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Assessment of Geoeducation Program for Indigenous Students in Kenyir Geopark, Terengganu, Malaysia

Dony Adryansyah Nazaruddin^{1*} , Norhayati Ab Manaf²

¹Marine Geoscience Program, Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia

²Institute of Tropical Biodiversity and Sustainable Development, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia

*corresponding author: dony@umt.edu.my

Original Research

Abstract

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Kenyir Geopark in Terengganu, Malaysia, was recognized as the country's ninth national geopark on May 30, 2023. Many stakeholders are now prepared to support conservation and development efforts in the geopark area. Universiti Malaysia Terengganu (UMT) as a local public university has taken some initiatives to develop local and indigenous communities in the geopark area through education programs focused on geoscience, called geoeducation, in collaboration with the Department of Mineral and Geoscience Malaysia (JMG) Terengganu and other agencies/institutions. The most recent Sungai Berua Geoschool Project (SBGP), is part of a series of geoeducation programs dedicated to indigenous communities, primarily for school kids living in the Sungai Berua village, Hulu Terengganu district, and coordinated under the Service Learning Malaysia University for Society (SULAM) initiative. This project provided an opportunity for UMT lecturers and students, as well as related partners, to teach basic geoscience and geopark knowledge to indigenous students through a variety of teaching modules including pre- and post-program questionnaires, presentations by facilitators, geoeducational games, coloring pictures of the geopark, and creating geoproducts. This study had three main objectives: first, to investigate the interest of all involved parties in geoscience and geopark topics; second, to examine teaching strategies and approaches to attract people to learn basic geoscience and geopark; and third, to analyze the project's benefits. This kind of project has the potential to be organized continuously to encourage the engagement of local or indigenous communities to improve their quality of education and economic level.

Keywords: Geoeducation, Geoschool, Sungai Berua, Kenyir Geopark, SULAM

Introduction

Kenyir Geopark spans 2,449 square kilometers in Hulu Terengganu district in Malaysia's Terengganu state. It was declared as Malaysia's ninth and most recent national geopark during the National Geopark Committee meeting on May 30, 2023. The recognition was given as part of the Geopark

Development Program launched by Malaysia's Ministry of Natural Resources, Environment, and Climate Change (NRECC 2023). There are so far 15 geosites, 11 biosites, and 11 cultural sites, as well as one archaeological site in this national geopark (Nazaruddin *et al.* 2023; Fig. 1). Among the main geosites and features (Fig. 2), there is the Bewah Hill karst morphology above the greenish

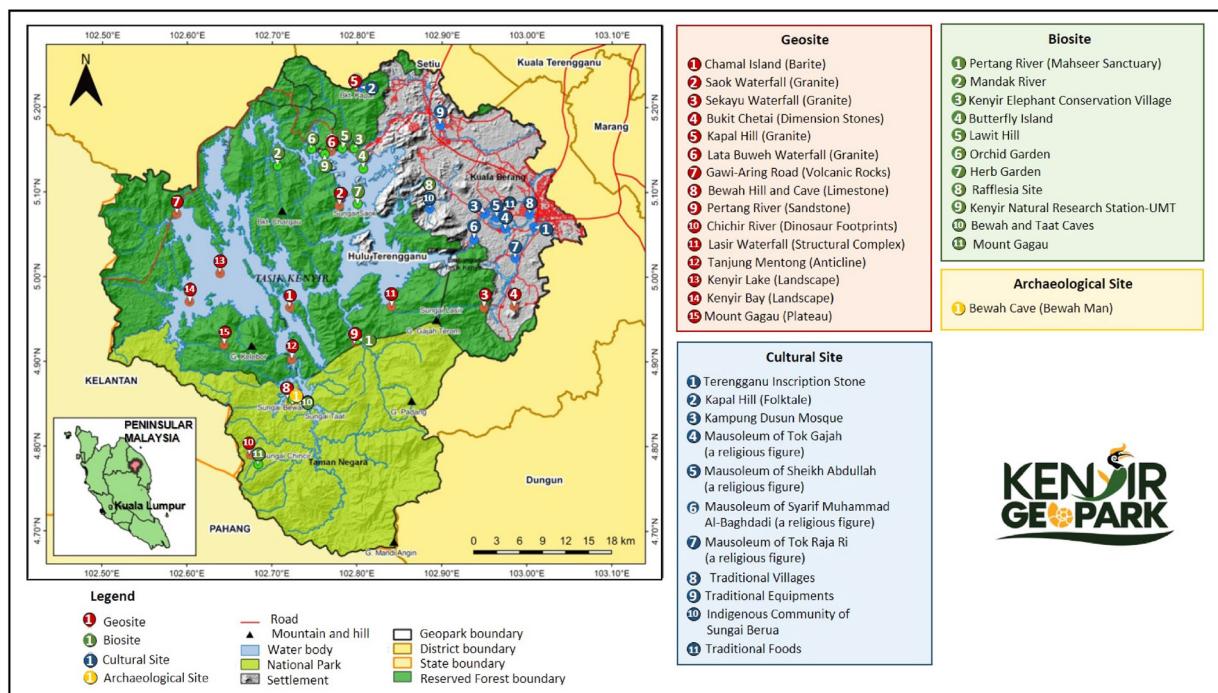


Figure 1. Location map of Kenyir Geopark with its geosites, biosites, cultural, and archaeological sites.

Kenyir Lake and the stunning Bewah Cave with many marine fossils on its walls. Beautiful waterfalls abound in several portions of the geopark area and dinosaur footprints in the Mount Gagau area enhanced the quality of Kenyir Geopark. There are certain biosites with endemic flora and fauna, such as the Rafflesia site in the Tembat Forest Reserve and some species of hornbills in the Hornbill Valley in Lawit Hill. Among the geopark's cultural sites are the Terengganu Inscription Stone and the Sungai Berua indigenous community settlement. The only archaeological site of the geopark is the Bewah Cave where the skeleton of the 16,000-year-old first Terengganu pre-historic human (named "Bewah Man") was unearthed.

