

Public Awareness Program and Development of Education Toolkit for Green Sea Turtle Conservation in Sarawak, MALAYSIA

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ABSTRACT

Nobody knows exactly what happened during 'the lost years' of the turtles in the wild, thus a green turtle headstarting project was carried out at Pantai Pandan, Lundu, Sarawak, Malaysia from June 2014 until December 2015 to shed some lights on the growth of hatchlings during a small part of their 'lost years'. As a consequent, opportunity of small scale awareness campaigns on sea turtle conservation arises during this project. Activities include talk related to green turtles conservation, hands on experience on turtle-human interaction (supervised), and documentation *via* videography. Evaluation on the affective domain among participants on this short program was carried out based on standard structured questionnaires followed by data analysis. A total of 666 people participated in the awareness program from October 2014 to November 2015. Approximately 72.8 % of participants had never seen and touched any life turtles thus this program had provided the opportunity to do so in a safe manner. Personal testimonies revealed the 21.2 % respondents that have eaten turtle eggs prior to this program said that they will never eat any in the future. Upon completion of this study, participants and local people alike, showed appreciation to the existence of green turtles in Malaysian waters and are very willing to be the sea custodians in the future. A series of brief video with the duration of 2 minutes each, a manual and an information kiosk had been produced, which serves as documentation of the project and to be used in future awareness program.

KEYWORDS

green turtle, awareness, video documentation, information kiosk

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Introduction

Worldwide, there are seven living species of sea turtles: green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricate*), olive ridley (*Lepidochelys olivacea*), leatherback (*Dermochelys coriacea*), flatback (*Natator depressus*), Kemp's ridley (*Lepidochelys kempi*) and loggerhead (*Caretta caretta*). The populations of all

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species are threatened by over exploitation, disease, incidental captured by fishermen and also destruction of critical nesting habitats (Wabnitz & Pauly, 2008). However, despite having existing laws and regulations to protect threatened sea turtles, law enforcement in certain areas of the world such as Liberia is still very weak or worse still, non-existent (IUCN, 2015).

The green sea turtle, an endangered marine turtle species (Seminoff, 2004) has been subjected to a long history of extensive human exploitation for meat and egg harvests (Mortimer, 1995). The main threats to sea turtles are incidental captured in several types of fishing gear and marine pollution, and other factors such as urbanization and lighting on beaches (Eckert, 1996; Lohmann *et al.*, 1996) as well as global warming (Fuentes & Porter 2013; Pike 2014). Ehrhardt & Witham (1992) suggested that conservation programs are necessary to restore the populations.

Headstarting is a technique where newly hatched turtles are taken into captivity and maintained for a period of time (usually 9 to 12 months) when they are at a size at which natural mortality factors that affect hatchlings are minimized (Mortimer, 1995). In this study, headstarting was initially carried out to study the growth rate of green sea turtle hatchlings but has coincidentally served as a place for sea turtle awareness program.

Environmental education is an important tool for the conservation of species, since it enables the expansion of knowledge about ecology and also promotes favourable attitudes that protect the environment and the conservation of natural resources (Ehrhardt & Witham, 1992). The application of environmental education for children has proven to be effective in the process of raising awareness on relevant issues (Basile, 2000). According to Clark (1991), combination of printed materials, audio-visual presentations and face-to-face interaction is probably the best way to start an education programme. In addition, Hudson (1988) claimed that video can be used to deliver conservation message as it is one of the beneficial tools to environmental educator. Furthermore, equipment needed for video making was relatively cheap and easy to use (Hudson, 1988).

In this study, to promote sea turtle awareness program in a more appealing and fun way, an effort has been made to use video and information kiosk (a type of interactive learning) suitable for the new generation. Other than that, a survey on the participants' view of the program was conducted to check the effectiveness of knowledge dispersal through the program.

