

# Using a Mobile Phone App as a Teaching Aid for Aesthetics Education: Case Study of a Photography Course at a Taiwanese Junior High School

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Aesthetic literacy is one of living literacies that human live should have. Currently, Taiwanese students usually have their first experiences with photography using smartphones at junior-high-school age, which is an activity directly connected with aesthetics. To determine whether mobile phone apps can assist aesthetic education, this study designed a photography course and developed a specially designed photography app to assist students in learning photography through the course. The participants were 25 junior high school students, who were asked to take photographs before the course began, after they were taught using PowerPoint presentations, and after they were taught using the mobile phone app. Their photography from after the course was evaluated by experts to determine the effect of using the app-taught course on the students' aesthetic literacy. The results of this study revealed significant improvements in students' composition and aesthetic abilities after participating the app-taught course. From the aforementioned research procedures and results, several findings and suggestions were proposed. These suggestions can serve as a reference for future aesthetic education courses that plan to employ mobile phone apps as teaching aids.

**Keywords:** *Aesthetics, photography; composition; mobile application*

## 1 Introduction

The importance of aesthetic education was indicated by the NMC Horizon Report: 2015 K-12 Edition issued by the New Media Consortium in the United States. In this report, Science, Technology, Engineering, Arts, and Math (STEAM) education was listed as a mid-term goal. The purpose of STEAM education is to educate students with interdisciplinary knowledge. Moreover, it described an experiment analyzing the math scores of students who did or did not participate in music, which found that students who did participate obtained higher math scores than those who did not participate by 42 points. Compared with students who only participated in music and art classes for half a year or less, students who had taken four years of music and art classes obtained 98 points more in their math score. Thus, art classes can develop creative thinking, adaptation ability, and other problem-solving techniques (Johnson, Adams Becker, Estrada, & Freeman, 2015). In other words, creativity is a foundation for cultivating students' comprehension and problem-solving abilities.

Chen (2012) indicated that learning photographic techniques enabled students to express their thoughts and share their emotions, value, and ideas with their peers, which was consistent with the objective of the arts and humanities course. In other words, learning photography would help the development of aesthetic literacy. According to a 2014 survey conducted by Foreseeing Innovative New Digservices of the Institute for Information Industry, 70% of the Taiwanese public aged 12 years and older possessed a smart device. Sun (2016) surveyed 564 junior high school students in Keelung, where is a city in North Taiwan, 48.7% of the students indicated that the camera was their most frequently used smartphone function. Taking photographs or videos with a mobile phone is one of the most common aesthetic activities for junior high school students; it is also the beginning of their photographic experiences.

Since the mid-1980s, the Taiwanese government has promoted the grade 1-9 curriculum, of which reform in the arts field featured appropriate courses with students' life experiences to develop abilities that they could retain (Chao, 2014). Chang (2011) indicated that during learning, whether in creation or discussion, teachers must guide their students to make connections to their daily lives and explore the context of daily culture to integrate learning and living. Contemporary photographic technology allows anyone with an idea to engage in image creation, and appealing images often receive wide recognition. In addition to perfect and professional images, the content and creativity of an image are also substantial learning indicators and are closely associated with personal experiences (Yu, 2008).

Therefore, this study implemented a photography course in a Taiwanese junior high school using mobile phone apps as teaching aids to determine whether the course and app were able to enhance the photographic techniques and aesthetic literacy of junior high school students. The objectives of this study were as follows:

- (1) Design mobile phone photography-composition app based on the photography principles.
- (2) Compare the photographic outcomes of students instructed by using photography apps and PowerPoint presentations.
- (3) Explore the influence of photography-composition teaching on students' aesthetic literacy.

## **2 Related works**

### **2.1 Aesthetic education**

Aesthetic education means integrating the principle and theory of beauty into teaching and employing activities related to beauty to inspire the perception of students, develop their tastes, and increase their aesthetic experiences to cultivate their minds and enlighten creative thinking (Lu, 2012). The Taiwanese Ministry of Education (2013) stated that the meaning of aesthetic education was to offer the learner a method, opportunity, and environment to perceive, explore, experience, recognize, and practice beauty, as well as to sharpen their minds and bodies for diversified perception.

