

Using Time-lapse Photography for Environmental Education and Flipped Learning: A Case Study on the Marine Ecology Primary School in Tainan Taiwan

Lin Chih-Peng^{a,*}, Chih-Chuan Chen^b

^a Department of Leisure Management
Taiwan Shoufu University, Taiwan

^b Interdisciplinary Program of Green and Information Technology
National Taitung University, Taiwan

*Corresponding author's email: [firlin \[AT\] gmail.com](mailto:firlin [AT] gmail.com)

ABSTRACT--- *The purpose of this study used the Time-lapse photography (TLP) technology as the non-formal environment education for experience activities and education materials. The time-lapse photography allows students feel; moving plants (blossoms / plant growth process), water pearls (Intertidal zone , bubbles in the water), lightsaber (sunset, night; star; acts of light), etc., TLP give students awareness on different feelings, through the processing experience will be touch in deep reflection.*

First stage, the university students led by marine ecology elementary school students perform the TLP activities. Application of remote and offshore areas environmental resources, human resources, shooting land, water and airspace and combine partial rural schoolyard features as the themes. And second stage, time-lapse video playback which guided reflection environmental education, life education and citizenship education etc., through film facilitation, and then painting of the viewing experience feelings for the pictures of schoolyard features which will become digital image archive picture books, provide other elementary school students share partial results.

Keywords--- Time-Lapse Photography, Environmental education, Flipped Classroom

1. BACKGROUND/ OBJECTIVES AND GOALS

Observation is one of the principal sources of learning, which has been shown a driving force in the learning process. However, in real world, observation could be a very difficult task because some things cannot be easily observed by naked eyes, or sometimes it is very often that people ignore the gradually and slowly changes in the environment. This obstacle can be overcome by the newly developed time-lapse photography (TLP) techniques.

This study focused on the environmental education in the marine ecology of the country and used TLP techniques, such as time lapse editing, cascading combinations (multiple photos together), and text description, to integrate the natural resources and create the environmental education materials with which the flipped learning is explored in the class. In this study, we take into account the changes of natural resources in the course of the timeline, by recording and creating the materials for environmental education, and then explore how the materials would affect the flipped classroom. Thanks to time-lapse photography techniques, the time lapse videos enable us to observe such subtle changes through long period of time without difficulty. Moreover, a collection of these videos can become very interesting educational materials. An empirical research was conducted on the environmental education in primary school. The campus environment was used as a natural resource, and with the help of time lapse photography, we created teaching and learning materials for natural science, art and craft in primary schools. Through the use of dynamic time-lapse movies and static cascading photographs, the video teaching materials can be developed in different fields. It can also be used as an instructional material for cross-language and cross-language information.

2. METHODS

Different from the traditional photographing or videotaping methods, this study uses time-lapse photography, whereby the frequency at which film frames are captured (the frame rate) is much lower than that used to view the sequence. When played at normal speed, time appears to be moving faster and thus lapsing. TLP has become a common tool for observing the dynamic changes in time.

In this study, focusing on the natural environment and using TLP technology to capture the environmental image frames per unit of time, and then create time-lapse films for a particular subject with the help of post-production techniques such as time-lapse editing, cascading combination (multiple photos together) technology. A series of related time-lapse films derived from specific areas can then be compiled into environmental education materials. This paper will focus on the natural environment at the local Marine Ecological Primary School in southern Taiwan. The time-lapsed video will be played to the students and incorporated with static laminated photos for further study of flipped learning methods as well as course content.

The works of this study, both dynamic time-lapse videos and static photos, will provide to cooperating elementary schools as a flip-learning materials for environmental education. Moreover, the findings can be applied to different curricula, such as natural science, aesthetics, and art and craft.

