Comunicar
Media Education Research Journal
E-ISSN: 1988-3293 | ISSN: 1134-3478
PREPRINT

Received: 2016-09-08
Reviewed: 2016-10-10
Accepted: 2016-12-05

RECYT Code: 51562
Preprint: 2017-02-15
Final Publication: 2017-04-01

DOI: https://doi.org/10.3916/C51-2017-09

Stop-motion to Foster Digital Literacy in Elementary School

Stop-motion para la alfabetización digital en Educación Primaria

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Abstract
Although digital media literacy is recognized as providing the essential competencies required for living in a new media age, it has only just started to gain focus just starts to gain focus in Taiwan's elementary education. One of the reasons is examination-oriented education, which diverts scarce resources away from this informal learning. The other reason is that educators tend to think of digital media education as a series of purely technical operations, which might lead student digital media learning to mindless work. Therefore, this study designed a media exhibition based on Kolb's experiential learning model for teaching students concepts of stop-motion films and techniques of film production. A design experiment involved 247 third-grade elementary students who were grouped to visit the experiential exhibition. The findings suggest that the students have improved their knowledge of stop-motion films. Analysis of produced films by students also shows that they have improved their media ability to represent their ideas and communicate with others. Through the analysis of the influence of demographics on the knowledge test, the findings revealed that the experiential exhibition is more effective for female elementary students and students' relevant previous experiences may not affect their acquired knowledge. Given those results and observations, we believe that the proposed experiential exhibition is a promising way to carry out digital media literacy education in elementary schools.

Resumen
Aunque los medios digitales se reconocen como proveedores de las competencias esenciales requeridas para vivir en la nueva era mediática, en la educación obligatoria de Taiwan todavía están comenzando a ganar relevancia. Una de las razones para esta situación es la educación centrada en un sistema de evaluación, cuyo resultado directo se refleja en los escasos recursos dedicados a este tipo de aprendizaje informal. Otro motivo importante es que los docentes tienden a pensar en la educación mediática como una serie de operaciones puramente técnicas, lo que podría implicar que el aprendizaje en medios digitales de los estudiantes no tiene mucho sentido. Por lo tanto, este estudio diseñó una exposición mediática basada

en el modelo de aprendizaje experiencial de Kolb para enseñar a los alumnos el concepto de las películas stop-motion y sus técnicas de producción. El estudio experimental involucró a 247 alumnos de tercer curso de primaria organizados en grupos para participar en la exhibición experiencial. Los resultados sugieren que los estudiantes han mejorado su conocimiento de las películas stop-motion. Además, el análisis de las películas producidas por ellos mismos muestra una mejora en sus habilidades mediáticas para representar sus ideas y comunicarse. Por otro lado, el análisis comparativo de variables demográficas revela una mayor eficiencia entra las alumnas con respecto a los alumnos, además, los conocimientos previos del alumnado no influyen en la adquisición de conocimientos. Dados estos resultados y según las observaciones, concluimos que la exhibición experiencial propuesta es una vía prometedora para el fomento de la alfabetización digital entre los alumnos de Educación Primaria.

Keywords / Palabras clave

Digital literacy, media literacy, elementary education, experiential learning, stop-motion films.
Alfabetización digital, educacion mediática, Educación Primaria, aprendizaje experiencial, películas stop-motion.

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1. Introduction

Digital media literacy focuses on the ability to access, analyze, or produce media messages in non-written modes afforded by media communication technologies such as films, video games, online and mobile media, which differs from traditional media literacy (Dezuanni, 2015). Recently, digital media literacy is beginning to be recognized as one dimension of the essential competencies required for living in a new media age (Jenson, Dahya, & Fisher, 2014). Thus, it is necessary to implement digital media literacy in K-12 education because the aims of media education are also the most important ones of traditional education.

Media educators believe that media production is essential for digital media literacy education because it emphasizes students as media makers, allowing them to be more effective media analysts (Dezuanni, 2015), and that production promotes social and cultural participation (Hobbs, 2004; Jenson & al., 2014). Cheung (2005); Hobbs (2004) further noted that students' participation in media production using video cameras or computers could permit a sense of satisfaction when they are engaged in creative, imaginative and aesthetic activities. Therefore, allowing children to participate in media production has now become an invaluable mode of learning just as it is necessary for them to learn to write as well as to read, supplanting the traditional didactic teaching (Frechette, 2002).

Digital media production education has been around for quite some time in the occidental countries, but has only just started to gain acceptance in oriental countries (Cheung, 2009; Ramirez-Garcia & Gonzalez-Fernandez, 2016), particularly in Taiwan (Chang & Liu, 2011). Moreover, in the university, most of the curriculum about media education for young children in primary schools is specifically provided, and remains marginal and is excluded from the formal education (Lopez & Aguaded, 2015). It is thus necessary to utilize theories and methodological approaches that strengthen young people's digital media production skills in Taiwan.

