

Teaching Procedure of ‘Creation of Animation’ by use of Origami and Clay

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折り紙と粘土による「アニメーション作成」の授業展開

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概要

本学の国際教養学科にある情報科学メジャーでは、情報系の知識と技術を主に学修する。そこで提供されている科目の一つに専修力、表現力、企画・創造力を育むものとしてアニメーション作成がある。この授業では、粘土によるコマ撮りアニメーションを作成するものであるが、2017年度では導入として折り紙によるアニメーション作成も行った。そこで本稿では、これまで改善を加えつつ、2回目を迎える2017年度の授業概要とその成果を示し、さらに今後へのより効果的な授業計画の提案を報告するものである。

Key words: 折り紙 Origami, 粘土 Clay, コマ撮りアニメーション Stop Motion Animation, ズエトロープ (回転のぞき絵) Zoetrope, クレイトーン ClaytoonTM, 自己評価 Self-assessment

1. Introduction

In the 15-lesson series on animation creation, which was launched as a biennially information science course for junior students at Hiroshima Jogakuin University in 2015, participating students create clay characters and produce stop motion animations. Although this animation creation course is an elective for the students of other majors (as shown in Figure 1), who are not expected to have developed sufficient knowledge and skills from their pursuit of related subjects, we have actually found that there are wide variations in computer-based image and video editing skill levels among all participating students, even though most possess basic levels of computer literacy.

In their study on clay animations, Nakamura, Sumi, and Eguchi¹⁾ conducted group lessons and described how the process of jointly creating clay animations is effective for facilitating learning cooperation. In a related study, Abe²⁾ pointed out that while the creation of handwritten animations is time-consuming, clay is readily available and can even be used as media content by kindergarten-aged children. He also suggested that other tools might be suitable for use by elementary school age children and older.

In video animation editing lessons, clay is commonly used because of its malleability. In the abovementioned study, the author adopted group-oriented education for the purpose of fostering group cooperation and chose clay as the teaching material based on its flexibility. However, in our course, we found it was difficult to begin the process

by teaching our students how to make a stop motion animation using clay because the time expended learning to fabricate characters in the early lessons did not allow sufficient lesson time to develop the necessary computer skills for animating them.

On the other hand, the time-consuming process of making characters can be shortened by the use of origami (traditional folded paper animal, plant, and vehicle) characters. Adopting this idea allows students to make anything that they conceive of as a character using an origami shape.

Accordingly, in this paper, we describe how the use of origami was adopted in lessons aimed at efficiently teaching stop motion animation before students begin working with clay, present an overview of our relevant lessons phases, report on the educational effects of origami, and provide suggestions for future lesson improvements.