Materials and Method

Public Awareness Program and Survey

The awareness campaigns were conducted after receiving endless requests for school and group visits from various organisations and schools in Sarawak, Malaysia. As it was the first local headstarting project, it is unavoidable to attract public interest, thus initiative begun to educate the locals as well as the public about sea turtles and the dangers that they are facing. Officially, the awareness campaign was conducted from October 2014 until November 2015. A total of 666 participants had involved in the awareness program. However, due to technical problems, only 259 people had participated in the survey. The questionnaire comprises simple and bilingual items, so that it could be

understood by all age groups and different ethnicity that make up Malaysians. All survey session was conducted at Pandan GoldCoast Holiday Villa (PGCHV), Lundu, Sarawak after the 10 minutes standard power point presentation (slides prepared by Sarawak Forestry Corporation, a state agency who is responsible for conservation of flora and fauna in Sarawak) and 10 minutes video presentation session. The questions asked in the survey included the participant's experience with sea turtles and their understanding of what the researcher had delivered during the presentation.

The sea turtle nursing and feeding session was conducted with the supervision of the main researcher at all time to ensure that no harm would be inflicted on the turtles as well as the participants. The participants were allowed to participate only after they have washed their hands and watched the proper handling demonstration by the main researcher. The participants were allowed to feed the turtles only with the food prepared by the researcher. Sponges were provided for cleaning the turtle's shell before releasing them back into their tanks.

Philanthropy Spirit and Community Service

After the interaction with sea turtle session, all participants were invited to do some beach cleaning to help with the conservation effort carried out in Lundu, Sarawak. Every participant was strongly encouraged to donate RM 1.00 (US\$ 0.48) into the turtle donation box.

Development of Educational Toolkit

Videos that were produced for this project was developed using Adobe Premiere CS6 for Windows while the information kiosk (IK) was developed using Adobe InDesign CS6 for Windows software in which both were licensed to Universiti Malaysia Sarawak (UNIMAS), under the care of Faculty of Applied and Creative Arts. The IK was implemented on a kiosk platform.

Results and Discussion

Public Awareness Program and Survey

Based on the age group, a total of 78 questionnaires were collected from age group 7 to 12, 31 questionnaires from age group 13 to 17 and also 140 questionnaires from age group 18 to 25. Approximately 54 % of participant was from age group 18 to 25 while 30 % are from age group 7 to 12 (Figure 1). The biased age group of participants was caused by requests from schools and university to participate in the program. According to United Nations Environment Programme (UNEP) (2007), nearly 30 % of the global population comprises young people who will be the decision makers of the future and their involvement has been internationally recognised as critical to sustainable development. Moreover, UNEP (2007) also mentioned that awareness raising campaigns are often most successful when they are targeted at specific groups because information can be tailored to the activities, needs and challenges of the group. Four correspondents came from age group 26 to 50 and also 6 correspondents from age group above 50. These participants tend to be teachers or supervisors managing the groups.

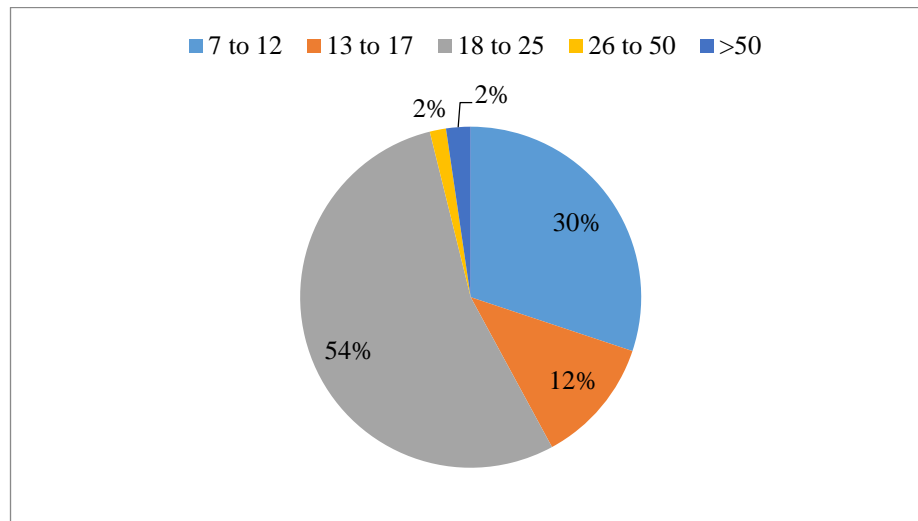


Figure 1. Age group of the respondents.