However, the primary media education in Taiwan encounters two main challenges. The one issue is that primary students commonly acquire media education through attending the exhibitions or workshops outside the school. In addition, schools tend to cut field trips because of financial pressures and examination-oriented education (Greene, Kisida, & Bowen, 2014). The other issue is that educators tend to see media education as a series of purely technical operations, which can lead to student media production functioning as mindless work (Hobbs, 2004).

In order to resolve these issues, the study has designed an experiential exhibition toward teaching primary students to make short stop-motion films inside the school. This experiential exhibition specifically featuring artifacts geared is complemented by utilizing Kolb (1984)'s experiential learn-

ing theory. It is hypothesized that such activities can instill knowledge of media production into the students and improve their technical abilities about media production.

2. Theoretical background

2.1. Media production

The students equipped with media production ability will construct knowledge to deal with the situation of globalization in the twenty-first century and develop lifelong learning skills −to enjoy learning, enhance effectiveness in communication, develop creativity and to develop a critical and analytical mind (Cheung, 2005). In addition, media production can motivate students' interests in subjects because they are encouraged to demonstrate knowledge and understand technical skill in their productions. Moreover, media production provides students the opportunity to put theory into practice through exploring and doing. Learners can encode and (re)produce knowledge relevant to their real lives through media production. For example, a video camera might be employed by a primary school student to record a nature phenomenon explaining a physical principle. From this perspective, the video camera becomes part of everyday communication and the sharing of an idea or concept rather than being a technology for film production (Jenson & al., 2014). However, technology alone would not engage students in media production and succeed. As argued by Dezuanni (2015), technical production skills have value primarily when they develop students' conceptual knowledge.

2.2. Stop-motion films

With the development of current digital technology (e.g., iPad or mobile phone camera, and free movie-making software (e.g. Windows Movie Maker), stop-motion films have become a simplified way for students to create short films in school classrooms (Fleer, 2013). The stop-motion films employ easy-to-use use feasible techniques by taking still images one-by-one with a digital camera mounted on a hand-held mobile phone and generating a video clip played slowly at two frames per second (Hoban & Nielsen, 2012). This technique is unlike traditional stop-motion animation (e.g. clay animation), which involves manually moving clay models and taking enough photos to play at 25-32 frames/second to continue movement. In other words, this stop-motion technique allows creators to stop, discuss and think about their information while taking each photo (Fleer & Hoban, 2012; Lee, 2015). For example, Wilkerson-Jerde, Gravel and Macrander (2015) emphasize that creating stop-motion films can further engage learners in thinking about the temporal dimensions of phenomena.

The benefits of learners' becoming stop-motion film producers have been discussed in previous research. For example, in the context of university teacher education, Hoban and Nielsen (2014); McKnight, Hoban and Nielsen (2011); Vratulis, Clarke, Hoban and Erickson (2011) have demonstrated the adaptability of stop-motion films on supports teachers in learning various science concepts and technological pedagogical content knowledge.

2.3. Experiential learning

According to Kolb's experiential learning model, knowledge results from the interaction between theory and experience because learning is the process of creating knowledge through the transformation of personal experience (Kolb, 1984). It describes four stages in the learning model. Kolb considers that learning takes place in a spiral-like movement where the four stages take turns (Rasanen, 1999). The following describes the four stages of the experiential learning model (Konak, Clark, & Nasereddin, 2014):

1) Concrete experience. Learning starts with having a concrete experience, which means to perform a new task to gain a direct practical experience.

2) Reflective observation. Reflective observation carried through in carried through in activities such as discussion and reflective questions enables students to reflect on their hands-on experiences. The learner's self-reflection plays a central role in linking theory to practice.
3) Abstract conceptualization. From the reflective observations of stage 2, learners are expected to formulate a theoretical model and a generalization of abstract concepts.
4) Testing in new situations. In this stage, learners plan and test for the theoretical implications of concepts in new situations. The results of this testing stage provide new concrete experiences.

To date, experiential learning has been adopted in numerous fields of education (Konak & al., 2014). For example, Pringle (2009) developed a six stages of Meaning Making in the Gallery (MMG) framework based on experiential learning model for gallery education. Moreover, Clemons (2006) modified an experiential interior design project that involved the use of elements and principles of design and an opportunity for self-expression of personal spaces.
The research cited above is encouraging, though most focus on university students, suggesting the need for further investigation into elementary students. Also, as suggested by Chang and al. (2011), students' demographic characteristics such as gender differences should be taken into consideration when developing digital media instructional activities. For example, mobile phones may be more suitable to promote male engagement in digital media literacy. Therefore, this study intended to investigate how elementary teachers can play their role as curators to stage the experiential exhibition featuring enjoyable and educative activities.

2.4. Research questions

1) Does the experiential exhibition improve students' knowledge about stop-motion films?
2) Do students' demographic characteristics affect their knowledge about stop-motion films and film production abilities?
3) Does the experiential exhibition improve students' techniques for producing a stop-motion film?