Liu (2012) stated that teaching photography enhanced the ability of aesthetics and appreciation for students in addition to training their ability to discover beauty and motivating them to document beauty and creation. In 2008, the Taiwan Ministry of Education disclosed the Grade 1–9 Curriculum Guidelines for Elementary and Junior High Schools, in which the objectives of arts and humanities courses comprised three principal axes: (1) Exploration and expression; (2) beauty appreciation and comprehension; (3) practice and application. Photography teaching and creation can achieve the abovementioned three objectives.

Specifically, the process of photoshoots enables students to explore the environment–individual relationship while simultaneously achieving creative expression through photography. Photographic work also enables students to conduct aesthetic discussions and appreciation, and the theme and preservation of photographic work enable students to understand the connection between the work and life of an individual. Finally, acquired photography techniques enable students to constantly connect their creations to their lives. Therefore, the present study incorporated photography teaching and outdoor photoshoots to implement aesthetic education. The influence of this course on aesthetic literacy was also explored.

## **2.2 Photographic composition**

Once a person picks up a camera and looks at the world through photographic vision, the relationship of this person and the photographed object becomes one of beauty appreciation (Liu, 2012). The outcome of a photograph is also associated with the principles of beauty; therefore, photography is suitable for learning aesthetics.

Patterson (2011) indicated that photography comprises two types of visual design: the design feature observed from the photographed object and the image design from arranging the photographed objects. Key elements of photography include the subject matter, lines, outline, color, texture, and composition (Hsieh, 2007). Savakis, Etz, and Loui (2000) indicated that composition to be one of the most important attributes when evaluating an image appeal.

The photographer Freeman (2014) proposed that an outstanding photograph must be based on remarkable composition. If the photograph is narrative, a powerful composition is required to present its content. Hoffmann (2008) stated that the composition of a photograph is similar to that of music; that is, the success of a photograph lies in the connection of each of the individual visual elements. Moreover, Zou (2010) considered that the purpose of composition is to effectively enhance all elements in the viewfinder to achieve a sensory impact. Hedgecoe (2006) indicated that the composition of a photograph must connect different elements logically to tell the story behind the image. An outstanding composition could emphasize the subject and content of a work; the combination of a remarkable technique and an excellent composition form an outstanding photographic work (Prakel, 2012). The composition holds a position in photography that is not to be underestimated. Thus, a student must properly learn composition to present the original idea with adequate emphasis.

The travel photographer Huang (2012) deduced several composition principles based on reviewing and analyzing his work over the years. These principles included horizontal, vertical, symmetrical, diagonal, crooked, golden ratio, L-shaped, T-shaped, cross, V-shaped, crevice, and centered compositions. The author of the present study compiled and organized nine composition principles fit for beginners, which were parallel, diagonal, curve, triangle, rule of thirds, subject-centered, symmetrical, contrast, and framed compositions. These nine types of composition formed the basis of the course and experimental design of the study.

## **2.3 Photographic evaluation criteria**

For the sake of objectivity in photographic evaluation, specific criteria must be established. Wu, Su, and Ouyang (2009) developed the Assessment Regulations for Photography Courses in which the assessment criteria for photographs were categorized into five aspects, namely the composition, exposure, shutter opportunity, depth control, and color. The evaluation criteria for the 2017 National Geographic Photo Contest: Travel Photographer of The Year Contest of the United States included the following three items: creativity (35%),

photographic quality (35%), and composition (30%). The evaluation criteria for the 100th Anniversary Nikon Photo Contest (2017) included creativity (30%), photographic quality (30%), techniques (including composition) (30%), and votes (10%).

In the Assessment Regulations for Photography Courses proposed by Wu et al. (2009), composition was listed as an individual evaluation criterion. The 2017 Travel Photographer of The Year Contest also listed composition as an individual item in the evaluation criteria. These two examples revealed the importance of composition. In the evaluation criteria of the 100th Anniversary Nikon Photo Contest, composition was particularly listed as one of the photographic techniques. Overall, most photography evaluations have employed the concepts of creativity, quality, and composition.

The objective of this study was to improve the aesthetic ability of students through a photography app for mobile phones to determine whether the app design could teach students about photographic composition. Therefore, composition was singled out as an individual item in the evaluation criteria. The creativity and other presentation methods with particular inspiration or significance were categorized as work aesthetics. These two items served as evaluation criteria in this study.