Based on the survey on participants understanding of the video, talk and presentation, 98.8 % respondents preferred video presentation while 96.5 % respondents were fond of the practical session (Figure 2). Similarly, Mayer (2001) supports that video is one of the effective ways to disseminate knowledge by mentioning that well-designed multimedia instructional messages can promote active cognitive processing in students, even when learners seem to be behaviourally inactive. Dede (1987) further supported the theory by stating that any visual media delivery system is capable of supporting learner interactivity while at the same time facilitating interconnectivity of images and symbols has the potential to become an extremely powerful educational tool. The full result of the survey is shown in Figure 3.

Out of 259 respondents, 96.5 % mentioned that they understood the power point presentation or talk that was given at the start of the turtle awareness program. Therefore, the researcher has also included 2 questions in the questionnaire to test the participant's understanding on the matter. From the questionnaire, 2.3% and 5.0 % respondent were unable to understand the danger of marine debris and nets to sea turtle, respectively. The rest of the participants were able to correctly answer the question thus indicating high understanding of the subject after the talk.

Approximately 72.8% participants have not seen a turtle before. Sarawak promotes conservation of wild animals such as proboscis monkey, orang-utan and hornbill as flagship animals. Although turtles nest at Talang-Satang National Park, the public are not aware of the situation and the conservation programs carried out on turtles of Sarawak. According to Toronto Zoo (2012), the opportunity to view native and exotic animals in simulations of their natural habitats will catch the attention of the general public and set the platform for them to learn about the biology of the organism as well as the challenges they are facing in their natural ecosystems. It is through educational initiatives that the public will become inspired to do what they can do to preserve the natural world thus highlighting the importance of the headstart project's location and its function in educating the public.



Figure 2: Practical session being carried out with school children.

Due to the rarely seen turtle size, only 12.7 % out of 259 correspondents managed to guess the right age of the reared turtles. The posthatchling period known as 'lost year', is a time at which the sea turtle history after departure from natal beach is poorly understood (Witham, 1980). By conducting a headstart program, the public were able to observe juvenile turtles at a time where they are impossible to find at sea.

Approximately 20.78 % of respondents said that they have seen turtles in Sabah, and 16.88 % said that they saw turtles on television while 14.29 % said that they have seen turtles in places like aquaria or sanctuaries. According to Swingle *et al.* (1990), the primary conservation role of zoological parks and aquaria has been one of public education in which it acts as centre for information transfer, as the main outlet for results of basic biological research to reach the public in an understandable form. It is also not surprising that many of the conservation program participants mentioned Sabah as a place where they have seen turtles. In Sabah, Palaniappan (2001) reported that Sipadan Island supports a large density of green turtles, second only to the Turtle Islands Park. Joseph & Chong (2014) also mentioned that many juvenile green turtles could be found in Sipadan Island consists of mixed stocks from Sabah Turtle Islands, Philippine Turtle Islands, Australia, Micronesia, Papua New Guinea and Indonesia.

Chan (2006) claimed that a long history of extensive egg exploitation is among the major causes of population decline in Sarawak where continued egg harvest for many decades has led to failure in protection of sufficient numbers of marine turtle eggs required for population maintenance. From the survey, it was found out that 21.2% participant has eaten turtle eggs before and after the program only one participant would still want to eat it. This indicates that public education and awareness plays an important role in the issue of endangered species conservation as these actions seek to promote behaviour change, which is of great importance for the success of a long term conservation program (Jacobson, 1987).