3. RESULTS

In addition to the TLP works of dynamic and static environmental education materials for the marine ecology elementary school, this study will, with the participation of primary school teachers, explore and examine the educational methodologies such as flipped classroom and flipped learning, individualized teaching and adaptive learning, and environmental education. The primary school promotes kayak activities which development and cooperation with university for us not only teaching kayak skills but also implementing environmental education (Fig. 1). The environment education through the primary school students' paints extension a picture book as the theme then showed the natural phenomenon in TLP.



explanation of periophthalmus
(traditional Chinese)

Fig1. The kayak and environmental education activities

3.1 Flipped Classroom and Flipped Learning

This study is based on the marine environment, which is the most familiar campus learning environment for the students. Marine ecology elementary school provides resources for a flip-flop classroom. For example like Fig.2a (as the theme) which painted a picture book (named: mangrove song) about a black-faced spoonbills (HAPPY) came to the Cigu lagoon made friends and established relation with mudskipper (amphibious fish), fiddler crab (*Uca*) and *Bruguiera gymnorhiza* for a story. The picture story is trying to attract more kids and primary school students as they would like to understand the marine ecology element school. Furthermore, used the marine ecology element school series photos (Fig 2b) to inspire students to connect . with nature.



a

the picture book(part thereof)



b

shallow bay in this primary school

Fig. 2: used picture story to attract students closer to nature

3.2 Teaching students in accordance with their aptitude

As educators, we know that STEM education (Science, Technology, Engineering, and Mathematics) is the wave of the future. And the flipped classroom model brings together advances in education and technology to provide a personalized, engaging learning experience for every student. So, utilization of TLP technology into the flipped classroom which enhance the enthusiasm and motivation for study.

TLP is a technique whereby the frequency at which film frames are captured (the [frame rate](#)) is much lower than that used to view the sequence. The frame rate of time-lapse movie photography can be varied to virtually any degree from a rate approaching a normal frame rate (between 24 and 30 frames per second) to only one frame a day, a week, or longer, depending on subject. In the meantime, many photos could be recorded for teaching aids.

Fig.3 series are utilizing TLP technology and capture images from marine ecology elementary school. And then play the video to share and explain orally. Except for the dynamic images, boldness attempt are cascading combinations (multiple photos together) for teaching aids which apply in the perception. For example, Fig. 3a. is photography of TLP images from marine ecology elementary school. Fig.3b the frame rate of above photography is 20 seconds and flowing photography is 10 seconds from TLP images which could be a time-lapse movie approaching a normal frame rate (between 16 or 24 frames per second). Through multiple photographs method expressed TLP video for Fig.3b and then applied the cascading combination (multiple photos together) technology which showed at Fig. 3c. But Fig. 3c is randomly oriented and looked at incoherently. So, Fig. 3c which rid parts of photos and adjusted layer controls at Fig. 3d.

Although there is no difficult textual narration, TLP images provides the most original intention of learning, and could provide teachers with a variety of learning styles according to their aptitudes. Fig 3 series expression photographer's ideal across. For example Fig 3b the TLP video almost like at the same time (a frame 10 seconds, six photos are $10 \times 6 = 60$ seconds). It is interesting for mudskippers (amphibious fish) which are walking and taking a rest such as thought-provoking questions Fig 3c and Fig 3d are taken all TLP photos image overlay one picture. Fig 3c application in vision or perception could be used as the principles of grouping (or Gestalt laws of grouping) which account for the observation that naturally perceive objects. Fig. 3d Used to explain the route map of this fiddler crab (*Uca*) and mudskipper (amphibious fish).



a



b



c



d

Fig. 3 TLP image capture (1photos/10Sec) and photomontage (digital image synthesis)

3.3 Environmental education

With TLP video in this study explores students' learning process by integrating environmental education with marine ecological concepts, including the concept of sustainable development (natural capital, ecosystem services), the value of natural environment (material value, spirit value, ethical value), along with scientific investigation (to cultivate communication technology, problem solving, classify-physical and chemical properties and investigations) and other projects as students' learning spindle. In the process of TLP shooting, visual image expression and preservation, in addition, environmental conditions record, which could be provided information for readers that acquire information as to build academic motivation for environmental education. Tables 1 in accordance with photography themes, TLP shooting conditions and environmental data have been recorded. Used the marine ecology elementary school resources have been thrilling interest to the TLP audience.