The Kenyir Geopark has become the pride of the state government and the people of Terengganu, especially for the working committee of the geopark. However, the designation means much work for all stakeholders to conserve and develop the geopark area. Therefore, the Universiti Malaysia Terengganu (UMT), through its Marine

Geoscience Program and Faculty of Science and Marine Environment, in collaboration with the Department of Minerals and Geoscience Malaysia (JMG) of Terengganu and other agencies/institutions look forward to conserving and developing all selected sites as well as the entire geopark area, including local and indigenous communities. One of the community activities implemented was a geoeducation program called "Sungai Berua Geoschool Project" (SBGP), which was designed for indigenous school pupils in the Sungai Berua village, Hulu Terengganu district, Terengganu, Malaysia on July 9, 2023.

The Orang Asli (indigenous community) in Peninsular Malaysia has rich customs and cultures related to nature. This indigenous community residing in the Sungai Berua village consists of the Semaq Beri (dominant) and Batek tribes with a population of about 334 people consisting of 172 males and 162 females. Their village has been equipped with basic facilities and can be reached by a paved tar road. All the villagers are indigenous people living in around 100 houses provided by the govern-

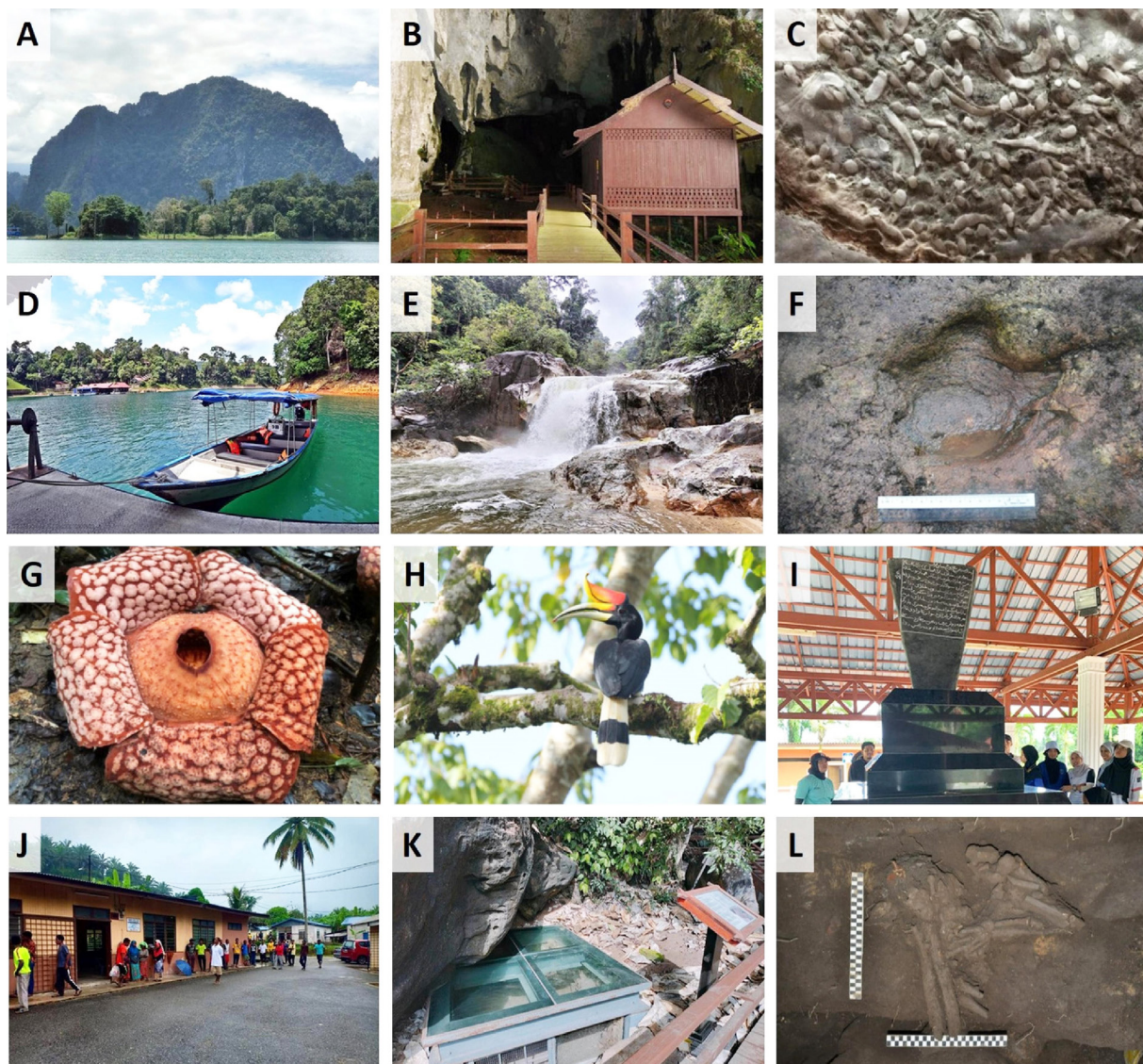


Figure 2. Some geosites, biosites, and cultural sites as well as an archaeological site of Kenyir Geopark: A, B, C) Bewah Hill with its Bewah Cave and coral fossils in its wall (geosite); D) Kenyir Lake landscape (geosite); E) Sekayu Waterfall (geosite); F) a dinosaur (iguanodontian) footprint in Mount Gagau area (geosite); G) species of *Rafflesia cantleyi* in the Tembat Forest Reserve (biosite); H) a species of hornbill in the Lawit Hill (biosite); I) Terengganu Inscription Stone, one of icons of Terengganu (cultural site); J) Orang Asli (indigenous people) in Sungai Berua village (cultural site); K, L) location of the settlement of the first Terengganu's pre-historic human where the 16,000-year skeleton of the pre-historic human ("Bewah Man") was discovered in the Bewah Cave (archaeological site).

ment. For them, particularly the Semaq Beri tribe, the river is an important aspect of their lives. Fish are caught for food and they also carry out traditional agricultural activities on a small scale, cultivating several types of plants near their homes and around the village. Due to financial needs, some of these catches are also sold to outsiders (Kenyir Geopark Main Committee 2023).