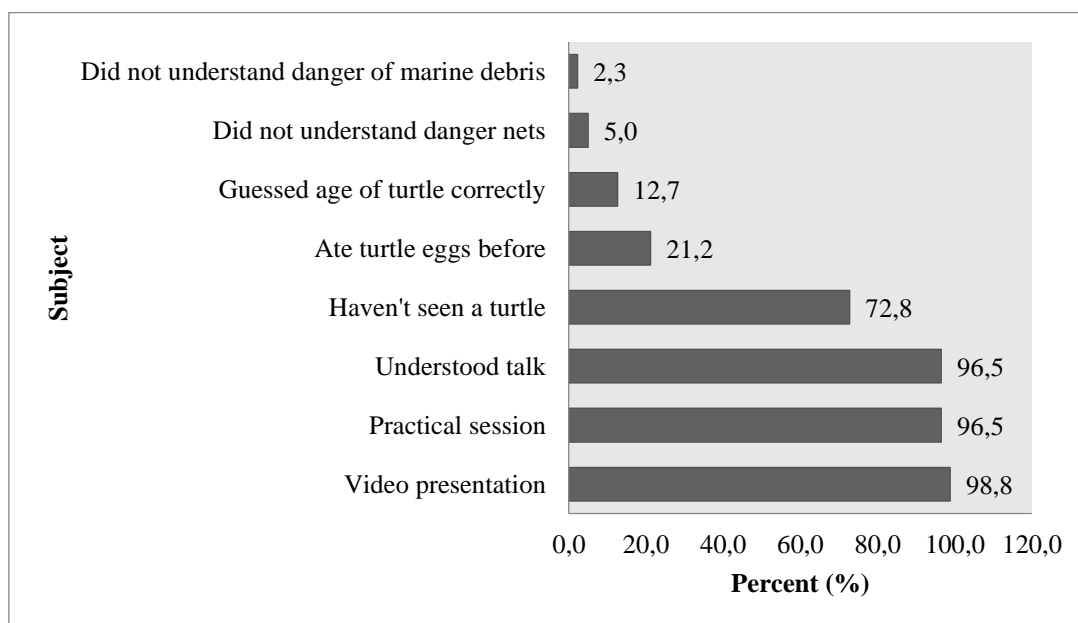


Figure 3. Result of survey (n=259)

In future, perhaps there is a need to emphasis on the dangers of eating turtle eggs for example by highlighting the presence of lead that could be dangerous to health in the future awareness programs. Joseph *et al.* (2014) stated that the level of lead detected in Malaysia's turtle eggs exceeded the permissible limits of the Malaysian Food Regulation 1985 and also that all five heavy metals (Mn, Cu, Zn, Cd and Pb) were detected in the eggs. Therefore, the public needs to be informed that environmental contaminants such as heavy metals may also be transferred to humans upon consumption of turtle eggs.

Philanthropy Spirit and Community Service

A total of RM 2,380.00 was collected by the end of December 2015. All donations were used to buy food for the hatchlings as the food cost increases with the turtle's age. Table 2 shows the price and type of food that were bought for the turtles in 18 months. Besides donation, UNIMAS has also provided a small fund of RM 10,000.00 for this project through *Dana Pelajar PhD* F07(DPP18)/1186/2014(18).

Participants were highly encouraged to participate in the beach cleaning program as a community service to give back to the local community. The organisers of the program were also educating the common public about the importance of beach cleanliness in the survival of sea turtles during the beach cleaning program.

Table 1. Price and type of food given to turtles (June 2014 to November 2015)

Item	Price	Estimated cost for the project
Kembong / Indian Mackerel (10 kg)	RM 57.00	RM 4,800.00
Squid (1 kg)	RM 6.00 – RM 12.00	RM 1,400.00
Shrimp (1 kg)	RM 5.00 – RM 12.00	RM 700.00
Sardines / Pilchards (10 kg)	RM 65.00	RM 2,000.00
Tongkol/ Mackerel Tuna (10 kg)	RM 65.00 – RM 75.00	RM 2,000.00
Cucumber (1 kg)	RM 1.00 – RM 6.00	RM 1,800.00
Turtle pellet (450 g pack)	RM 6.50	RM 1,800.00
Cockles (1 kg)	RM 6.00	RM 300.00

*The cost above is not inclusive of (i) medicine and vet services and (ii) electricity and water bills.

