

Museum Trip to Enrich Environmental Awareness and Education

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Abstract

Real-world knowledge via exposure activities could be positively enriched with the aid of situated learning. In a way to practice this theory and to revolutionize the educational system, this phenomenological-qualitative research was conducted to analyze how natural history museum supports the interest of STEM students towards the environmental issues. Specifically, this study ought to answer the research questions: how did natural history museum improve the interest of STEM students towards environmental issues?, what are the changes in students' conceptions of learning environmental issues after the museum exposure?, how museums could make environmental issues seem more 'real' and urgent?, what opportunities the students received in meeting museum staff?, and how do students compare what they learn and how they learn environmental issues in formal and informal science settings? Data triangulation technique including observation, semi-structured questionnaire and focus group discussion was administered to 20 STEM students enrolled in a private educational institution in the Philippines through purposive-sampling during the year 2019. The results of the study showed patterns according to the students' individual sensory experiences from the museum visit. The reports of the students were analyzed and emerged in four themes: solving environmental problems by means of education, causes and effects of environmental issues, inquiry-based learning of natural history, and interesting and realistic learning scheme. It was indicated that the natural history museum do support the interest and learning of STEM students towards environmental issues at some aspects.

Keywords: natural history, museum education, STEM, environmental awareness, situated learning

Introduction

Situated Learning Theory

The lens of situated learning theory should be used to study the social structure of experiential learning, which exists as a "community of practice" (Lave & Wenger, 1991) and resultant meaning-making. It was mentioned that the community practice model may benefit the community at large by helping experiential educators to design experiences that contain real-life situations for students.

DiFrancesco (2011) defined the situated learning theory as how the students construct their own knowledge in a social setting. It proves that this learning theory can bring inferences for the whole area of experiential education. Thus, the study found to be a guide for suggested activities in environmental settings through internship and service learning platforms.

Similarly, the engagement of students in progressively multifaceted tasks within social communities is upheld by situated learning theory. This promotion could positively happen as an effective education by requiring the knowledge-acquisition to be generated from authentic settings of practice.

Engaging students in progressively more multifaceted tasks within social communities shows the effective education that requires learning rooted in authentic contexts of practice based on situated learning theory. Students are able to learn from that knowledge and practice it in group activities, whereas the teacher acts as a provider, facilitator, and mediator of knowledge. Therefore, students reach a new level of knowledge and understanding based on their involvement as a real practitioner in the group or community (Besar, 2018).

Outdoor Education and Museum Visit

Griffin (1998) outlined in the article “Learning science through practical experiences in museums” that educational trips to museums can arrange an essential and advanced sector of school real-world knowledge in science. However, museums are informal learning settings where teachers have narrow control over the detailed ideas or involvements with which the students are involved. The students can perform scientific investigative procedures not only acquiring more systematic information by allowing their personal interests and inquisitiveness to drive their learning.

In the similar approach, the use of museum settings for educational excursions offers a different way of teaching and learning course for pre-service science teachers in Taiwan. This is concluded from the conduct of extensive museum tour covering the visit, dialogue with museum educators, crafting of lesson plans, and practicing teaching in the science museum (Chin, 2004).

Adams (2006) exhibited the utilization of city’s museums, zoos and botanical gardens to teach science and conduct the 8th grade exit project on independent science investigation. This initiative intended to produce a sustainable practice of middle school students and teachers to supplement urban science education using museum resources.

Another study on the topic Teaching Science in Museums: The Pedagogy and Goals of Museum Educators by Tran (2006) discovered that there was creativity, complexity, and skills elaborated in teaching science in museums as contradicted to illustrations in the literature reviews of teaching in museums as focused in instruction and lecture. Additionally, the emotional goals to cultivate interests in science and learning largely influenced the educators’ teaching actions.

Correspondingly, Tal and Morag (2007) found very few efforts to test the students to express their own views in a museum visit. Some similar issues when the educational activities were tightly organized by a guide were analyzed. There were very few attempts to link the content to the students’ previous understanding or interests on such guided tours.

The findings of the study by DeWitt and Osborne (2010) found that many science-centre exhibits produced playful exploration. It also discovered several major exhibit design factors for attracting the 9-11-year-old students: hands-on interaction, multiple opportunities for exploration and collaboration, and phenomena that compared with previous experiences or that were observed as cognitively stimulating.

Dockett et al. (2011) explained the significance of children’s journals as both a resource of building data and as a resource for reflection on the prominence of museums in research with children. The project underpinned an obligation to distinguish young children as knowledgeable social actors with the right to be asked on matters that are important to them.