This community service program was conducted under the Service Learning Malaysia University for Society – Universiti Malaysia Terengganu (SULAM-UMT) as an initiative of the Ministry of Higher Education Malaysia in partnership with UMT. Through this project, UMT lecturers and students as well as other related agencies/institutions had an opportunity to teach fundamental

geoscience and geopark to indigenous students using various teaching methods or modules. Geoeducation programs are important for indigenous communities, including indigenous students and youths, to make them understand mainly geological resources around them and how geology relates to their everyday lives (IGGP 2023).

Some hypotheses of this study are as follows: first, all involved parties will demonstrate a greater interest in geoscience and geopark topics compared to those who do not participate; second, several teaching modules will attract involved people to study basic geoscience and geopark; and third, this project will positively impact participants and others involved. This study evaluates the project based on three primary goals: 1) To investigate the interest of all involved parties towards geoscience and geopark topics; 2) To examine teaching strategies and approaches to entice people to learn fundamental geoscience around the geopark; and 3) To analyze benefits of the project. This project was designed following the United Nations' Sustainable Development Goals (SDGs) 4 (Quality Education) and 8 (Decent Work and Economic Growth) (UNDP 2023).

Literature review

The concept of “geopark” emerged in the mid-1990s in response to the need to preserve and enhance the value of geologically significant locations in Earth’s history (UNESCO 2015). Since the early 21st Century, UNESCO promoted the geopark concept to conserve and enhance not only geological heritage but also natural and cultural heritage, while providing sustainable economic and social development (Martini 2009; Fornaro & Fernandes 2018). A geopark, according to GGN (2010), is a geographical area where geoheritage sites are administered with a holistic approach to protection, education, and sustainable development. The synergy between geological, biological, and cultural heritage must be emphasized as an es-

sential component of each geopark. According to Halim *et al.* (2011), geopark concept can be seen as a potential tool to bridge community marginality and enhance livelihood sustainability. A set of programs should be initiated and planned to translate the geopark concept into action, such as educational programs involving educational modules.

Geoparks provide opportunities to deliver education programs (specifically called “geoeducation”) for all sectors and ages of society. According to Andrasanu (2006), geoeducation is a form of education, formal or informal and a strong tool for successful geoconservation activities and the promotion of geosciences. A Geopark Management Toolkit (2023) provided that geoeducation programs can be organized in both indoor and outdoor classrooms for teaching a wide range of basic geoscience knowledge and topics and developing an understanding of geopark concepts. Geoeducation is an ongoing process that offers “life-long learning” to residents and visitors which can be delivered in collaboration with existing educational providers both within or outside the geopark and by engaging with other governmental and non-governmental bodies. Recently, several UNESCO Global and National Geoparks in the world have actively organized geoeducational programs. Geoeducation at the Gorontalo National Geopark in Indonesia aims to teach a variety of skills, to increase understanding of nature and other topics for children and adults. Several activities have been conducted for school students such as camping and visits to geothermal and lake sites (Geopark Gorontalo 2022). Singtuen *et al.* (2022) discussed the geoeducation activities at the Khon Kaen National Geopark which has a diversity of dinosaur fossils and other geological features. There were four geoeducational modules were conducted: a geodiversity one-day trip, geomorphological study trail, a geoethical site, and Phu Wiang Dinosaur Museum visit for school and university students. Meanwhile, in Malaysia, Langkawi Geopark

(2022) has always organized geoeducation programs to nurture the young geoparkians including indigenous communities, institutions, and agencies by delivering information and hosting attractive activities, such as geomangrove, geocoral, geoclub, geoteacher, geocamp, and so on.

Geoeducation programs can be implemented by the “geoschool” concept which was defined by Fermeli *et al.* (2011) as the name of a European research project for innovative teaching of geoscience in (secondary) schools with the main objective of providing the geoscience education community with advice, assistance, and different educational aids, and so on. Geoschool refers to an EU project that brings together geoscientists and educators from universities, institutions, and other parties who can “translate” geosciences into terms and educational opportunities that school students can understand. In the geoschool projects, the main goals are to bridge the gap between scientific knowledge and school knowledge in geosciences, to improve teachers’ knowledge and students’ ability to appreciate and value the geosciences, and to enhance geoscience educational skills in the school environment. Fermeli *et al.* (2014) stated that geoschool concept can investigate school students’ interest in geoscience and the teaching approaches used. The Secretaria Regional de Ambiente, Recursos Naturais e Alterações Climáticas (SRAAC 2016) stated that to improve geoscience knowledge, it is necessary for the participation of teachers, students, and the entire school community. Moreover, the mastery of local geological contents is required to understand the geological phenomena on a global scale. The main objectives of the geoschool are to know and understand the local geology, to improve teachers’ and students’ knowledge and skills in geoscience, to improve geoscience education in the surrounding environment, and to assist the education for sustainability. Other than in European countries, geoschool project has also been developed in other parts of

the world. A geoschool project in Brazil started in 2002 to supply primary and middle school teachers with geological data, images, and maps of a certain region in a format of didactic materials assisted by computer support. Several assumptions included the lack of a specific discipline in Brazilian basic education that houses the geoscience contents, geoscience knowledge is confined to sparse insertions in the disciplines of geography and science, and there is a predominance of lectures, possibly illustrated by the teacher (Monteiro 2020). Meanwhile, the geoschool project at the Jeju Island UNESCO Global Geopark in the Republic of Korea began in 2018 aiming to raise awareness about geological heritage among community members and school students and train locals as geoguides at geosites. Geoschool can also refer to an education program for students who attend schools located near geosites or geoparks (Jeon *et al.* 2022). However, Carneiro *et al.* (2022) who have experienced two decades of learning with the geoschool project revealed several challenges of conducting geoschool project such as precarious materials conditions, inadequate geoscientific education of teachers, and students’ lack of enthusiasm.

Geoeducation programs and geoschool projects in a geopark can be conducted by “geoparkians” geopark ambassadors. Geoparkian is a generic term assigned to anyone active inside an individual geopark (Karkut 2018).