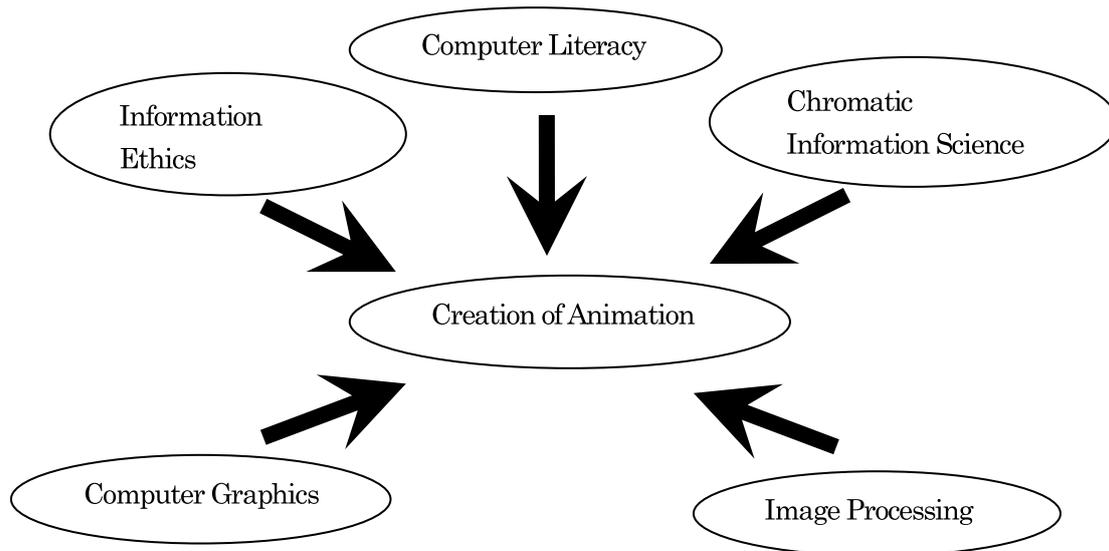


Figure 1. Relationship between Creation of Animation and other subjects.

2. Lesson Plan

Animation creation lessons were conducted based on the following process:

1. Receive a lecture about the history of animation.
2. Create an origami animation.
3. Create a zoetrope.
4. Create a clay animation.
5. Observe clay animations with the entire class and make self-assessments.

The details, from the second process onward, are covered in the sections that follow.

2-1. Origami Animation

Each class was separated into groups of six to eight students, which then created an origami animation based on their own selected themes. The process of making an origami animation is as follows:

1. Produce a story flow using a storyboard (Figure 2).
2. Create characters by folding origami paper.
3. Take photos of the origami characters with cellular phones.
4. Forward the photos to the student's university email addresses.
5. Download the photos to the classroom computer.
6. Perform video editing on the computer.

The students were recommended to begin their work by visiting an origami-club website³⁾, where instructions are provided on how to fold all kinds of origami characters. Since the computers in our classroom are not equipped with a dedicated video editing application, the students performed video editing using the animation function of Adobe Photoshop Creative Suite 6 (CS6)⁴⁾, which is a well-known image processing software product. This primarily involved arranging photo images into the proper sequence. In the origami animation stage, the students were instructed not to attempt to elaborate photo editing (i.e. clipping and image composition) or to insert digital video properties (i.e. transition effects and sound effects).

No.	Image	Content	Time		Date 年 月 日
			秒	コマ	

Figure 2. Animation storyboard. Illustrations are entered in the large left column, actions are entered in the large right column, and frame sequence numbers are entered in the narrow rightmost column

2-2. Zoetrope

Zoetrope fabrication was performed by following the procedure outlined on the Himage Laboratory website⁵⁾. Prior to the start of this lesson phase, students were instructed to obtain a large, flat-bottomed cup (similar to the one shown in Figure 3) and bring it to this class. The zoetrope creation process is shown below:

1. Draw eight original figures in a series on a sheet of paper, as shown in Figure 4.
2. Cut the sheet of paper into eight pieces.
3. Mask the surface of the cup using black tape.
4. Place the cut-out paper pieces on the inside of the cup.
5. Make eight 5-mm-wide slits in the side of the cup.
6. Spin the cup zoetrope on a rotary tray, as shown in Figure 5.



Figure 3. Sample zoetrope performed by following the procedure on the Himage Laboratory website⁵⁾. The diameter is 70 to 90 mm. When rotated properly, the figures will show a winking eye.

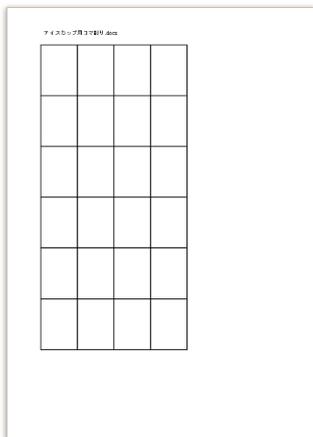


Figure 4. Zoetrope creation sheet. Each cell is 35x25 mm, and each student uses eight cells in a cup to create the animation.



Figure 5. Rotary tray originally designed to hold seasoning containers. This model was purchased for ¥108.

