria in Table 1.

We created forty criteria items for each drawing target. If the characteristics of the drawing target and the picture drawn by the user were almost the same for each item, we gave them 1 point. If they were different, they received 0 points.

5 Results

Fig. 3 shows the responses to the post-experiment questionnaire. Regarding their satisfaction with their artistry, the average value of the evaluation was 1.82 using the baseline method and 2.73 using our method, showing a significant difference ($p < 0.05$). In Q2, the average value of the evaluation was 1.91 using the baseline method and 2.64

Table 1. Examples of the objective evaluation criteria.

Proportion	・Is the size of each part accurate? (bangs, tied up hair, eyebrows, eyes, nose, mouth, ears, and facial contours) ・Is each part properly positioned? (bangs, tied up hair, eyebrows, eyes, nose, mouth, ears, and facial contours) ・Face orientation and eye contact
Shape	・Is the shape of the face properly contoured? ・Is the curly hair in the right position? ・Is the shape of each part accurate? (eyebrows, eye area, eyelashes, eyebrows, nose, mouth, teeth, tongue, ears, bangs, tied hair)
Color	・The way the light hits the bangs ・Flow of tied hair ・Is the color of each part accurate? (skin, eyebrows, eyes, cheeks, nose, lips, teeth and tongue, cheeks and chin, hair)

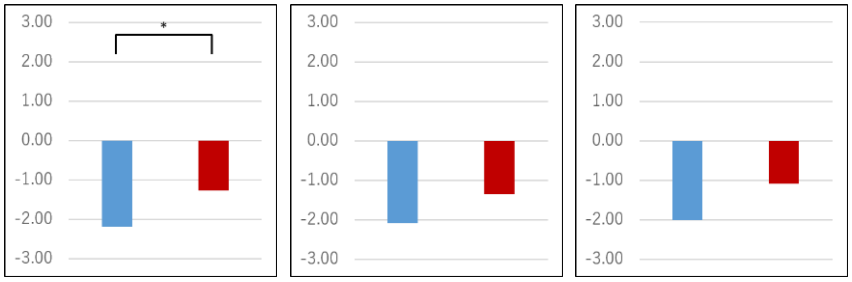


Fig. 3. Average about Users' self-evaluations of itemized observational copy-drawing experiment (from left to right: Q7: How satisfied are you with the quality of the drawing?, Q8: How well did you copy-drawing the subject?, Q9: Compare the subject with your picture. How similar are your drawing and the sample?, blue: baseline method; red: our method).

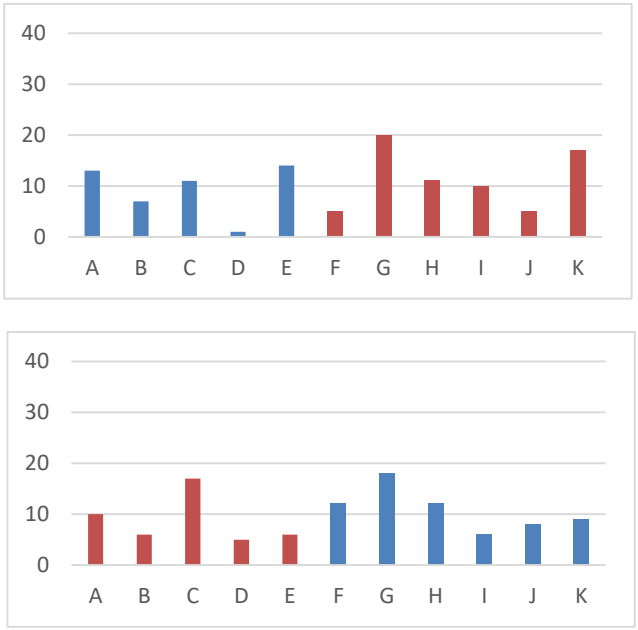


Fig. 4. Objective evaluation of each imitations (left: evaluation of (a), bottom: evaluation of (b), blue: baseline method; red: our method).

using our method; there was no significant difference between the two. In Q3, the average value of the evaluation was 2.00 using the baseline method and 2.91 using our method; again, there was no significant difference between the two. These results demonstrate that the participants could express their awareness and express that awareness as a picture with verbalization.

Next, we present the results of our objective evaluation of the copy-drawings drawn by the participants. Fig. 4 shows the scores of the accurate assessment. First, the scores

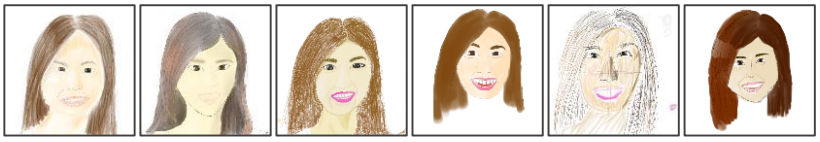
for subjects (a) and (b) varied widely between participants, and the degree to which they reflected the observation in the picture differed depending on the participant. Comparing the participants shows that five people scored higher when copy-drawing using our method than using the baseline method. By those results, we suggest that this method promotes proper observation and that some users can sufficiently reflect observation in the drawing. The number of feature descriptions was higher when verbalizing the features during observation and drawing. From this, we can conclude that the participants were able to notice what they observed. Under the same conditions, more references were made to features such as size, position, shape, angle, eyelids, and color. However, one of the participants commented, “The picture I had imagined and the one I drew were very different.” This comment suggests that it is not enough for beginners to note down the results of their observations and that some parts lack observation and awareness. Another participant commented, “I was able to recall what I discovered during my observation by writing down notes while I was drawing. When I was working on the illustration, I noticed that I had finished a part that I could not correct, so I think that observation in advance is important.” By taking notes during an observation, students will plan their drawing process to avoid making mistakes.