Materials and Methods

The geoeducation program for the indigenous community SBGP in Kenyir Geopark, Terengganu, Malaysia, fully funded by the Center of Knowledge Transfer and Industrial Linkages – Universiti Malaysia Terengganu (PIJI-UMT) under the SULAM-UMT, was presented to the public during a one-day event occurred 9th July 2023 at the SK Sungai Berua (school). As many as 38 facilitators, overseen by three UMT lecturers,

were registered in the SBGP among UMT year-2 and year-3 students from the Marine Geoscience Program, Faculty of Science and Marine Environment. Twenty-two participants, selected among indigenous elementary school students, joined the SBGP. Five agencies/institutions, such as the Department of Orang Asli (Indigenous People) Development (JAKOA), the Department of Minerals and Geoscience Malaysia (JMG) Terengganu, the Terengganu State Forestry Department, and the Quety Qeeds Interactive Learning Center also participated to the program contributing to the success of the project. This study adhered to ethical guidelines when conducting a research project that involves indigenous communities. Before this project started, researchers came to consult and discuss with JAKOA staff, the head of indigenous communities (called “Tok Batin”), and the school (SK Sungai Berua) headmaster in a planned meeting in the Sungai Berua village. The consultation and negotiation achieved a mutual understanding of our proposed project including the time, venue, participants, aims, methods, and potential benefits. All the above-mentioned parties also supervised and accompanied researchers when activities of the project were going on.

Among materials utilized in the SBGP, there were laminated pictures of geodiversity in Kenyir Geopark, dinosaur bone puzzles, printed pictures and colored pencils, acrylic keychains, and screw pine leaves (Fig. 3).

The SBGP was articulated in the following five modules:

1. Pre- and Post-Program Questionnaire.
2. Presentations by Facilitators.
3. Geoeducational Game.
4. Coloring Pictures of Geopark.
5. Creating Geoproducts.

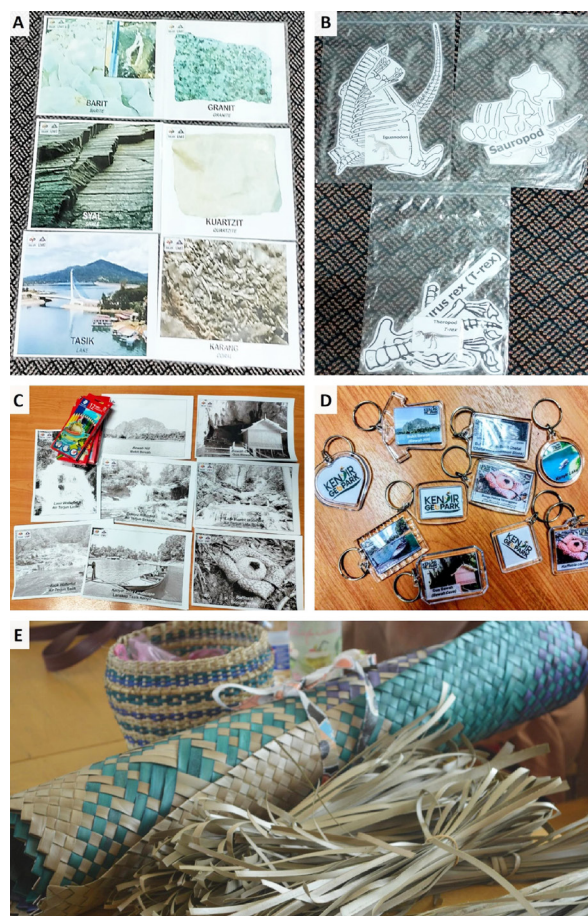


Figure 3. Some materials used in different modules of this geoeducation program: A) laminated pictures for the “presentations by facilitators” module; B) different sets of dinosaur bone puzzles for the “geoeducational game” module; C) printed pictures and colored pencils for the “coloring geopark pictures” module; D) acrylic keychains for the “creating geoproducts” module; E) screw pine leaves to create some local products of indigenous community used during the “creating geoproducts” module.

Figure 4 depicts the activities carried out for each module.

Pre- and post-program questionnaire

A questionnaire was designed in advance for data collection of this study (see Supplementary Material). This in-person questionnaire was scheduled at the beginning and end of the program. The goal of this module was to assess the impacts of this geoeducation program on all parties involved, primarily indigenous pupils of Kenyir Geopark. This questionnaire was divided into three sections: gen-



Figure 4. Activities in all modules of Sungai Berua Geoschool: A, B) face-to-face (pre- and post-program) questionnaire; C, D) presentations by facilitators on basic geoscience and geopark topics; E, F) geoeucational game of dinosaur bone puzzles; G, H) coloring activity of geopark pictures; I, J) creating geoproducts (geopark merchandise) such as keychains and screw pine mat.

eral information of respondents, before (pre-) geoeucation program assessment, and after (post-) geoeucation program assessment. According to the UW-Madison Division of Extension (2021), questionnaire results may be compared to illustrate improvements in respondents' knowledge and abilities before and after participation in this program.

Presentations by facilitators

To introduce the participants to basic geoscience

and geopark, facilitators were separated into nine groups and presented selected geoscience topics based on the geodiversity of Kenyir Geopark. The printed and laminated images or photos of geosites and features based on minerals, igneous, sedimentary, and metamorphic rocks, fossils, landforms/landscapes, and geological deformations were utilized in several oral presentations (Fig.3A). A large poster of Kenyir Geopark provided by JMG Terengganu was displayed in the venue during the event. According to Elliot (2023), presenting images (alongside text) is a way to make presentations more eye-catching and will make the ideas feel more immediate, relevant, and positive feedback. Visuals are crucial for a presentation to be interesting. If the audience only sees text, they will stop paying attention. Some tips for using images in the presentations are: use high-quality photos, practice consistency in tone (aesthetic quality of the images), avoid photos/images clutter, don't use watermarked images, and keep it simple.