3. Methodology

3.1. Setting

The exhibition takes place at an exhibition room in an animation elementary school located in southern Taiwan. The mission of the school is to develop students into educated and involved animators through a series of programs and exhibitions. K3 students will learn knowledge of animations from this exhibition every year.

3.2 Participators

In this study, we invited 247 third-grade students lacking practical experience in media production for our analysis. Each student has 125 minutes to participate in this event and extra 25 minutes to finish questionnaires. This is an organized program as well as formal classes for students in the elementary school. In Taiwan, except this elementary school, there are hardly formal classes including animation teaching. Most students have to learn animation subject at some specific workshop if they desire to.

3.3. The design of the experiential exhibition

The proposed experiential exhibition was separated into four stalls and designed to teach students the concept of visual persistence and stop-motion film production (see Figure 1). As shown in figure 1, K3 students from 9 classes were allowed to enter the exhibition room to receive the 100-

minute curriculum each time. The exhibition room was mainly divided into four parts: Stall A, Stall B, Stall C, and Stall D (Figure 1).

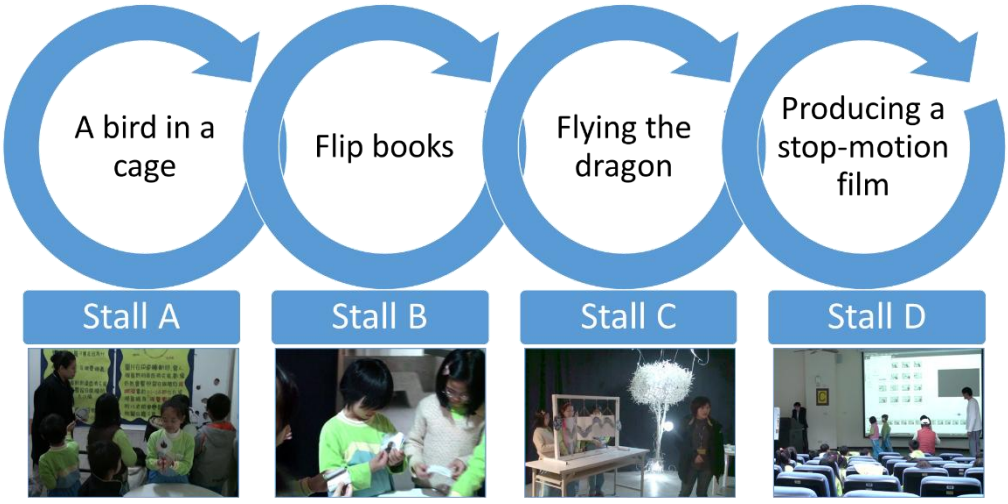


Figure 1. The four stalls of experiential exhibition.

1) Stall A: First, the stall guide started with a brief introduction regarding visual persistence. Then, the students used mobile cameras to photograph their preferred objects such as birds, cats, dogs, books and flowers. After the teachers had helped the students print these images, they pasted the printed paper on the blank side of the cardboard, which has a printed cage on the other side, and pasted the cardboard on the stick. Last, they would be surprised to see the photo and the cage on the stick become an object in the cage by rotating the stick quickly. By means of these activities, the students can learn by themselves and get to build the concept of visual persistence by watching the overlapped images.
2) Stall B: We provide the students with flipbooks made by 4k students at the stall. Each flipbook has an individual story, which consists of a series of pictures that vary gradually from one page to the next. When turning these books rapidly, the students can not only enjoy a great number of stories but also will be surprised to see the pictures appear to animate. The students were grouped by three and were asked to collaboratively record the animation through using mobile cameras. Here, we aim to stimulate kids to observe more phenomena of visual persistence, reinforce their conceptual understanding and thus kindle their interest in frame by frame animations.
3) Stall C: The students first used many pieces of cardboard to draw a single dragon on--Both sides of the cardboard have a body part of the dragon on them, but they are in different directions. Then they punched the cardboards and attached them in order to the wooden frame with rubber bands in order. After working together to finish the handicraft project, they could make the dragon “fly” by keeping flipping these cardboards over quickly. Meanwhile, they were also asked to collaboratively record the phenomenon of visual persistence through using mobile cameras. The stall allowed students to cooperate to get the task done, experience the magical phenomenon of visual persistence further. It goes without saying that they got addicted to the charm of stop-motion animation as we expected.
4) Stall D: First, the teachers demonstrated how to create a stop-motion step by step. Then they divided the students into groups of 3-5 and asked each group to make a short film. Each student played an essential part in the group –at least one task per member. After the students created a story together, someone would work on the shooting script, some would be the actors or actresses, someone would be responsible for taking photos, and some should be in charge of the post-production. In the last stall, the students made the short stop-motion film and then screened it in a

space whose main purpose was to enable the students to finish a piece of work on their own by combining the knowledge they just acquired using their creativity.
The activities in four stalls of the experiential exhibition incorporated Kolb's experiential learning cycles, comprised of five stages:

a) Manipulating objects. Students commonly get direct practical experience by performing a new task. In our activities, concrete experience corresponded to manipulation of objects. These hands-on activities can engage students through visual and kinesthetic senses.
b) Observing the phenomenon. Students could easily observe the phenomenon of visual persistence through manipulating the objects. Teachers also posed questions to encourage investigation (e.g. what did you see? How did rotation speed affect the view?). Students were also encouraged to exchange their ideas within the group. Through dialogue, students build a better understanding of the phenomenon.
c) Reflecting on the phenomenon. Teachers initiated the discussion questions such as "How did this phenomenon happen?", "Why did you think so?" to prompt students to consider how they have arrived at their interpretations. Group discussion is a particularly effective strategy to promote meaningful reflection and engagement in the learning process.
d) Conceptualizing the experience. The visual persistence was conceptualized by connecting learners' previous real-life experience. The utilization of generalization questions is a useful strategy. For example, teachers would request students to connect what they had performed in the activities with the animation movies they had seen before. Also, they could also be asked to list the advantages and disadvantages of media production techniques.
e) Testing on new objects. We designed four sequential stalls to enable learners to transfer the learned concept to new situations. More specifically, the first two stalls differed in numbers of frames. In stall B, the students performed the multiple-frame animation concept following the two-frame animation concept of stall A. In stall C, students were asked to collaboratively perform the multiple-frame animation concept. This collaborative performance provided a new experience for stall D.

3.4 Instruments

3.4.1. Demographic questionnaire

To gauge the background information of participants, a demographic questionnaire was designed. The items of questionnaire contain gender the number of visits to media exhibitions, and whether they have the experience of media production or not. The item number of visits to media exhibitions, is intended to understand participants' previous experiences about visiting image, animation, and film exhibitions. The item whether they have any experience of media production or not, is directed to understand participants' previous experiences about making an animated or stop-motion film.

3.4.2. Stop-motion film knowledge test

The knowledge on this test was included in two units: the theory of visual persistence and the techniques of the stop-motion film production. For example, the item "Visual persistence states the phenomenon where the retina retains an image for a short period after the removal of the stimulus that produced it", was aimed at examining the concept of visual persistence. In addition, the item "Taking digital still photos one by one with the camera, and then playing back photos quickly on the computer is a kind of stop-motion films", was aimed at examining the techniques of the stop-motion film production. The complete test included 15 true/false test items and was checked by the elementary teacher, who is also the curator of the experiential exhibition.

3.4.3. Scoring rubric in the stop-motion film production

Five experienced elementary teachers were invited to examine the quality of the films produced by students. The examination was based on scoring rubric designed by the curator of the experiential exhibition, who is also the expert in producing stop-motion films. The scoring rubric is comprised of three dimensions. The first dimension stipulates that the running-time for films, shall be no shorter than twenty (20) seconds and no longer than thirty (30) seconds. Failure to meet expectations resulted in automatic deduction of thirty (30) points. The second dimension, requires that there should be no lapses in the scenes for the continuity of films. The scores of the films shall be adjusted according to the numbers of lapses. The final dimension states that the scenes shall flow smoothly from one to another in editing videos. The scores of the films shall be deducted according to the smoothness of the films. The final scores of the films were calculated from an average of five teachers' scores.

3.5. Procedure

Figure 2 shows the experimental procedure. The entire procedure covers three 50-minute classes over a period of successive seven weeks. In the beginning, 247 students were divided into nine groups. In the first week, the stop-motion films which were created by other students from different countries (e.g., “T-shirt War”, “It is a Kinder Magic”, “Deadline post-it”) were selected and showed to students during a regular class session. At the end of the same class, the demographic questionnaire and the knowledge pre-test about stop-motion films were given to the students in all groups. Three weeks later, it was arranged that only one group each time participated in the experiential exhibition during two regular class sessions. The participation of students covered a period of three weeks. The experiential exhibition included was comprised of four stalls. In each stall, the teachers led students to get involved in the activities. And then, the teachers showed students the films created by themselves and made favorable comments on their works. Upon completion of the day's learning activities, students were given 10 minutes to complete a post activity test on their knowledge of stop-motion films.