The original cup-type zoetrope design calls for the device to be center-mounted on a straw so that it can be rotated in accordance with the referenced procedure⁵⁾. However, since we found producing a smooth rotation using a sample zoetrope was difficult with that method, we used an inexpensive rotary tray instead and found that, in addition to being easier to handle, it was more easily adjustable for stable rotation speeds. Finally, the students were required to write a report on the zoetrope creation process that would include the following:

1. What is a zoetrope.
2. How to make a zoetrope.
3. Photos of the student's zoetrope.
4. Comments about the lesson.

2-3. Clay Animation

To create their clay animations, students used Van Aken International Claytoon™ modeling clay⁶⁾ purchased via CEC Co. Ltd.⁷⁾ because (at ¥864 for a four-color, 1 lb. set) it is a reasonably priced, non-hardening product. In the first part of this project, students were divided into groups of two to six students. Each group was provided two packaged Claytoon sets (18151 SWEETHEART containing pastel green, pastel pink, pastel yellow, pastel blue clays; and 18162 HOLIDAY containing red, white, blue, green clays). In addition, each group was provided one block of 18418 Beige Flesh clay and one block of 18411 Black clay. Providing the clays beforehand ensured the students would keep the available colors in mind when creating their animation storyboards.

The clay animation process is similar to that of origami animation, although the students also had the option of editing their photos on a computer and adding digital video effects (including sound effects) when there was sufficient time. In the last lesson of the phase, each group presented their animations to the entire class, and described their progress and concepts.

Then, each student was requested to make a self-assessment of their group's animation based on following process:

1. First, watch a clay animation created by the author.
2. Rate their clay animation based on the five-point scale below:
 - (1) much worse than the author's, (2) worse than the author's, (3) equal to the author's,
 - (4) better than the author's, and
 - (5) much better than the author's, while adding comments reflecting their assessments.

3. Student Work

3-1. Origami Animation

Figure 6 shows an origami animation produced by a student group entitled "Walking." Since, as noted in Section 2-1, students were not required to edit photos via computer, classroom computers and the tabletop can be seen in the frames. In this animation, the group hoped to evoke a sense of calm by showing baby chickens and their mother walking on a sunny day. The characters are shown walking from left to right, and then from right to left, by moving their positions back and forth and turning them around at the proper interval. Note that the group chose to use colors that contrast pleasantly with the animation background; red sun on blue sky, and yellow chickens on green grass.

(西口 理恵子)



(a)



(b)

Figure 6. The sixth (a) and eighth (b) frames of the student group made 14-frame origami animation entitled “Walking.”

3-2. Zoetrope

Figure 7 shows a student's zoetrope describing a soft-serve ice cream. Here, the zoetrope is so sharply outlined that we can clearly perceive the gradually melting ice cream.



(a)



(b)



(c)

Figure 7. Student zoetrope. (a) Top view, (b) side view, and (c) cup placed on the rotary tray.

3-3. Clay Animation

Figure 8 shows a group clay animation entitled “Swimming in the Sea.” The storyline is as follows:

1. Fish and other marine species are swimming in the sea.
2. A shark suddenly appears and attacks them.
3. They manage to swim away from the shark.
4. They escape from the shark in the end.



(a)



(b)



(c)

Figure 8. Student clay animation entitled “Swimming in the Sea.” (a) Clay characters in the paper box where they are stored while creating the animation. (b) Frame before the shark appears. The green contents are kelp made of paper, but the seashells are real. (c) Frame showing the shark arriving.

Figure 9 shows slides presented by the group that made the clay animation “Swimming in the Sea” (Figure 8).



Figure 9. PowerPoint slide from the group presentation showing the progress of creating the animation “Swimming in the Sea” (Figure 8).