Geoeucational Game

Geoeucational resources need to be funny and impressive for the teachings to be properly understood and retained (Mergili *et al.* 2023). Therefore, a game-based approach was created for the effective and empirical dissemination of related knowledge during an organized event (Sütő *et al.* 2020). A geoeucational game called "dinosaur bone puzzles" was created to introduce participants to dinosaur fossils discovered in the Kenyir Geopark area, specifically in the Mount Gagau area (during the Gagau Scientific Expedition in 2014), which consisted of footprints of three different types of dinosaurs: iguanodontian, sauropod, and theropod. The participants were separated into six groups and given different puzzles (Fig. 3B).

Coloring Pictures of the Geopark

Coloring books or sheets for children are geoeucation tools to present the topics in a funny and

interesting way (Frey 2021). A lot of pictures of important sites and features in Kenyir Geopark such as Bewah Hill, Bewah Cave, Lasir Waterfall, Ship Rock, Kenyir Lake, Rafflesia, and so on, were prepared for all participants to color. This module was designed to allow participants to express their creativity and imagination about some of the geopark's locations and features. Before the session began, the facilitators gave each participant a black-and-white photo and colored pencils (Fig.3C).

Creating Geoproducts

The last module of the SBGP was practicing (hands-on) how to create geoproducts (or geopark merchandise). This activity was carried out to generate souvenirs and promotional goods for the Kenyir Geopark, such as keychains with images of geopark sites and features (Fig. 3D) and other indigenous community products, such as

mats made of screw pine (*Pandanus amaryllifolius*) leaves (Fig. 3E). According to Rodrigues *et al.* (2021), geoproducts refer to produced goods or commercial services that draw inspiration from geodiversity of a territory. Geoproducts have a close relationship with the outstanding geological elements that define the area. Meanwhile, Rodrigues & Neto de Carvalho (2009) elaborated that as innovative products and marketing strategies, geoproducts can actively support the growth of local economies by playing a significant role in the geotourism, giving new experiences and long-lasting memories to geotourists. Geoproducts may also combine traditional products with new ideas and perspectives.

Results and discussion

Geoeducation research works by using questionnaires are still scarce in the global community (for example Comănescu & Nedelea 2020; Sütő *et al.*

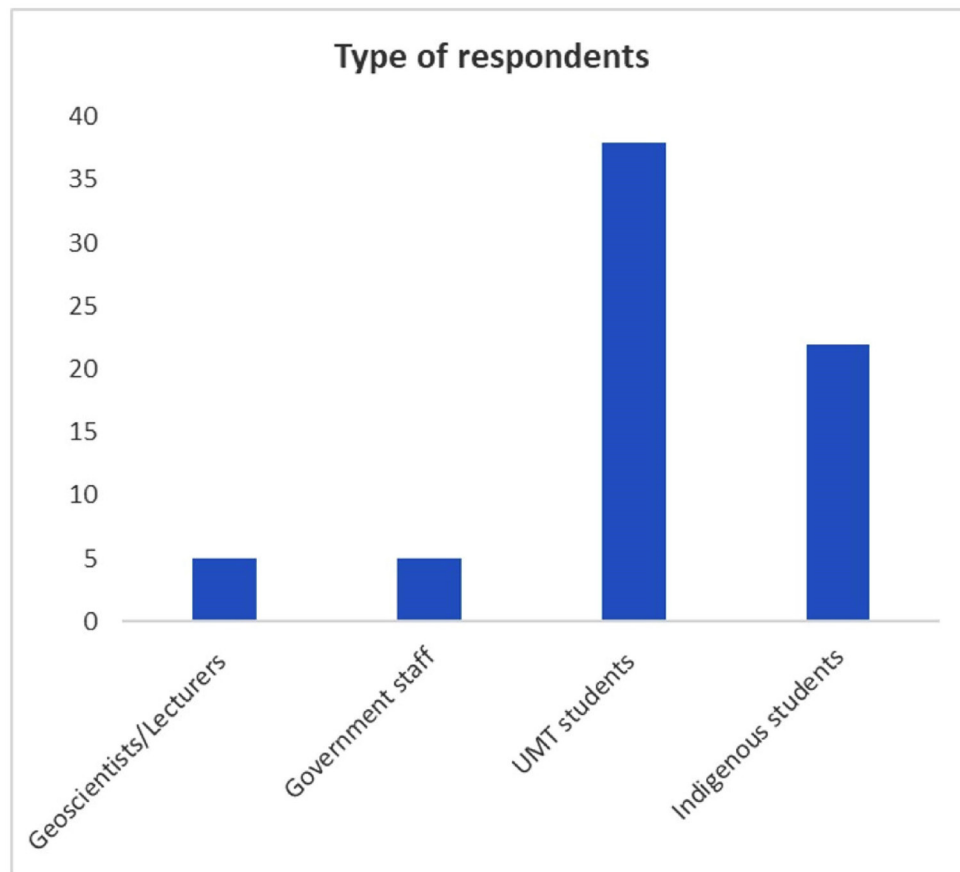


Figure 5. Respondent profile for Sungai Berua Geoschool project.

2020; and Georgousis *et al.* 2022). In the Malaysian context, the concept of geoeducation itself is still poorly introduced and explained to the communities. Questionnaires have been already used for the assessment of geoeducation programs (for example Nawi *et al.* 2020 and Yusof *et al.* 2021), however, these studies were more on environmental education.

In this current study, the impacts of the SBGP were thoroughly evaluated by using a questionnaire before (pre-) and after (post-) the program. Analysis of the questionnaire was separated into three sections based on the three parts of the questionnaire.

Respondent Profile

A total of 70 participants to the questionnaires, corresponding to the active actors of the SBGP, were subdivided into four groups based on their occupations and levels of education (Fig. 5):

- 38 respondents among the UMT student facilitators;
- 22 respondents among the indigenous students of SK Sungai Berua;
- 5 respondents among the Geoscientists/Lecturers from UMT and JMG Terengganu;
- 5 respondents among the components of the Government staff from SK Sungai Berua/school (headmaster, teacher, and admin staff), JAKOA (staff), and Terengganu State Forestry Department (staff).