#### **2.4 Mobile application of photographic composition**

Mobile learning (m-learning) refers to establishing a new learning environment wherein students use mobile devices as aids to teaching materials. In m-learning, teachers and students can learn anytime and anywhere. The learning content is related to the environment and varies with changes in it; moreover, the learning progress can be recorded (Mikic, Anido, Valero, & Picos, 2007). M-learning tools can be a tablet personal computer (PC), a smartphone, a pocket PC, a personal digital assistant, a notebook, or any aids or devices that can load digital information content (Quinn, 2000). Kukulska-Hulme (2005) revealed seven desirable attributes of m-learning, which were spontaneous, personal, informal, contextual, portable, ubiquitous, and pervasive. With the development of digitalization, conventional cameras using photographic film have been replaced by digital cameras; moreover, mobile phones, which almost everyone possesses currently, can take pictures. However, the advancement in tools does not mean the art or techniques of photography can be simplified. Learners must learn conventional photography as well as understand digital image processing techniques.

Most commercially available photography smartphone apps are designed to assist photographers in taking photographs that fit their demands or aesthetic requirements. Such apps play an assistive role that could be applied to m-learning. This study selected three apps related to photographic composition that had higher feedback scores in both Google Play (2017) and Apple Store (2017): Hypocoam, cam0.618, and Insight. Hypocoam had two kind compositions for users; cam0.618 provided six compositions for users, but the direction of composition outlines cannot be flipped based on the smart phone screen; Insight app had easy-use interfaces and 24 types of composition. Either the operation is too complicated for a beginner or too simple to offer much operational freedom. Therefore, this study designed a composition-assistive app integrating the aforementioned advantages for photography beginners.

### **3 Experiment**

This study employed an experimental research design and recruited junior-high eighth-graders through purposive sampling. This study designed a photography course for a student club and focused on teaching photographic composition using the photographic composition app as a learning aid. The aim was to determine the effect of the classes and photography app on learners' photography techniques and aesthetic literacy.

#### **3.1 Experiment flow**

The experimental flow was as follows: (1) designing the course and photography teaching app: Photo Time; (2) inviting two experts to verify the content, learn about the course design, and comment on possible improvements to the app; (3) conducting actual course teaching and student practice; (4) inviting three experts to evaluate three photographic works of the students; (5) conducting statistical analysis on the three actual photographic outcomes; and (6) interviewing three students to know their learning experience.

To explore whether the use of the photographic composition app to assist teaching could effectively improve the learning outcomes of learners, three actual photoshoots were conducted. The first was conducted before the students learned any photography techniques and the second was conducted after they were taught using PowerPoint presentations, covering the principles of form and photographic composition. The third photoshoot was conducted after students were taught using the photographic composition app developed by the authors. This app was used to explain composition theories as well as employed in the actual photoshoot. For all three photoshoots, students were requested to use their devices as photography tools to mitigate the effects of various photography tools or operation styles on the objectivity of the experiment.

Finally, these photographs were given to experts for evaluation focusing on their composition and aesthetics. The composition included all nine composition principles, and the aesthetics involved the subject, creativity, lighting, focus, and colors. This evaluation was used to determine the photographic composition and aesthetic ability of students before and after they participated in the class.

The participants were recruited from the eighth grade of a junior high school in Taoyuan City, Taiwan. The entire course was conducted using student club activity time. Each class lasted 90 minutes and was conducted once every two weeks for a total of four times within eight weeks. For each photoshoot, students were requested to take at least three pictures for a total of at least nine by each student after the three photoshoots. All the photoshoots took place on the school campus.