Development of Educational Toolkit

An educational toolkit comprising three products related to green sea turtle conservation campaign had been successfully developed. As an evaluation process, the toolkit had been displayed during UNIMAS Innovation and Technology Exhibition 2016 (InTex2016) on 23rd to 24th May 2016 in which the educational toolkit was awarded a silver medal. The educational toolkit comprises the following:

(a) Manual

The 16 pages manual on interaction between human and sea turtles described step by step instructions for:

(i) Standard Operating Procedure (SOP) for human-turtle interaction, both in hatchery and at the beach (where turtles nests).

(ii) Husbandry practice including egg and hatchling management techniques, water quality management, feeding process and daily care of hatchlings, and proper handling of sea turtle hatchlings (only applicable for facilities that are permitted to conduct headstarts).

(iii) A standard survey, suitable for age 7 to 50 years old (and above). The questionnaire is bilingual (English and Bahasa Malaysia), to check the effectiveness of the turtle awareness campaign.

(iv) Sea turtle species recognition for the public where the basic identification key for 7 species of sea turtle is described along with some description for sea turtle body parts.

(b) Video

The 2 minutes-video summarizes the turtle conservation activities from June 2014 to November 2015. Footage includes a brief insight of the turtle awareness campaign's power point and video presentation, sea turtle feeding and nursing session (practical session), the turtle tagging process and also the turtle releasing ceremony. This video will be uploaded into YouTube in order to reach a wider audience to get the message across the globe. The snapshots of the video are in Figure 4.