Interviewers were the 38 UMT student facilitators. They asked questions in person to respondents of geoscientists/lecturers, government staff working in the Sungai Berua village, and indigenous pupils living in the village. Meanwhile, UMT students completed the questionnaires on their own.

Respondents were classified by gender, age, and level of education (Table 1). Of 70 selected respondents, 31 (44.3%) were male and 39 (55.7%)

female, indicating a quite balanced gender distribution. However, there were more female respondents because UMT had more female than male students, a prevalent phenomenon of the gender gap in Malaysia's public institutions (Tienxhi 2017). In terms of age, 16 respondents (22.8%) were children under the age of ten, 6 respondents (8.6%) were 11-15 years old, 38 respondents (54.3%) were 21-25 years old, and 10 respondents (14.3%) were beyond the age of 30. The majority of respondents (47 people or 67.1%) had tertiary education or university level, just one respondent (1.4%) had pre-university level, and 22 respondents (31.4%) were school pupils (indigenous community).

Table 1. Categories of respondents

Category	Frequency (f)	Percentage (%)	
Gender	Male	31	44.3
	Female	39	55.7
Age	≤ 10 years old	16	22.8
	11 – 15 years old	6	8.6
	16 – 20 years old	0	0
	21 – 25 years old	38	54.3
	26 – 30 years old	0	0
	> 30 years old	10	14.3
Education	Not attend school	0	0
	Primary School	22	31.4
	Secondary School	0	0
	Pre-University	1	1.4
	Tertiary Education	47	67.1

Pre-geoeducation Program Assessment

Pre-program assessment showed that the majority of respondents (58 people or 82.8%) were interested in learning about the Earth (geoscience) because they were all geoscientists/lecturers (5 respondents), government staff components (5 re-

spondents), UMT students of Marine Geoscience Program (38 respondents), and some indigenous students (10 out of 22 kids). Seven (10%) and five (7.2%) indigenous students were not interested and were unsure about learning this subject. Like many others, several indigenous students were interested in learning the subject, most likely because as local or indigenous communities, they had connections to geological sites and features in the environment they lived in or around, and they loved to be outdoors (Gorokhovich & Learning 2013). In the meantime, the majority of respondents (53 people or 75.7%) had ever previously studied geology, mostly through subjects of science and geography in schools and geoscience subjects in universities, including UMT students enrolled in the Marine Geoscience Program. Meanwhile, 17 respondents (24.3%) had never studied the Earth before. When asked about their plans, all respondents, including geoscientists/lecturers (5 respondents) and government employees (5 respondents) stated that they desired to improve their careers in their respective disciplines. The majority of UMT students (22 out of 38) planned to be geoscientists or geologists in the future, while the remainder desired to work in other geoscience-related fields. According to Gray *et al.* (2021), there are several reasons why geoscience students still want to stay in this major and become geoscientists, among others: personal interests, influence by others, and introductory classes attracted them to this field. Meanwhile, many indigenous students aspired to be teachers, police officers, and other well-known professions. The SBGP showed that the profession of geoscientist/geologist is still not a popular job in Malaysia as listed by UOW Malaysia (2023).

As many as 55 respondents (78.6%) were aware that the Kenyir area had been designated as a national geopark in Malaysia, whereas 15 respondents (21.4%) were unaware. This high percentage is plausible owing to a number of factors, including: 1) Involvement of geoscientists/lecturers (from

UMT and JMG Terengganu) in the working committee of Kenyir Geopark; 2) participation of government staff (from the national school, JAKOA, and the State Forestry Department) in several activities within the geopark area; 3) UMT students learned about Kenyir Geopark mostly through their lecturers (such as Nazaruddin *et al.* 2023) and online news such as broadcasted by The Star (www.thestar.com.my/news/nation/2023/06/01/tasik-kenyir--now-a-national--geopark), Astro Awani (www.astroawani.com/berita-malaysia/tasik-kenyir-diiktiraf-sebagai-geopark-kebangsaan-421937), and Sinar Harian (www.sinarharian.com.my/article/261134/edisi/terengganu/tasik-kenyir-diiktiraf-sebagai-geopark-kebangsaan), and so on or social media such as facebook of Bulletin TV3 (www.facebook.com/BuletinTV3Official/posts/7206232772725175), twitter of BFM News (twitter.com/NewsBFM/status/1663930978216329216), and instagram of Beautiful Terengganu Malaysia (www.instagram.com/p/Cs5qELYPu5j/). Only one UMT student was unaware of the news. Meanwhile, just eight of the 22 indigenous pupils understood the status of the Kenyir area due to the information from others. Nevertheless, the awareness and knowledge of indigenous people, including indigenous students, can contribute to the sustainable management of geopark (Pásková 2018).

When asked which sites in Kenyir Geopark they visited, the majority of respondents (58 people or 82.9%) visited Kenyir Lake, the most famous destination in the geopark area which has previously been gazetted as one of ecotourism sites in Malaysia (for example Adam *et al.* 2019). Meanwhile, 38 people (54.3%) visited Bewah Cave, 37 people (52.9%) visited Sekayu Waterfall, 19 people (27.1%) visited Lasir Waterfall, 14 people (20%) visited Lata Buweh Waterfall, 10 people (14.3%) visited Saok Waterfall, and six people (8.6%) visited other places such as Rafflesia site, Mahseer Sanctuary in Pertang River, Chetai Hill, and Chi-

chir River/Mount Gagau. Only four respondents (5.7%) never visited any site in the geopark area, and three respondents (4.3%) were unsure; practically all of them were indigenous students. In terms of frequency of visit, most respondents (49 people or 70%) visited the geopark area once or a few times per year, eight respondents (11.4%) visited once or a few times per month, seven respondents (10%) visited once or a few times per week, four respondents (5.7%) never visited the geopark before, and two respondents (2.9%) were unsure how frequently they visit the geopark. Figure 6 summarizes respondents' responses to questions

for pre-program assessment.