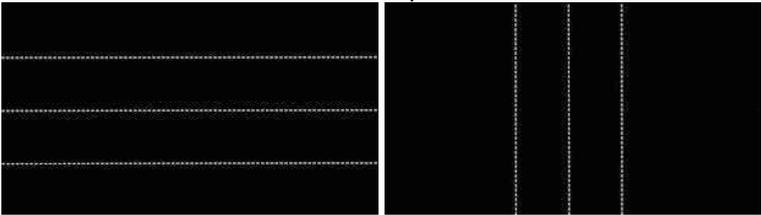
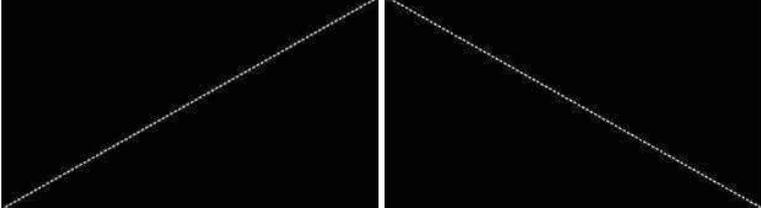
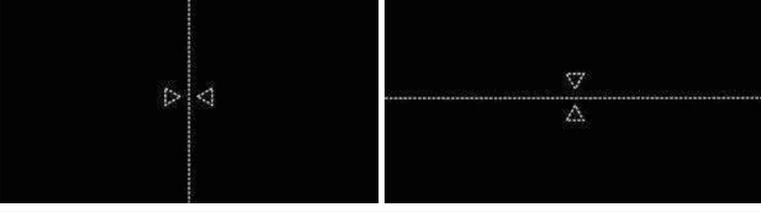
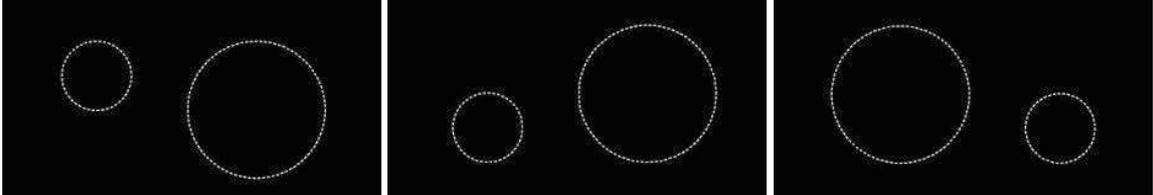
#### **3.2 Mobile application design**

The photographic composition app was designed to simulate actual usage conditions, which enabled students to choose different compositional frames when taking pictures. The software used to write this app was Unity 3D. The app operates on Android version 4.1 or higher and can be found and downloaded in Google Play by searching for "Photo Time." The interface introduction was divided into two parts: the first focused on the main operational interface of the app (Table 1) and the second focused on the part of composition layout of the application (Table 2).

Table 1 Interface design of Photo Time

<p style="text-align: center;">Name and LOGO</p> 	<p style="text-align: center;">Menu</p> 
<p style="text-align: center;">Samples of actually interface</p> 	

Table 2 Part of the composition layout for the Photo Time app.

<p style="text-align: center;">Parallel composition</p> 		
<p style="text-align: center;">Diagonal composition</p> 		
<p style="text-align: center;">Symmetrical composition</p> 		
<p style="text-align: center;">Contrast composition</p> 		

### **3.3 Photographic topics**

In the photoshoot area (i.e., the school campus), no fitting location to practice curve composition was found, and furthermore, the experts indicated that curve composition is more difficult for a beginner than other composition types. Therefore, the curve composition was eliminated from the present study, leaving parallel, diagonal, triangle, rule of thirds, subject-centered, symmetrical, contrast, and framed compositions to be practiced.

As previously described, the experiment comprised three photoshoot stages. For each photoshoot, students were required to submit at least three pictures for each of the three composition types assigned to them by a draw. Moreover, the topic for the first photoshoot was decided by a draw. The topics were as follows: (1) contrast, frame, and triangle composition; (2) rule of thirds, symmetry, and frame composition; (3) subject-centered, parallel, and diagonal composition. The topic for the second photoshoot was a topic that differed from the first photoshoot (for example, if topic 2 was drawn for the first photoshoot, then topic 1 or 3 would be selected for the second photoshoot). Similarly, the topic for the third photoshoot was one that was not applied in the first or second photoshoot. This measure prevented participants from taking the same photograph with the same topics. The experts evaluated and determined that the three topics were similar regarding difficulty.

### **3.4 Expert content verification and photoshoot works evaluation**

All students were asked to download the app from Google Play without being told the identity of the developer. Two experts were invited to comment and provide opinions on the experimental procedure, course content, mobile phone app, and photography topics after the completion of experiment, course, and app designs; relevant modifications and corrections were made according to these opinions. The professional background of the two experts; both had been photography teachers over 5 years and were keen to determine whether these nine composition designs were fit for regular photography demands, in addition to wishing to provide suggestions about the course design. After the three actual photoshoots in the classes, three experts were invited to evaluate all the photographic works of the students. All three experts had at least 15 years of experiences in aesthetic professions, such as photography, artistic creation, and communication design.