Table 1: Description of the samples

Photography					Environmental condition
Theme	date	Time-lapse	Total sheets	camera	
Uca and mudskipper	2016/10/10	1photos/10Sec	588	goProH4	low tide
Tide	2016//10/16	1photos/15Sec	190	goProH4	high tide
sunset	2016/10/28	1photos/30Sec	89	Canon 700D	fall
big Moon	2016/09/16	1photos/30Sec	147	goProH4	Moon Festival

3.4 Conclusions and future work

This paper investigates the environmental education in the marine ecology of the country using time-lapse photography (TLP) techniques for the flipped classroom. The main contributions of the paper are: (1) the TLP works of dynamic and static environmental education materials for the Marine Ecology Elementary School. (2) painted a picture book (named: mangrove song) about a black-faced spoonbills came to the Cigu lagoon made friends and established relation with mudskipper (amphibious fish), fiddler crab (*Uca*) and *Bruguiera gymnorrhiza* and TLP videos for the flipped classroom, and (3) explores students' learning process by integrating environmental education.

We plan in the future to implement diversified ecological primary School in southern Taiwan for TLP shooting themes and environmental education materials. From a practical standpoint, it would also be useful to extend the perceptions of the environmental education, especially variations in the value of natural environment.

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4. REFERENCES

- Dewey, J. (1938). *Experiential and education*. New York: Collier Books.
- EnglesonC. & Yockers, D. H.D. (1994). A guide to curriculum planning in environmental. Wisconsin: Wisconsin Department of Public Instruction.
- HartA, & BensonA. (1996). Researching media education in English classrooms. *Journal of Educational Media*, 7-21.
- Jacoby,& othersB. (1996). *Service-learning in higher education-foundations and principles*. San Francisco: Jossey-Bass.
- JoplinL. (1981). On defining experiential education. *The Journal of Experiential Education*, 4(1), 17-20.
- KellerMJ. (1983). Motivational design of instruction. (edit: ReigeluthC. M.In) *Instructional design theories and models: an overview of their current status*, 384-434.
- Kenneth LaudonLaudonJane. (2007). *Essentials of Management Information System*. New York: Prentice Hall.
- KolbD.A. (1984). *Experiential Learning : Experience as the Source of Learning and Development*. Windsor. CT, U.S.A: Yankee Clipper Books.

- MaddenAN., & SlavinE.R. (1983). Effects of cooperative learning on the social acceptance of mainstreamed academically handicapped student. *Journal of Soecial Education*, 171- 182.
- NeillTJ. (2002). Brief evaluation of the Mystery Adventure Experience. Durham, NH: Unpublished manuscript. University of New Hampshire.
- NeillTJ. (2008). Enhancing Life Effectiveness: The Impacts of Outdoor Education Programs. Sydney, NSW, Australia: Unpublished manuscript, University of Western Sydney.
- NeillTJ. (1999). The melting pot of outdoor education effects; Testing the flavours of program type, duration and participant age. .In *Proceedings of the 11th National Outdoor Education Conference (11-15)*. Perth, Western Australia: Camping and Out.
- O'BrienA.James. (2005). *Introduction to information system*. New York: McGraw-Hill.
- QuezadaL., & Christopherson, R. W.R. (2005). Adventure-based service learning: University. *Journal of Experiential Education*, 1-16.
- Ryan Chylinski(2013). How to Shoot Time-lapse Photography and how to make a time-lapse video. Retrieved from <http://www.learntimelapse.com/time-lapse-photography-how-to-guide/>
- SchmiederAA. (1997). The nature and philosophy of environmental education Goals and objectives. *Trends in environmental education*, 22-34.
- SmallV. & Gluck, MR. (1994). The relationship of motivational conditions to effective instructional. *Educational Technology*, 36 (8), 33-40.
- SmithK & Bruce W. TuckmanM. (2005). Forming, storming, norming and performing in groups, the encyclopaedia of informal education. Retrieved from www.infed.org/thinkers/tuckman.htm
- TuckmanWBruce. (1965). Developmental Sequence in Small Groups', *Psychological Bulletin*. 63 (6), 384-99.
- TyreeM. (1998). Designing an instrument to measure the socially responsible leadership using the social change model of leadership development. *Dissertation Abstracts International*, 59(6), 1945T. (1945).
- TyreeMT. (1998). Designing an instrument to measure the socially responsible leadership using the social change model of leadership development. *Dissertation Abstracts International*.
- WielkiewiczMR. (2000). The leadership attitudes and beliefs scale: An instrument for evaluating college students' thinking about leadership and organizations. *Journal of College Student Development*.