Post-geoeducation Program Assessment

Analysis of post-program assessment disclosed that after taking part in the SBGP, 63 respondents (90%) were interested in learning about the Earth (or geoscience), with an increase of five respondents (7.2%) compared to 58 respondents (82.8%) who were interested in learning about the subject before the program. This growing number was likely contributed by indigenous students who were enthusiastic about the program's modules. Meanwhile, seven respondents (10%; all of them

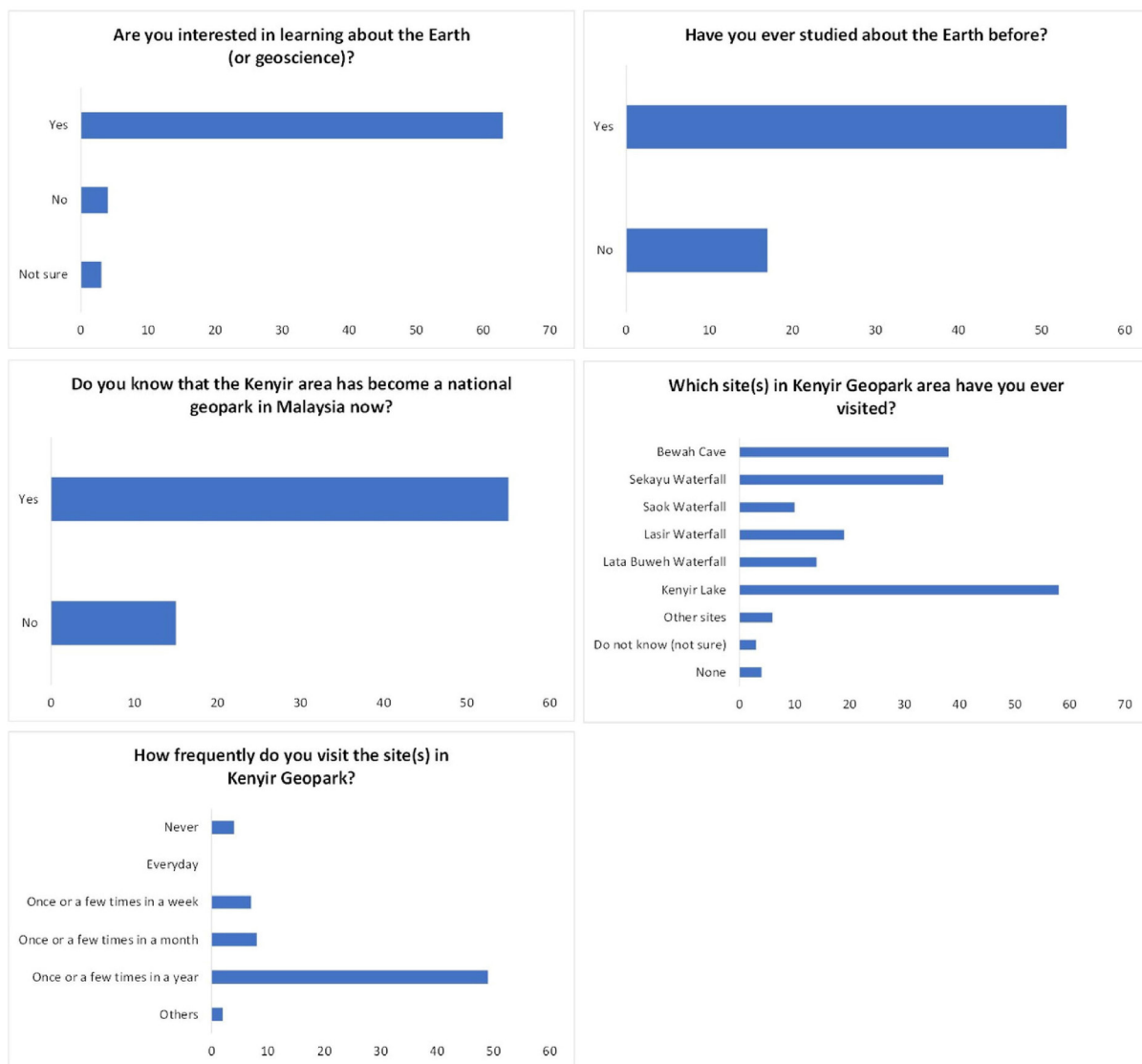


Figure 6. Summary of respondents' responses to questions for the pre-geoeducation program assessment.

were indigenous pupils) were unsure. Generally, indigenous students in Malaysia have low motivational levels to study (Salleh *et al.* 2009), therefore, it is important to carry out educational programs with attractive modules that can increase their motivation and enthusiasm. Of the five topics presented by the facilitators to the indigenous students, “fossils” was chosen as the favorite topic by 18 respondents (25.7%) because many respondents, particularly school students, were obsessed with fossils after seeing some pictures of dinosaur fossils during the program. This was consistent with Marples’s (2021) assertion that children will experience a time of hyperfixation, referred to as “imagination-based play” during which they will become intensely engaged in things such as dinosaurs. Other respondents preferred “landforms/landscapes” (17 respondents or 24.3%), “rocks” (16 respondents or 22.8%), “minerals” (10 respondents or 14.3%), and “geological deformations” (nine respondents or 12.9%).

When asked which method of teaching and learning was their favorite, 20 respondents (28.6%; of indigenous students and UMT students) chose “coloring pictures of geopark”. Coloring exercise gives a medium for children to express themselves or show off their creativity. This simple and fun activity may strengthen their motor skills as well as provide kids with the thrill of producing artwork (Ahmed 2023). Other favorite modules were “educational game” (18 respondents or 25.7%), “presentations by facilitators” (17 respondents or 24.3%), and “creating geoproductions” (15 respondents or 21.4%).

In terms of their interest in becoming a geoscientist, most respondents (54 people or 77.1%) said they were interested in their current jobs as geoscientists or in becoming geoscientists in the future. Meanwhile, 10 respondents (14.3%; all indigenous students) were uninterested in this work, while six others (8.6%; a UMT lecturer in

social anthropology and five government staff) were not related to this job for their future. When asked which site in the Kenyir Geopark area they would like most to visit, 28 respondents (40%) chose Kenyir Lake, 21 respondents (30%) for Bewah Cave, seven respondents (10%) for Sekayu Waterfall, and each four respondents (5.7%) for Saok Waterfall, Lasir Waterfall, and Lata Buweh Waterfall, as well as two respondents (2.9%) did not know which site they preferred to visit.