Items evaluated for each photograph were divided into the following two categories: composition and aesthetics were evaluated. For each category, a score was assigned from 1 to 5; the higher the score was, the favorable the performance was. Students were numbered according to the number of strokes in their last name in an order. Additionally, to prevent students' images being in the same order influencing the evaluation results, students were divided into an odd-number group and an even-number group; images of students in the odd-number group were presented in the order of photoshoots (1), (2), and (3), whereas those of the students in the even-number group were presented in the order of photoshoots (3), (2), (1).

After all evaluation results had been collected, statistical analysis was conducted in Statistical Product and Service Solutions (SPSS). First, the reliability of the three experts' evaluations was analyzed, and the reliability of internal consistency (Cronbach's  $\alpha$ ) was tested; the present study employed 0.7 as the standard, which meant that the questionnaires with test results higher than 0.7 were highly reliable (Chiou, 2006). Subsequently, analysis of variance (ANOVA) with dependent samples was conducted to analyze the differences in evaluation scores provided by the three experts for the composition and aesthetics items. The ANOVA significance standard was set as  $\alpha = 0.05$ ; that is, if the  $p$  value of the ANOVA

result was lower than 0.05, this result was significant and had explanatory significance. Finally, the least significant difference (LSD) test was used as the post-hoc method.

### 3.5 Participants interview

A semi-structured interview was conducted after the entire course had been completed to determine what the participants had learned and thought. The interviewees were three students selected through purposive sampling. The interviews were conducted with the consent of the students and conducted individually. The interviews comprised two sections: (1) App usage: Do you think learning with an app improved your photography techniques and aesthetic literacy? Can you provide a few examples? (2) Suggestions for classes: Did you prefer learning with the app or the PowerPoint presentation? Why?

## 4 Results and discussion

The original number of participants in this study was 28. However, due to sick leave, official business leave, and other reasons, the final number of the actual research sample in each stage was 25. In this section, the reliability analysis of the questionnaire was conducted first, and the results were as follows: the internal consistency value (Cronbach's  $\alpha$ ) of the three evaluations by expert 1 was .855; that by expert 2 was .863; and that by expert 3 was .750.

### 4.1 Results of experts' evaluation

To investigate whether the photographic composition and aesthetic ability of students improved after three classes, the three experts were requested to evaluate the students' images taken during the three photoshoots. The experts evaluated individual work based on composition and aesthetics. Finally, the ANOVA with dependent samples was conducted by the author on the scores of these works.

Regarding the evaluation results of expert 1, according to Table 3, the mean of the three groups was significantly different ( $F = 6.740$ ;  $p = .003 < .05$ ). The post-hoc results indicated a significant difference between the first and third photoshoots ( $p = .004 < .05$ ) as well as between the second and third photoshoots ( $p = .043 < .05$ ). According to Table 4, the mean of the three groups was significantly different ( $F = 9.129$ ;  $p = .000 < .05$ ). The post-hoc results indicated significant differences between the first and third photoshoots ( $p = .000 < .05$ ) as well as between the second and third photoshoots ( $p = .005 < .05$ ).

Table 3 Summary table of within-subject ANOVA analysis: composition (expert 1)

Sources	SS	df	MS	F	Post Hoc: LSD
Between groups (A)	3.947	2	1.973	6.740**	Third photoshoots (M = 2.68, Sd = 0.63) > Second photoshoots (M = 2.36, Sd = 0.57), First photoshoots (M = 2.12, Sd = 0.53)
Within groups					
Between-subjects (S)	9.787	24	.408		
Error (A*S)	14.053	48	.293		
Total	27.787	74			

Note: \*\* $p < .01$ .

Table 4 Summary table of within-subject ANOVA analysis: aesthetics (expert 1)

Sources	SS	df	MS	F	Post Hoc: LSD
Between groups (A)	3.307	2	1.653	9.129***	Third photoshoots (M = 2.20, Sd = 0.76) > Second photoshoots (M = 1.80, Sd = 0.65), First photoshoots (M = 1.72, Sd = 0.54)
Within groups					
Between-subjects (S)	22.347	24	.931		
Error (A*S)	8.693	48	.181		
Total	34.347	74			

Note: \*\*\* $p < .001$ .