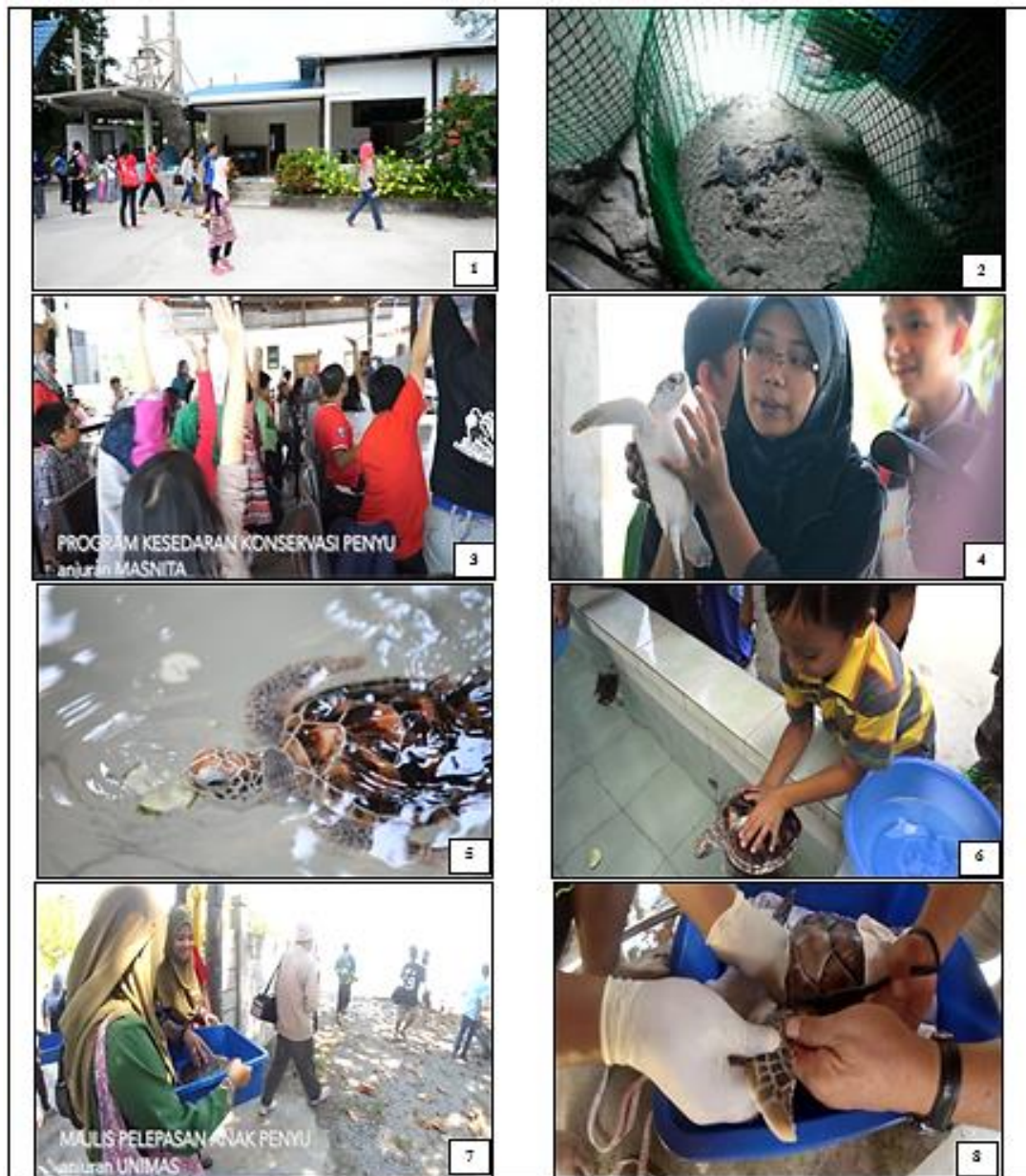


Figure 4. Snapshots of video in sequence (1-8)

(c) Interactive information kiosk (IK)

This e-book styled IK is a form of interactive learning where when used in a touch screen gadget it could be handled easily by small children. This IK offers information on green sea turtle biology where pictures and videos are also inserted so that learning about sea turtle will be fun. The content of the IK are green sea turtle physical outlook, facts, life cycle, habits of green sea turtle in terms of locomotion, feeding and resting position, threats faced by sea turtles,

the nesting site of green sea turtles, its conservation status and conservation efforts that are carried out in Sarawak. The snapshots on the IK are in Figure 5. This IK used Bahasa Malaysia as medium targeting local audience. However, in future, improvement will be made to use bilingual approach (Bahasa Malaysia and English).

Conclusion

Eighteen months sea turtle headstarting project carried out in Lundu, Sarawak had open up opportunity for small scale yet systematic awareness campaigns to educate the public on the importance of turtle conservation. Survey results showed that knowledge and awareness of the public is still at its infancy stage. However, voluntary involvement of local people in this project promotes further understanding on the human-sea turtle relationships. This pioneer project had also boosted the sea-custodian spirits among local people and the public, which is important for survival of this endangered species. A video and an information kiosk had been produced as a tool for future environmental conservation and awareness program. Future work should involve an in depth documentation of sea turtle life cycle and sea turtle at its natural foraging and breeding habitat.