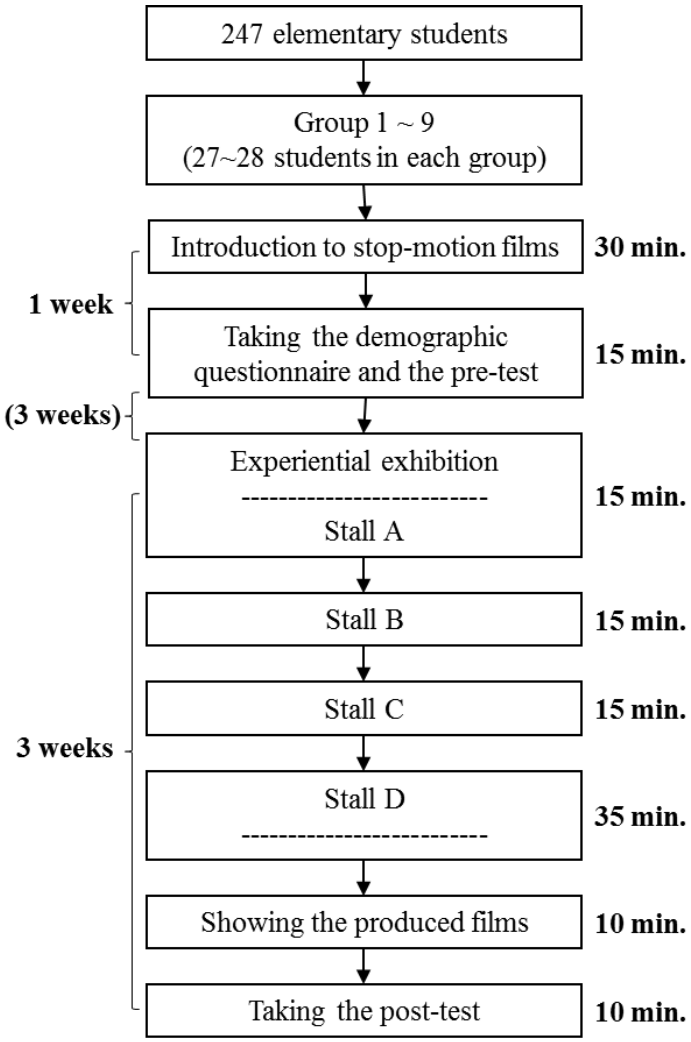


Figure 2. Experimental procedure.

4. Results

4.1. Demographics

The results in Table 1 show that the numbers of female and male participants are almost equal. The number of times that students visited the media exhibitions indicated that half of the students had attended the media exhibitions more than ten times. However, no one has the experience of media production yet.

Table 1. Demographic characteristics of participants (N=247)

Characteristic	n	%
Gender		
Female	125	51
Male	122	49
Number of visits to media exhibitions (e.g., photos, animations, films)		
0	11	5
1-5	31	13
6-10	40	16

10+	165	66
Having the experience of media production (e.g., animations, films)		
Yes	0	0
No	247	100

The finding of Table 1 reveals that students participating in this study had previous experience in going to media exhibitions, but lacked experience in media production. The rich experiences of elementary students in visiting media exhibitions can be attributed to the growing trend of emphasizing the cultural and creative industries in Taiwan (Chen, Wang, & Sun, 2012). Many media exhibitions featuring creative objects were staged for public media literacy promotion. However, the finding of lacked of experience in media production also provides the research with the background for this paper: Most children received passive experiences in visiting the exhibitions, lacking active experimentation to be effective media analysts and promote social and culture participation (Clemons, 2006).

4.2. The knowledge test about stop-motion films

The result shows that the difference between students' pre-test and post-test mean scores of knowledge about stop-motion films has a significant difference, t (246)=-21.337, p=<.001. Students' post-test mean scores (M=10.23, SD=1.81) are higher than their pre-test mean scores (M=13.09, SD=1.3).
The results imply that the designed experiential exhibition can significantly improve their knowledge of stop-motion films. To our knowledge, this is the first study involving elementary students in learning about stop-motion films. Through manipulating concrete objects in the stalls of the experiential exhibition, the abstract concept is physically presented. The elementary students find it easier to relate the new concept to their previous experiences (Santos & al., 2014).

4.3. The influence of demographics on the knowledge test about stop-motion films

4.3.1. Gender differences

An ANCOVA was performed to determine how post-test knowledge scores of stop-motion films are influenced by participants' gender while controlling the differences among the students' pre-test knowledge scores of stop-motion animation (see Table 2). Significant effects across different gender were found for the post-test knowledge scores, F (1, 244) = 5.32, p = .04. Post hoc analyses of the outcomes show that female students gain higher scores than male students.

Table 2. Pre- and post-test mean scores, standard deviations, and analysis of covariance (ANCOVA) results for two genders and four visiting times conditions

Knowledge test of Stop- motion animation	Pre-test		Post-test		ANCOVA	
	M	SD	M	SD	F	d
Sex					F(1,244)=5.32*	.02
Female (n=125)	10.23	1.79	13.28	1.18		
Male (n=122)	10.22	1.83	12.90	1.39		
Number of visits to media exhibitions					F(3,242)=1.58	.02
0	9.27	1.56	12.36	1.63		
1-5	10.10	1.68	12.84	1.32		
6-10	10.46	1.88	13.13	1.30		
10+	10.25	1.82	13.18	1.27		
*p< .05.						

The findings of Table 2 are consistent with Chang and Liu (2011); Chang and al. (2011)'s studies that female elementary students tend to be more media literate than male ones. The results can be attributed to two reasons. First, girls may use media in a more balanced way that involves both traditional and new digital media literacies, whereas boys may still be more focused on related new digital media literacy such as mobile devices (Unlusoy, de-Haan, Leseman, & Van-Kruistum, 2010). Our experiential exhibition concerns both traditional paper-based and new digital media activities, and thus girls were more engaged in such activities. Second, boys may view the digital media device as a playful toy, whereas girls may treat it as a tool to accomplish a task (Lee & Yuan, 2010). Therefore, girls may demonstrate a higher level of engagement in the experiential exhibition, allowing them to outscore boys on knowledge test of stop-motion films.