Regarding the evaluation results of expert 2, according to Table 5, the mean of the three groups was significantly different ( $F = 5.401$ ;  $p = .008 < .05$ ). The post-hoc LSD results indicated a significant difference between the first and third photoshoots ( $p = .004 < .05$ ) as well as between the second and third photoshoots ( $p = .022 < .05$ ). According to Table 6, the mean of the three groups was significantly different ( $F = 6.573$ ;  $p = .003 < .05$ ). The post-hoc results indicated significant differences between the first and third photoshoots ( $p = .001 < .05$ ) as well as between the second and third photoshoots ( $p = .043 < .05$ ).

*Table 5 Summary table of within-subject ANOVA analysis: composition (expert 2)*

Sources	SS	df	MS	F	Post Hoc: LSD
Between groups (A)	3.307	2	1.653	5.401**	Third photoshoots (M = 3.84, Sd = 0.62) > Second photoshoots (M = 3.44, Sd = 0.65), First photoshoots (M = 3.36, Sd = 0.64)
Within groups					
Between-subjects (S)	14.587	24	.608		
Error (A*S)	14.693	48	.306		
Total	32.587	74			

Note: \*\* $p < .01$ .

*Table 6 Summary table of within-subject ANOVA analysis: aesthetics (expert 2)*

Sources	SS	df	MS	F	Post Hoc: LSD
Between groups (A)	3.440	2	1.720	6.573**	Third photoshoots (M = 3.56, Sd = 0.65) > Second photoshoots (M = 3.24, Sd = 0.60), First photoshoots (M = 3.04, Sd = 0.61)
Within groups					
Between-subjects (S)	15.120	24	.630		
Error (A*S)	12.560	48	.262		
Total	31.120	74			

Note: \*\* $p < .01$ .

Regarding the evaluation results of expert 3, according to Table 7, the mean of the three groups was significantly different ( $F = 8.377$ ;  $p = .001 < .05$ ). The post-hoc results indicated a significant difference between the first and third photoshoots ( $p = .001 < .05$ ) as well as between the second and third photoshoots ( $p = .031 < .05$ ). Moreover, regarding the aesthetics item for expert 3, the mean of the three groups was not significantly different ( $F = 2.471$ ;  $p = .095 > .05$ ).

*Table 7 Summary table of within-subject ANOVA analysis: composition (expert 3)*

Sources	SS	df	MS	F	Post Hoc: LSD
Between groups (A)	8.107	2	4.053	8.377**	Third photoshoots (M = 3.16, Sd = 0.75) > Second photoshoots (M = 2.68, Sd = 0.80), First photoshoots (M = 2.36, Sd = 0.57)
Within groups					
Between-subjects (S)	13.333	24	.556		
Error (A*S)	23.227	48	.484		
Total	44.667	74			

Note: \*\* $p < .01$ .

## 4.2 Results of interview

This section presents the semi-structured interviews with the three students to understand the influence of the course on its participants. The results of these interviews are described as follows.

### 4.2.1 Interviewee 1

The expert evaluation results for the photographs from the first photoshoot by interviewee 1 were 3, 2.5, and 2 points (means of composition and aesthetics), whereas the evaluation results the third photoshoot were 4, 3, and 4 points. The results indicated that the photography techniques of the interviewee were notably improved.

The author asked whether the app-taught course helped improve photography techniques and aesthetics, interviewee 1 answered, "I think so! Because the composition lines were very clear when taking pictures with the app." In other words, interviewee 1 was confident about the effect of the app on improving composition techniques.

In response to the question, "Did you prefer the app-taught or PowerPoint-taught course?" the interviewee 1 answered, "I prefer the app because using the app I could take pictures myself. Taking pictures by myself was more interesting." This response indicated that interviewee 1 was interested in actual hands-on operation, satisfied with the photoshoots. Relevant responses from interviewee 1 included: "I felt a sense of accomplishment about taking pictures."

#### 4.2.2 Interviewee 2

The expert evaluation results for the photographs from the first photoshoot by interviewee 2 were 4, 2, and 3 points, whereas those of the final photo were 5, 3, and 4.5 points. The results revealed an improvement in both the composition ability and aesthetics.

The author asked, "Did the app help improve your photography techniques and aesthetics?" The interviewee answered, "Yes. I think I can take better pictures now than I could before." The result indicated that interviewee 2 was confident about the effect of the app-taught course in photography.