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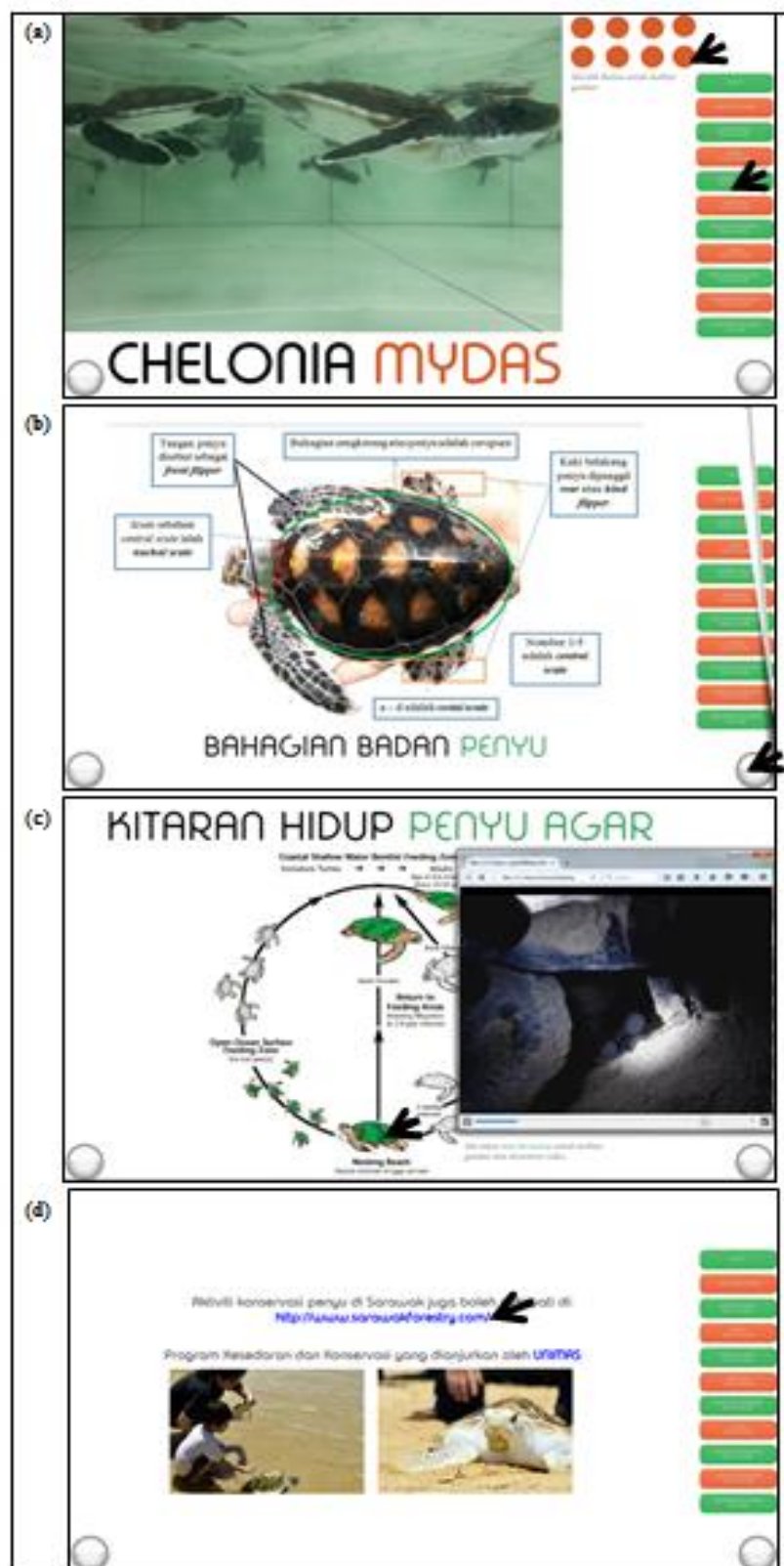


Figure 5. Snapshots of IK interface. The buttons at which the arrows are pointing to are push-able buttons which helps users move to certain pages or go back to previous page (a & b). The arrow in (c) points to a character which is linked to a video when pushed. The arrow in (d) would direct users to a website for other sea turtle conservation work done in Sarawak.

Disclosure statement

No potential conflict of interest was reported by the authors.

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References

- Basile, C. G. (2000). Environmental education as a catalyst for transfer of learning in young children. *The Journal of Environmental Education*, 32, 21-27.
- Chan, E. H. (2006). Marine turtles in Malaysia: On the verge of extinction? *Aquatic Ecosystem Health and Management*, 9 (2), 175-184.
- Clark, J. (1991). *The status of Integrated Coastal Zone Management: A Global Assessment*. University of Miami/RSMAS.
- Dede, C. (1987). Empowering environments, hypermedia and microworlds. *The Computing Teacher*, 15 (3), 20-24.
- Eckert, K.L. (1999). Designing a Conservation Program. In: Eckert, K.L., K.A. Bjorndal, F.A. Abreu-Grobois & M. Donnelly. (Eds). 1999. *Research and Management Techniques for the Conservation of Sea Turtles* (pp. 1-3). IUCN/SSC Marine Turtle Specialist Group Publication No. 4.
- Ehrhardt, N.M. & Witham, R. (1992). Analysis of growth of the green sea turtle (*Chelonia mydas*) in the western central Atlantic. *Bulletin of Marine Science*, 50 (2), 275-281.
- Fuentes, M. M .P. B. & Porter, W.P. (2013). Using a microclimate model to evaluate impacts of climate change on sea turtles. *Ecological Modelling*, 251, 150-157.
- Hudson, B.E.T. (1988). User and public information. In: R.A. Kenchington & B.E.T. Hudson (Eds.), *Coral Reef Management Handbook* (pp. 163-176). UNESCO Regional Office for Science and Technology for South East Asia, Jakarta.
- IUCN (2015). *IUCN Red List of Threatened Species :Version 2015.2*. Retrieved June 22, 2015 from www.iucnredlist.org.html.
- Jacobson, S. K. (1987). Conservation education programmes: evaluate and improve them. *Environmental Conservation*, 14, 201-206.
- Johnson, S.A., Bjorndal, K.A. & Bolten, A. (1996). A survey of organized turtle watch participants on sea turtle nesting beaches in Florida. *Chelonian Conservation Biology*, 2, 60-65.
- Joseph, J., Ali, S.A. & Hing, L.S. (2014). Heavy metal compositions in Green turtle (*Chelonia mydas*) eggs from nesting beaches in Peninsular Malaysia. *Asian Journal of Conservation Biology*, 3 (1), 83-87.