Moreover, Chang et al. (2012) assessed the impact of a Science Museum Invoked Learning Environment (SMILE) on students. The study presented that SMILE as an experimental teaching intervention highly improved the scores of students on tests,

much closer to the expectations of students and the difference between the students' expectations and actual experience was reduced.

Plakitsi (2013) discussed in the article 'teaching science in science museums and science centers: Towards a new pedagogy?' that various schools worldwide conduct their science course in science museums and centers as extensive programs to elevate the educational paradigm. This is in line with the term 'science in society' as a blend of formal and informal science education to represent that the educational system is on the edge of the international scene. Apart from engaging the students to learn science in science museums and science centers, the general public including professionals and out-of-school youth are also encouraged.

Many natural history museums such as science museums and science centres aim to subsidize to school-related learning in science. In a conducted article review, it indicates that the effectiveness of educational activities at diverse types of science-communication venues (SCV) in associating students' science learning differs. The review also found the evidence of interesting differences between activities; depending on how these activities are arranged (Peter & Kolsto, 2014).

Meanwhile, Mujtaba et al. (2018) concluded in the article 'Learning and engagement through natural history museums' that NHMs can offer students with new understanding and perceptions, with influences that can last for years. They studied the probable advantages of connections between NHMs and schools, and the possibilities for NHMs to teach about stimulating environmental issues including evolution and climate change and to expand more traditional artifacts with the use of digital technologies. NHMs can support students perceive science in means that the school classroom hardly can, with chances to meet scientists, discover whole topic expositions, participate with interactive exhibitions, utilize digital technologies and to support learning in the school science classroom all through field study and their online existence.

Also, Wang and Chiou (2018) justified the positive findings on the study 'An Analysis of the Sustainable Development of Environmental Education Provided by Museums'. It involved the review of past studies that are fixated on environmental protection in formal educational contexts while museums as non-formal educational contexts have assumed comparatively limited tasks to solve environmental problems. It is asserted in the study that the primary role of the museum is to assimilate the principles of local, regional, and national culture toward complex management, as the museum is a significant cultural transporter and a vital strength for informal schooling.

An environmental education study conducted by Punzalan et al. (2019) in the Philippines reiterated that field trip can bring the learners in the actuality of undergoing and interrelating with nature that eventually can lead to appreciation. It was suggested especially to urban school students. The school and the government officials should support each other to come up with collaborative efforts in order for the students to partake in programs that will nurture the promise to care for the environment.

Situated learning theory aims to develop the real-world knowledge of students through extension activities like museum visit. In a way to practice this learning theory and to emphasize the capacities of museum as informal classroom on addressing environmental problems as part of revolutionizing the Philippine educational system, this phenomenological-qualitative research was conducted to analyze how natural history museum supports the interest of STEM students towards the environmental issues. Specifically, this study ought to answer the following research questions: how did the natural history museum improve the interest of STEM students towards environmental issues?, what are the changes in students' conceptions of learning environmental issues after the museum exposure?, how museums could make

environmental issues seem more 'real' and urgent?, what opportunities the students received in meeting museum staff?, and how do students compare what they learn and how they learn environmental issues in different environments (formal and informal science settings)?

Methodology

Participants

This research was initially carried out with 20 senior high school students enrolled in a private educational institution in Dasmariñas City, Cavite, Philippines who participated in the museum visit. The students are under the Science, Technology, Engineering and Mathematics (STEM) strand of Academic Track in SHS program. They were purposively-chosen based on their educational inclination and interest with the research problem. There were 16 grade 12 STEM students and 4 grade 11 STEM students who participated in the qualitative survey about their experiences and perceptions in museum visit. Moreover, 3 grade 12 participants were selected to be part of the focus group discussion. It was agreed from the start of this study that the participants and the school will not be disclosed according to ethical standards. On that note, pennames were utilized in presenting the responses of the participants in this paper.

Research Design

This study emphasized the attributes of natural history museum as a venue for field study to support the interest of STEM students towards environmental issues. Phenomenological approach of qualitative research was utilized in this study to analyze the sensory experiences that allow the students to perceive or understand things naturally. Data triangulation technique including observation, semi-structured questionnaire and focus group discussion was administered to selected STEM students in the Philippines.