4. Discussion

4-1. Origami Animation

Origami is familiar to most students because it is commonly taught in Japanese kindergartens and in their homes. With that background, it is unsurprising that they are enthusiastic about making origami animations. Additionally, as mentioned in Section 1, even though origami is less suitable than digital rendering and clay for creating changeable character shapes, the students could produce understandable animations by changing character positions. In our study, we found that two 90-minute lessons are sufficient to impart on the students the knowledge needed to produce their origami animations, and verified that the origami animation creation process achieves our primary purpose, which is quick to teach the students the processes involved with creating a stop motion animation.

Since students learned about storyboard creation by pursuing the origami instructions on the recommended website³⁾, they could easily share the characters among their group members. As a result, we conclude that the use of origami facilitates cooperative work among group members and recommend that origami be accepted as another teaching material for cooperative work projects, the need for which was mentioned by Nakamura, et al.¹⁾ in their study on clay animation.

Note that while toy blocks have been examined as possible alternatives to origami figures in character making, we believe that origami is a more appropriate teaching material in terms of variations in character size and price. Our results also suggest that origami animation can serve as an adequate introduction to making clay animation.

4-2. Zoetrope

In their remarks, many students said, ‘zoetropes are interesting’ and the ‘mechanism of animation is amazing.’ In agreement with the previous study by Abe²⁾, they came to realize that the zoetrope mechanism can be seen as an original form of animation. Additionally, being new to the students, the process of creating a zoetrope has the potential to stimulate the development of their intellectual curiosity. Of course, very few of the zoetropes made by the students displayed their animations smoothly at first, but after outlining the drawings sharply and broadening the slits properly, they found their zoetropes could perform well. The author felt that it was necessary to emphasize these points in preparation for the next phase of the course, which is ‘creation of animation.’

4-3. Clay animation

In this phase of the lesson series, in comparison with the earlier phases of the course, students were allotted plenty of time to make their clay animations and presentation slides. Having already created origami animations, they were familiar with the advantages provided by using a storyboard to confirm the process they needed to follow. In addition, they were better able to estimate the time required for image and video editing. This supports our conclusion that creating origami animations is conducive to teaching the clay animation creation process.

Similar to origami animation, the clay animations created in this study are mostly based on the idea of changing of character’s position. In other words, students do not convey actions by changing the characters’ shapes, which is normally a primary advantage of using clay. However, in future lesson plans, the author will address the issues that students will confront when it is necessary to make storyboard introduced shape changes as well as position modifications.

With respect to quality levels, which students determine by themselves in our lesson plan, there were considerable variations between groups. In his study, Kii⁸⁾ proposed that students review their works with a view toward enhancing the quality of clay animations. Since our current lesson schedule does not allow for sufficient time to review each group’s work before the entire class, the author intends to modify the plan so that groups can visit each other to comment on the work in progress using a performance evaluation form, which should be studied further, either immediately or online later, as the lesson phase progresses.

The animation produced by the author was found to provide a helpful criterion for student self-assessment since it gave them a benchmark from which they could clearly explain the reasons for their given ratings. Nevertheless, further studies will be needed to improve the quality of the student self-assessment process.

5. Summary

The present study is summarized by the following four key points:

1. Creating origami animations provides a helpful introduction to the process of making clay animations. Students quickly grasp the time and effort required by the creation procedure, and also learn the necessity of storyboarding prior to starting their clay animation projects.
2. Zoetrope building has the potential to stimulate intellectual curiosity in students.
3. While the current clay animation process follows the origami animation method in that it is based primarily on character position changes, the author intends to modify the lesson plan so that future students can take advantage of clay’s malleability to change character shapes as well as positions.
4. Since all of the students determine the quality of their clay animations via self-assessments, there are notable achievement gaps among groups. In the future, the author intends to facilitate visits between groups over the course

of the lesson phase so they can observe and immediately comment on each other's work using a performance evaluation form, or give comments online later, as a way to help each other improve the quality of their clay animations. Furthermore, even though students are provided a critique of their clay animations in order to make self-assessments of their clay animations, further studies on the self-assessment process need to be undertaken to ensure high-quality student works result from future lessons.

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