- Joseph, J. & Chong, Y. K. (2014). Determination of natal origins of juvenile green turtles foraging at Sipadan waters, Sabah, Malaysia. In: *34th Annual Symposium on Sea Turtle Biology and Conservation, 10-17 April 2014*. New Orleans, Louisiana, USA.
- Lohmann, K. J., Witherington, B. E., Lohmann, C. M. F. & Salmon, M. (1996). Orientation, navigation, and natal beach homing in sea turtles. In: Lutz, P.L. & J.A. Musick (Eds), *The Biology of Sea Turtles* (pp. 107-135). Florida: CRC Press, Boca Raton.
- Mayer, R. E. (2001). *Multimedia learning*. Cambridge: Cambridge University Press. (p.19).
- Mortimer, J.A. (1995). Headstarting as a management tool. In K. A. Bjorndal (Eds.), *Biology and Conservation of Sea Turtles* (pp. 613-615). Smithsonian Institution Press, Washington, DC, US.
- Page, S.J. & Dowling, R.K. (2002). *Ecotourism*. Harlow, England, New York: Prentice Hall. 338 p.
- Palaniappan, P. (2001). Distribution and abundance of sea turtles in Sabah. *Report to Universiti Malaysia Sabah*. No. 37/98, (pp 1-47).
- Pike, D. A. (2014). Forecasting the viability of sea turtles eggs in a warming world. *Global Change Biology*, 20, 7-15.
- Seminoff, J.A. (2004). *Chelonia mydas*. In: IUCN 2007. *2007 IUCN Red List of Threatened Species*. Retrieved July 27, 2008 from <http://www.iucnredlist.org/>
- Swingle, W. M., Warmolts, D. & Keinath, J. (1990). Loggerhead Sea Turtle Head-Start Evaluation Project: A Classic Example of the Conservation Role of Zoological Parks and Aquariums. *Drum & Croaker*, 23 (2), 3-6.
- Toronto Zoo (2012). *Conservation and Education Activities Booklet 2012-2013*. Retrieved on March 26, 2016 from <http://www.torontozoo.com/40/media/Conservation%20&%20Education%20Activities%20Booklet%202012-2013.pdf>
- United Nations Environment Programme (2007). *Public Environmental Awareness and Education*. Retrieved March 26, 2016 from <http://www.unep.org/dec/onlinemanual/Enforcement/InstitutionalFrameworks/PublicAwarenessEducation/tabid/99/Default.aspx?page=1.html>
- Wabnitz, C. & Pauly, D. (2008). Length-weight relationships and additional growth parameters for sea turtles. In: Palomares, M.L.D. and Pauly, D. (Eds.), *Von Bertalanffy Growth Parameters of Non-fish Marine Organisms*. Fisheries Centre Research Report, 16 (10). Fisheries Centre, University of British Columbia [ISSN 1198-6727], pp. 92-101.
- Witham, R. (1980). The "Lost Year" Question in Young Sea Turtles. *American Zoologist*, 20, 525-530.