4.3.2. Previous experiences of visiting media exhibitions

An ANCOVA was also performed to determine how post-test knowledge scores of stop-motion animation are influenced by the number of participants' previous visits to media exhibitions while controlling the differences among the students' pre-test knowledge scores of stop-motion animation. Table 2 indicates that there is no significant difference in post-test knowledge scores across the four visiting times conditions, $F(3,242)=1.58$, $p=.08$.

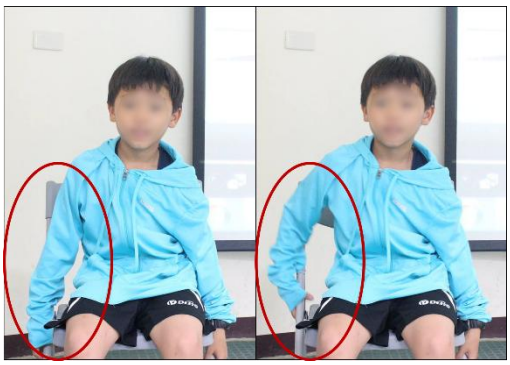
The finding of Table 2 is inconsistent with our hypothesis that students possessing extensive prior experiences of media learning should outperform those possessing poor prior experiences in knowledge about stop-motion films. One explanation is that students were free to roam the exhibitions without an instructional guide (Greene & al., 2014). Students retain little factual information from these exhibitions (Greene & al., 2014; Rasanen, 1999). However, this format is the norm in visiting exhibitions. The other explanation is that exhibition educators (e.g., docents, teachers) interpret the objects based on verbal conceptualization (Rasanen, 1999). Students passively received interpretation of objects, lacking active experimentation (Pringle, 2009). Consequently, students' prior experiences cannot facilitate media learning in new situations.

4.4. Stop-motion film production

The scored Format, Continuity, and Sequencing of produced films averaged scores of 30, 17.3 and 23.0 respectively. The scored stop-motion films averaged an overall score of 71.2 (SD = 10.56). The overall scores for these short films reveal that students get to produce good quality films through participating in the exhibitions. As shown in an example from the students (see Figure 3a), they represented a stop-motion film about adopting a hands-off approach to take off an anorak. In particular, the breakdown suggests that all of the groups can cope with the format of films. In other words, students have clear concepts that a stop-motion film is comprised of a sequence of photos and how many photos are necessary to make a 20 to 30-second film. The breakdown also suggests that students had some difficulty in maintaining the continuity of films. Films showed in fig 3b illustrate this the cause of the error could be forgetfulness or carelessness to establish a logical coherence between shots. Moreover, students also found some difficulties in editing a film with a smooth sequence. The common error in students' films that affected their sequencing was that the movement of bodies or objects tended to shrink over time. The tendency may be attributed to either student's lack of attention to a gradual shift toward movement or the attempt to reduce the amount of photos they needed to shot by making the movement smaller.

The effect can be attributed to the characteristics of stop-motion. While making the stop-motion films, students can take still photos one by one, that allows students to stop, discuss and think about their information (Fleer & Hoban, 2012; V. R. Lee, 2015). In other words, the stall of producing a stop-motion film in the experiential exhibition could provide students with new collaborative experience, which echoes Konak and al. (2014) studies.

a)



b)

Figure 3. a) A student's stop-motion film lacking logical coherence Selection of still images from a stop-motion film.

5. Limitations of the study

One of the limitations of the research is that we report on a single-group intervention. Furthermore, because this experiential exhibition was held at the end of the school year and faced formal classroom scheduling constraints, we were unable to explore the long-term influences of such approaches over students' digital media literacy. Also, we curated the theme exhibition on stop-motion films. Extending this approach to students' formal learning programs would be interesting. Another limitation of the research is that all the participants were grade 3 students. Therefore, the findings in this research should be generalized with caution. Finally, we also recommend further research considers how to guide the young people to understand and analyze the social and cultural phenomenon through the production process.

6. Pedagogical implication

There are several implications from this study regarding the learning of stop-motion film production through visiting the experiential exhibition. First, this study shows that the new strategy of digital media literacy education can be adopted to instruct students in the knowledge about stop-motion films and further facilitate them to create short films within 100 minutes; above all, it can be fitted into typical elementary education classes. The experiential exhibition may provide opportunities for widespread staging in elementary education classes as a new way to develop digital media literacy.

Second, the simplicity of the slow-motion film production techniques creates additional possibilities for making the valuable use of mobile devices in elementary schools. It is uncommon in modern elementary education due to tight scheduling constraints in courses and the time-consuming nature of making stop-motion films in a traditional way (Fleer, 2013). However, by the use of mobile phone cameras, electronic tablets such as iPads, and built-in generic movie making software, elementary students can learn how to make a stop-motion film during the 1.5 h exhibition. After that, they can also use their personal mobile phones to capture images and create their films at home.