When asked whether they were satisfied or not with the SBGP and whether it was beneficial to them, the majority of respondents (69 people or 98.6%) were satisfied with it, with only one respondent (1.4%; an indigenous student) unsure, and the majority of respondents (66 people or 94.3%) thought it was beneficial to them, with only four respondents (5.7%; all indigenous students) disagreeing. This analysis showed that this program was beneficial for a variety of reasons, including getting basic knowledge on geoscience and geopark (22 respondents or 31.4%), having fun (13 respondents or 18.6%), providing an opportunity to talk to different people (11 respondents or 15.7%), motivation to contribution on education (nine respondents or 12.8%), getting meals and souvenirs (eight respondents or 11.4%), motivation to study (six respondents or 8.6%), and other benefits such as gathering time with friends (one respondent or 1.4%). Last but not least, as the implication of this program, the majority of respondents (68 people or 97.1%) agreed that this type of activity should be arranged again next time, with only one respondent (1.4%) disagreeing and another (1.4%) unsure. Figure 7 depicts a summary of respondents’ responses to questions for post-program assessment.

Conclusion

Geoeducation programs are important tools for developing principally human resources in the Kenyir Geopark. When comparing before and af-

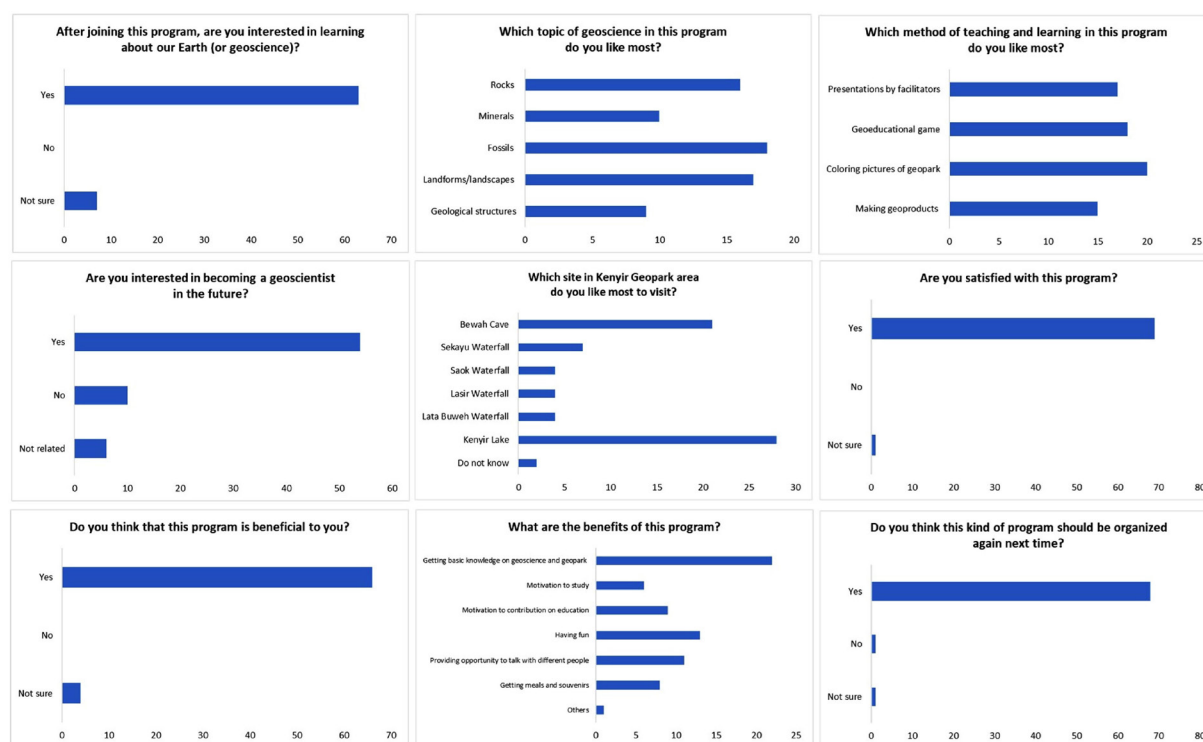


Figure 7. Summary of responses of the respondents on questions for the post-geoeducation program assessment.

ter the SBGP, there was an increase in the number of people interested in learning about the Earth (geoscience). During the project, the favorite geoscience and geopark topics included fossils, landforms/landscapes, rocks, minerals, and geological deformations. In terms of teaching methods (or modules), “coloring pictures of geoparks” was the most favorite one to entice participants to learn fundamental geoscience and about geoparks during the project, followed by “educational game”, “presentations by facilitators”, and “creating geoproducts”. This project was beneficial to all parties involved, such as getting basic knowledge on geoscience and geopark, having fun, providing an opportunity to talk to different people, motivation to contribute to education, getting meals and souvenirs, motivation to study, and other benefits.

The assessment of this geoeducation program for indigenous students in the Kenyir Geopark also brought broader implications that extend beyond the immediate research context. This successful SBGP can serve as an example of an educational

program to bridge the gap of knowledge between indigenous and non-indigenous students. Such a program also empowers indigenous students by equipping them with knowledge of fundamental geoscience and geopark for their roles and involvements in their geopark development. For the potential long-term effects, it is expected that indigenous students and communities who received this geoeducation program may be more likely to pursue higher education and careers related to geoscience and geopark, to generate incomes within the geopark area for their life improvement, and so on.

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rua village, Hulu Terengganu district, Terengganu, Malaysia.

Authors' Contribution

Conceptualization: Dony Adryansyah Nazaruddin and Norhayati Ab Manaf. Data collection and analysis: Dony Adryansyah Nazaruddin and Norhayati Ab Manaf. Writing – original draft preparation, review and editing: Dony Adryansyah Nazaruddin.

Conflict of Interest

The authors declare that they have no conflicts of interest.

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