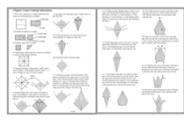
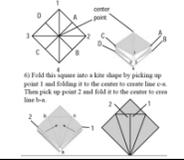
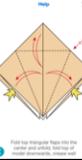


Table 1. Three instructional Models for learning origami

Print	Video	App
		
		

The nine (9) participants recruited for the user test were divided into three groups. None of the participants had any experience learning origami. The research assessed user success, behaviors, and experiences in response to the different delivery methods. Data from the three groups was measured and evaluated based on: 1) time required to complete the task, 2) number and kinds of errors and 3) incidents of misunderstanding the instructional information. We also gathered user experience data by observation, exit surveys, and interviews to compare the three learning models at the experiential level.

Table 2. Time Completed (minute)

N	Print	Video	App
P1	24	9.22	11.42
P2	38.31 (give up)	9.13	18.33
P3	29.31	14.20	10.20 (give up)

The Average time required to complete the task was 14.9 minutes using the App Instruction, 10.8 minutes using the Video Instructions, and 26.7 minutes using the printed Instruction. The results are shown on Table 2. The time measurement shows that participants using the Video instructions completed the task most rapidly.

Two participants gave up and did not complete the task, one in print, and one on the App. Both participants encountered difficulty on the same step which may show the difficulty of static media in visual instruction compared to motion media. (Table 3). Even though the instructions were comprised of multiple steps detailing the necessary folds, in different sides simultaneously, the video group followed the steps easily without audio instruction while users encountered difficulty in both the printed and the App instructions even though those instructions were supplemented with a detailed written descriptions. Participants appeared more relaxed and showed a much higher level of confidence when being guided to the next step through the video instruction.

Table 3. Complex instruction of visual literacy

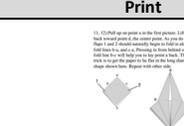
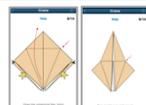
Print	App
	
Video	
	

Table 4. Difficulty level of the learning origami

N	Print	Video	App
P1	Difficult	Easy to Neutral	Difficult
P2	Difficult	Neutral	Easy
P3	Difficult	Easy	Neutral

Measurement: very easy, easy, neutral, difficult, very difficult

A similar exit interview question asked participants to rate the difficulty of the instruction. The Participants who had the Printed instructions gave the instructional materials the lowest effectiveness ratings while both the Video and App groups were positive about their visual comprehension of the instructions. (Table 5). All of the participants in the App and Printed instruction groups tended to interact first with the illustrations as their primary approach to the learning task. The Video instruction, however,

provided only live simulations without audio or text. Therefore the Video group did not demonstrate the same behavior. The tendency to look first at image supports the belief that learners primarily engage with graphic instruction and only engage the written instructions when they encounter difficulty at the visual comprehension level.

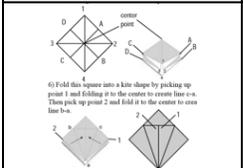
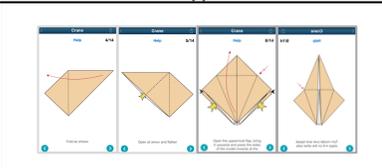
Table 5. Comprehension of visual instruction

N	Print	Video	App
P1	Neutral	Easy	Easy to Neutral
P2	Neutral	Easy	Neutral
P3	Difficult	Very Easy	Difficult

Measurement: very easy, easy, neutral, difficult, very difficult

In further discussions with the participants, we found that the written material in the printed instructions was difficult to understand in terms of constructing a visual image of the necessary steps. Participants from the App instructions group said that the wording did not help them to follow the task instructions when they (the instructions) required multiple folding steps. Participants in the Video instruction group stated that time-based instruction was easy to follow without any text and/or audio resources. In response to our question about which step the participants found most challenging, a frequently mentioned issue was difficulty understanding multiple steps represented by a single image, even when the image was accompanied by textual instructions. (Table 6). Even though the printed instructions provided more visual elements with the instructions, and regardless of the detailed written instructions, participants were still confused.

Table 6. The most challenging step

Print	App
	

In their interviews, participants suggested improvements to the instructional model they had tested. The App instructions group suggested that the visual instructions should provide more accurate infographics, especially including clear definition of lines in the images and whether they (the lines) indicate a fold upward or downward. They also wanted more images detailing the steps. The Video instruction group had no suggestions for the improvement of the visuals, but one consideration with the video was speed control. The Printed instructions group recommended more images and more detailed steps. They also suggested that the line drawings should include folding methods again dealing with the proper direction of the fold, upward or downward