Regarding the class contents, the author asked, "Did you prefer the app-taught or PowerPoint-taught course?" Interviewee 2 answered, "I preferred the PowerPoint-taught course. I am not sure why, but the presentation seemed clearer." This response indicated that interviewee 2 determined the app to be a teaching aid and preferred the information to be listed in a presentation.

#### 4.2.3 Interviewee 3

The evaluation results for the photographs from the first photoshoot by interviewee 3 were 5, 1, and 3 points, whereas the results for the final photographs were 4, 2, and 3 points. Interviewee 3's photography techniques did not demonstrate remarkable improvement.

The author asked, "Did the app help improve your photography techniques and aesthetics?" The interviewee answered, "I think so, compared with the pictures I took before." Therefore, interviewee 3 had noticed an improvement compared with before the course.

Regarding the class content, the author asked, "Did you prefer the app-taught or PowerPoint-taught course?" Interviewee 3 answered: "The app was better because it felt more convenient, particularly because I could take pictures by myself. I prefer taking pictures by myself." This indicated that interviewee 3 was interested in actual hands-on operation.

### 4.3 Discussion

Analysis results of revealed that scores for the students' photographs from the third photoshoot were significantly higher than those of the first and second photoshoots. The results indicated that the students' composition ability may be improved after classes. Interviewee 1 indicated that the clear markings for composition on the app facilitated photo taking. Lin (2014) indicated that employing tablet PCs with an app for information courses resulted in exceptional learning outcomes. This outcome was similar to the results obtained in this study, which indicated that using an app as a teaching aid was beneficial. Interviewees 1 and 3 preferred using the app in classes because the hands-on operation

was interesting, whereas interviewee 2 preferred the presentation in class because it was clear. In summary, both teaching methods had their advantages.

Several inevitable problems were encountered during the study that might affect its research results: (1) A few students were not able to participate in the complete course because of sick leave or personal leave; therefore, a complete collection of student images was not possible. Moreover, because the number of students who signed up for this course was fixed, adding additional participants was not an option. (2) Changes in the seasons and weather were impossible to control; for example, the day of the first photoshoot was sunny and those for the second and third photoshoots were cloudy with slight rain. This caused a change in lighting, which rendered quality control of photographs difficult. (3) The app designed for this study was uploaded for Android by the author. However, certain brands of mobile phone were unable to install the app that the students had to take turns using another mobile phone to practice. The unfamiliarity of students with the mobile phone's operation could have influenced the photographic outcomes. (4) The length of time of using the App was no longer than 60 minutes for each participant; therefore, it is hard to evaluate the long-term effect of the aesthetic ability through using the App.

## **5 Conclusion**

According to the experiment results of the present study, the composition and aesthetic abilities of the students were improved after the course on photographic composition. These results proved that teaching could indeed shape and nurture aesthetic literacy. In addition, the app served as a teaching aid to improve the students' photographic techniques and aesthetic literacy. The variable in this study was the use of a mobile phone app in teaching photographic composition, and the influence of the variable on aesthetic education was determined. The results indicated that both the use of an app and a PowerPoint presentation were liked by students. The author suggests starting the course with an app to attract students' attention before continuing with further teaching of knowledge to achieve the optimal advantages of each teaching method.

Concerning the research participants, the participants of the present study were selected through purposive sampling; thus, some students volunteered and some were assigned. This situation resulted in different students' active participation levels. Future studies are suggested to employ random sampling and conduct their research in art classes instead of student clubs to prevent excessive similarity in participants' features.

Regarding the research time, because this study was limited to teaching during the time allotted for student club activities, the research schedule could not be postponed even when the weather conditions were not ideal for the activities. Future studies are suggested to set the photoshoots indoors to mitigate the influence of weather conditions. In addition, the long-term effect of photography skill through the App should be further studied in the future. For instance, whether the users can really has a good skill of photography composition without using the App when they have learned the photography with the App after a period time.

Finally, the paper presented that the mobile applications can be a teaching aid for design or art education. However, when the courses overuse the Apps as the teaching aids, does it possible make students over focus on the training of technical ability, which in turn of the affects the development of creativity or imagination. The balance of knowledge teaching and skill training when using Apps as the teaching aids, which is worth to be studied in the future.

## 6 Acknowledgement

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