Third, stop-motion films can be made in many subject areas such as science, geography, and geometry (Hoban & Nielsen, 2014). In particular, it is suitable for difficult topics involving change and relative movement such as phases of the moon.
A final implication is that the experiential exhibition offers students a chance to collaboratively reflect and discuss the media concepts within the groups. Furthermore, uploading their films to social websites (on YouTube, for example) for public reviewing is a good way to provide students with an additional option of using multimodal communication to share and respond with other learners.

7. Discussion and conclusion

Current literature has shown the value of university students as media makers, but none of the studies involved elementary students (Hoban & Nielsen, 2014; McKnight & al., 2011; Vratulis & al., 2011). Therefore, the research in this paper designed a media exhibition based on Kolb's experiential learning model to teach them concepts of stop-motion films and techniques of stop-motion film production. Such an experiential exhibition features that learning to constructing knowledge, skills and value through tangible experiences, which is different from the traditional methods of exhibitions that are using verbal conceptualization and delivering abstracted knowledge (Clemons, 2006; Rasanen, 1999; Santos & al., 2014). It is hypothesized that the proposed experiential exhibition is effective to provide an informal learning experience of digital media literacy and can be widely staged in elementary education classes.
A designed experiment involved 247 grade 3 elementary students that were grouped to visit four stalls of an experiential exhibition around the theme of stop-motion techniques and film production. Each stall contained a cycle of hands-on activities that involved students in manipulating objects, observing the phenomenon, reflecting the phenomenon, conceptualizing the concept, testing on new objects. The designed experiment placed students in constructive learning environments and involved multiples cycles of experimenting, reflecting, and conceptualizing in collaboration. These are all keys to digital media literacy, and as demonstrated in this article, can be effectively brought in at the elementary level.
The findings show that students have improved their knowledge of stop-motion films. Analysis of stop-motion films that the students have created also shows that they also improved in their media ability to represent their ideas and communicate with others. Through analysis of the influence of demographics on the knowledge test about stop-motion films, the findings reveal that the experiential exhibition is more effective for female elementary students, and students previous visit experiences may not affect their acquired knowledge. Given those initial results and observations, we believe that the proposed experiential exhibition for digital media literacy education is a promising one.
In Taiwan, art curriculums are commonly taugt to k1-k12 students in classroom. These curriculums usually focus on basic types of artistic creation, such as painting, drawing, and sculpture. Nowadays, to participate in the arts is to get involved and take part, a process which can occur on many levels. Therefore, art learning shouldn’t be limited by formal education and it should happen anywhere. In fact actually, the source of art creation comes from human beings' awareness and thought, all we have to do is to inspire students.

Acknowledgement

This research is partially supported by the Ministry of Science and Technology, Taiwan, R.O.C. under Grant no. MOST 105-2511-S-006 -015 -MY2.

References

Chang, C.S., & Liu, E.Z.F. (2011). Exploring the Media Literacy of Taiwanese Elementary School Students. Asia-Pacific Education Researcher, 20(3), 604-611.