Pictures drawn under our method

Pictures drawn under baseline method

Fig. 5. Copy-drawings of subject (a) by participants.

Pictures drawn under our method



Pictures drawn under baseline method

Fig. 6. Copy-drawings of subject (b) by participants.

6 Discussion

From the results of the subjective evaluation of the experiment, we determined that describe the picture sample during observation and drawing enhanced their perception. Participants who draw a picture with verbalizing were satisfied with their finished picture. The resulting drawings showed that the beginners were more likely to pay close attention to the details by verbalizing during observation and copy-drawing

Fig. 5 and 6 show the illustrations drawn in the experiment. First, we present the results of the participants' subjective evaluation of their copy-drawing. These figures show that the characteristics of the picture differed significantly using each method.

For subject (a) (see Fig. 5), five participants shaded in the mouth with black using our method, while only three participants did so using the baseline method. In addition, five participants drew the eyelashes using our method, while only two participants drew them using the baseline method. Also, by the authors observing closely, three participants using our method and one participant using the baseline method drew the part of the hair that was tied up as the upper half being vertical and the lower half being horizontal, i.e., considering the flow of the hair instead of just drawing a simple curl.

Next, for the subject (b) (see Fig. 6), five participants drew the left eye slightly more extensive and lower than the right eye using our method, and three participants did so using the baseline method. In addition, two participants using our method and one person using the baseline method could draw the shadow on the left side of the hair.

Next, we compare the results between participants. Fig. 7 shows an example of two participants who drew significantly different features under the condition of verbalization. Participant K included details around the mouth and the flow of hair using our method. Participant C drew detailed shadows at the hairline and lips using our method. Although differences depend on the person, the amount of detail increased overall, and many participants made profound expressions.

The participants using our method were encouraged to observe the features and thus expressed them more consciously in their drawing. At the same time, there was no significant difference in how well they could draw their copy-drawings (shown in Fig. 3) or how much their picture resembled the subject. The score of the objective evaluation varied from person to person. Thus, it may not be possible for beginner artists to fully observe, imagine, and consider just by verbalizing their awareness, so they did not fully express their observations in the drawing.

In the future, we plan to solve this problem by increasing the number of participants, conducting further experiments, and utilizing landscapes such as mountains and rivers in the experiments.

One of the participants commented that there was a gap between the originals and their drawings. Most participants were not very satisfied with their pictures, so some of their illustrations were still in line with the sources. When considering how we could look a little deeper and reflect on the picture, we focused on the verbalized concreteness. From the analysis of illustrations using our method, we found many abstract verbalizations, e.g., "the hair is curly," "the nose is high," and "the person is smiling." Unfortunately, these descriptions are not memorable enough, so it is impossible to reproduce the subject's atmosphere or subtle expressions.

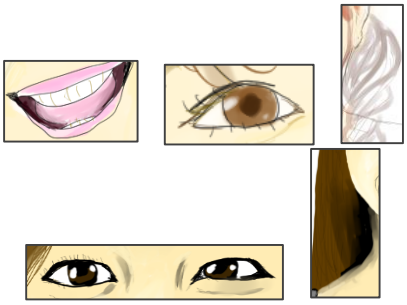
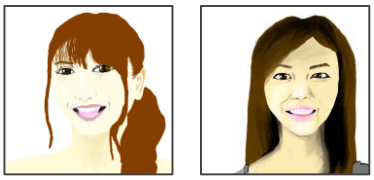


Fig. 7. Details of drawings. Top row: mouth, eyelashes, and tied up hair. Bottom row: eyes and hair shadow.

K's imitation



C's imitation

Fig. 8. Detailed drawings.

In order to improve this, we should establish specific criteria and language. For example, "The top half of the hair is vertical, but the bottom half curls up and becomes horizontal," or "The nose is higher than the ears, and the corner of the mouth is higher on the right side when smiling." Using numerical values as a criterion can be effective as well: for example, "The ratio of the height of the eyes is 1:2, and the nose is 1 cm next to the left eye." In the future, we will examine these issues and clarify whether specific language is effective or not.

We show an example of verbalization in Table 2. K often verbalizes the shapes and positional relationships of facial parts such as eyes and nose, and the awareness gained through the verbalization is reflected in the painting. C is more verbalized than others in terms of color. As a result, the shadows of the hair and neck are drawn under the conditions of the proposed method. In addition to that, C painted the tooth color with a mixture of yellow and white and consciously drew the part exposed to the cheek light.

Table 2. Examples of verbalization

K's Verbalization	・Ear holes and eyes are about the same height. ・The inner corner of the eye is inside than the nose. ・The edge of the mouth is about the position of the black eyes. ・Close to the distance between the eyebrows and the eyes. ・There is bangs along the line to the outer corner of the right eye. ・Left front tooth just below the middle of the nose.
C's Verbalization	・The left side is dark, the right side is bright ・The left corner of the eye is huge ・The dark part is the shadow of the inner corner of the eye ・Teeth are not too white

7 Conclusion

We proposed a method for verbalizing observations to guide beginner artists when they copy-drawings. The results showed that the use of verbalization promotes observation, creativity, and perception.

In our experiment, it was evident that beginners could observe finer details through verbalizing and reflected their findings from the observations in the drawings to some extent. We aim to increase the number of participants and collect additional work samples to determine common errors and areas often overlooked by beginners. We will present an interactive guide that draws attention to places and viewpoints that beginners do not usually observe and investigate the subsequent changes in the drawings.

In the future, we will investigate whether observations can be made sufficiently by asking users about places to observe and places where observations are not sufficient and clarify the effectiveness of the method when inducing observations. In addition, we will focus on the observation and clarify how beginners observe subjects. Finally, we aim to develop a system that can fully support beginners during the observation process.

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