Chang, C.S., Liu, E.Z.F., Lee, C.Y., Chen, N.S., Hu, D.C., & Lin, C.H. (2011). Developing and Validating a Media Literacy Self-evaluation Scale (MLSS) for Elementary School Students. Turkish Online Journal of Educational Technology, 10(2), 63-71.
Chen, M.Y.C., Wang, Y.S., & Sun, V. (2012). Intellectual Capital and Organizational Commitment: Evidence from Cultural Creative Industries in Taiwan. Personnel Review, 41(3), 321-339. https://doi.org/10.1108/00483481211212968
Cheung, C.K. (2005). The Relevance of Media Education in Primary Schools in Hong Kong in the Age of Mew Media: A Case Study. Educational Studies, 31(4), 361-374. https://doi.org/10.1080/03055690500237033
Cheung, C.K. (2009). Education Reform as an Agent of Change: The Development of Media Literacy in Hong Kong during the Last Decade. [Reforma educativa y educación en medios como agentes de cambio en Hong Kong]. Comunicar, 32, 73-83. https://doi.org/10.3916/c32-2009-02-006
Clemons, S.A. (2006). Interior Design Supports art Education: A Case Study. International Journal of Art & Design Education, 25(3), 275-285. https://doi.org/10.1111/j.1476-8070.2006.00494.x
Dezuanni, M. (2015). The Building Blocks of Digital Media Literacy: Socio-material Participation and the Production of Media Knowledge. Journal of Curriculum Studies, 47(3), 416-439. https://doi.org/10.1080/00
Fleer, M. (2013). Affective Imagination in Science Education: Determining the Emotional Nature of Scientific and Technological Learning of Young Children. Research in Science Education, 43(5), 2085-2106. https://doi.org/10.1007/s11165-012-9344-8
Fleer, M., & Hoban, G. (2012). Using 'Slowmation' for Intentional Teaching in Early Childhood Centres: Possibilities and Imaginigs. Australasian Journal of Early Childhood, 37(3), 61-70.
Frechette, J.D. (2002). Developing Media Literacy in Cyberspace: Pedagogy and Critical Learning for the Twenty-First-Century Classroom. Westport, CT: Praeger.
Greene, J.P., Kisida, B., & Bowen, D.H. (2014). The Educational Value of Field Trips: Taking Students to an Art Museum Improves Critical Thinking Skills, and More. Education Next, 14(1), 78-86.
Hoban, G., & Nielsen, W. (2012). Using "Slowmation" to Enable Preservice Primary Teachers to Create Multimodal Representations of Science Concepts. Research in Science Education, 42(6), 1101-1119. https://doi.org/10.1007/s11165-011-9236-3
Hoban, G., & Nielsen, W. (2014). Creating a Narrated Stop-motion Animation to Explain Science: The Affordances of “Slowmation" for Generating Discussion. Teaching and Teacher Education, 42, 68-78. https://doi.org/10.1016/j.tate.2014.04.007
Hobbs, R. (2004). A Review of School-based Initiatives in Media Literacy Education. American Behavioral Scientist, 48(1), 42-59. https://doi.org/10.1177/0002764204267250
Jenson, J., Dahya, N., & Fisher, S. (2014). Valuing Production Values: a 'Do it Yourself' Media Production Club. Learning Media and Technology, 39(2), 215-228. https://doi.org/10.1080/17439884.2013.799486
Kolb, D.A. (1984). Experiential Learning: Experience as the Source of Learning and Development. Englewood Cliffs, NJ: Prentice Hall.
Konak, A., Clark, T.K., & Nasereddin, M. (2014). Using Kolb's Experiential Learning Cycle to Improve Student Learning in Virtual Computer Laboratories. Computers & Education, 72, 11-22. https://doi.org/10.1016/j.compedu.2013.10.013
Lee, C.Y., & Yuan, Y. (2010). Gender Differences in the Relationship between Taiwanese Adolescents' Mathematics Attitudes and their Perceptions toward Virtual Manipulatives. International Journal of Science and Mathematics Education, 8(5), 937-950.
Lee, V.R. (2015). Combining High-speed Cameras and Stop-motion Animation Software to Support Students' Modeling of Human Body Movement. Journal of Science Education and Technology, 24(2-3), 178-191. https://doi.org/10.1007/s10956-014-9521-9
López, L., & Aguaded, M.C. (2015). Teaching Media Literacy in Colleges of Education and Communication. [La docencia sobre alfabetización mediática en las Facultades de Educación y Comunicación]. Comunicar, 44, 187-195. https://doi.org/10.3916/c44-2015-20
McKnight, A., Hoban, G., & Nielsen, W. (2011). Using Slowmation for Animated Storytelling to Represent non-Aboriginal Preservice Teachers' Awareness of “Relatedness to Country". Australasian Journal of Educational Technology, 27(1), 41-54.
Pringle, E. (2009). The Artist-led Pedagogic Process in the Contemporary Art Gallery: Developing a Meaning Making Framework. International Journal of Art & Design Education, 28(2), 174-182.
Ramírez-García, A., & González-Fernández, N. (2016). Media Competence of Teachers and Students of Compulsory Education in Spain. [Competencia mediática del profesorado y del alumnado de educación obligatoria en España]. Comunicar, 49, 49-57. https://doi.org/10.3916/c49-2016-05

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Rasanen, M. (1999). Building Bridges: Experiential art Understanding. Journal of Art & Design Education, 18(2), 195-205.
Santos, M.E.C., Chen, A., Taketomi, T., Yamamoto, G., Miyazaki, J., & Kato, H. (2014). Augmented Reality Learning Experiences: Survey of Prototype Design and Evaluation. IEEE Transactions on Learning Technologies, 7(1), 38-56. https://doi.org/10.1109/tlt.2013.37
Unlusoy, A., de Haan, M., Leseman, P.M., & van-Kruistum, C. (2010). Gender Differences in Adolescents' Out-of-school Literacy Practices: A Multifaceted Approach. Computers & Education, 55(2), 742-751. https://doi.org/10.1016/j.compedu.2010.03.007
Vratulis, V., Clarke, T., Hoban, G., & Erickson, G. (2011). Additive and Disruptive Pedagogies: The Use of Slowmation as an Example of Digital Technology Implementation. Teaching and Teacher Education, 27(8), 1179-1188. https://doi.org/10.1016/j.tate.2011.06.004
Wilkerson-Jerde, M.H., Gravel, B., & Macrander, C.A. (2015). Exploring Shifts in Middle School Learners' Modeling Activity while Generating Drawings, Animations, and Computational Simulations of Molecular Diffusion. Journal of Science Education and Technology, 24(2-3), 396-415. https://doi.org/10.1007/s10956-014-9497-5