Instrument

The following research data gathering techniques were utilized in support to phenomenological approach of qualitative research. Data triangulation strategy was conducted to record the individual attitudes of students during museum tour, to validate their experiences through open-ended questioning, and to elaborate their insights by discussing particular issues transcribed from the museum experience. Observation gathers facts or information about people, things, places, events, and so on, by watching and listening to them. The survey questions were developed by the researchers which were derived from the literature review pertaining to studies on the association of science museum and environmental problems. Questions to elicit factual answers ask about the respondents' views, attitudes, preferences, and other opinionated answers which are provided with sufficient space where the respondents could write their sentential answers to opinionated questions. A focus group is a group discussion on a particular topic organized for research purposes. This discussion is guided, monitored and recorded by a researcher (sometimes called a moderator or facilitator). This is also useful in generating a rich understanding of participants' experiences and beliefs.

Procedure

The participants of this research were attending senior high school program in the Philippines. The researchers administered the self-report open-ended questionnaires

to the STEM students after the museum visit. Students volunteered to fill-out the survey instrument through pen and paper method. All participants have been informed about the aim of the study before the museum trip observation, administration of survey and conduct of the focus group discussion. The analysis was carried out by emerging themes that came up from the participants' responses during the data triangulation techniques.

Results and Discussion

The principal goal of this study was to analyze how natural history museum supports the interest of STEM students towards environmental issues. To attain this, twenty STEM students from a senior high school in Dasmariñas City, Cavite, Philippines who participated in museum visit as a field study were observed and interviewed. The phenomenological way of analysis was employed to analyze the data whereas transcripts were read multiple times to highlight significant statements of the participants. Subsequently, the clusters of meanings from significant statements were identified to form themes. In the study conducted, there are four major themes emerged from the analysis; solving environmental problems by means of education, causes and effects of environmental issues, inquiry-based learning of natural history, and interesting and realistic learning scheme.

Solving Environmental Problems by means of Education

It is perceptible in the students' responses that one of the aspects how natural history museum support their interest towards environmental issues is the enrichment of their interest and conception. Majority of the students claimed that they became motivated and even strengthened their insights on studying the current environmental conditions based on the evidence showed by the museum. Likewise, there were students who agreed that the museum tour even changed their interest on studies from one specific field to environmental topics. Some reasons why the museum tour have changed and improved the interest and learning of the STEM students were the exhibits of the biodiversity including the extinct flora and fauna in the Philippines, the taxonomy or how the animals and plants are classified by the scientists and environmental concerns which they consider as simple affecting factors before but found out to be seriously degrading the natural wonders of the environment in collective form during the museum tour. The following responses were transcribed from the survey and focus group discussion.

RJ: It made me interested about life and the ancestors of present animal and plant species. It motivates me to protect the environment, the Earth itself, by giving importance to the life of each animal regardless of its role and appearance.

Cedric: I became more interested in the Biology aspect of STEM. I'm usually more inclined to Chemistry, but seeing the connection of it to the life on Earth, I got interested in solving environmental problems. My conception in learning them changed in a way that there are various creatures on Earth that should be protected and that even they need help in catastrophes.

Jared: When someone explained about the fossils, I have learned a lot about the evidences of the Philippines' past and also the reasons why there are no fossils of dinosaurs here. As a STEM student, I earned more interest in terms of Biology and Geology.

Paul: It made me wonder and interested on our natural living and history as Filipinos. It was so fascinating to know that our country has so much natural history in it.

Benedict: It has reminded me on how great and wide the biodiversity of the Philippines is.

Karen: The museum improved my interest when it comes to preserving our environment and in studying environmental issues. It made me realized the beauty that we had when we were still caring for our environment because we are so diverse in different species of plants and animals. I was able to feel our loss realistically.

Ann: It improved my interest to study or take environment or natural science in college. I learned more about the environmental issues like habitat destruction and how animals and people lived before.

Demi: It has improved my interest as a STEM student especially in the aspect of discovering animal and plant species in the Philippines (taxonomy). It changed my perception on environmental issues as some of today's species are already extinct due to pollution, wastes and overpopulation.

Aira: Learning science is not only about how we can protect the environment or studying things in this world. The museum showed that everything in this world has explanation and own beauty.

Nica: The museum strengthened my interest to value our surroundings because time will come and it will be all gone. I got more interested in Botany.

Daniel: Some Philippine animal species are already extinct and it encouraged me to save their habitats to preserve their genetic clans.

Girlie: Most of the displayed animal and plant replicas showed their near extinction because of environmental issues like pollution and other human interventions (hunting and selling).

John: It improved my interest as a STEM student by learning the different animal and plant species in the Philippines, ecosystems and fossils.

Causes and Effects of Environmental Issues

Another aspect that is considered in supporting the interest of STEM students towards environmental issues is the indicating problems in the environment. With the goals of exposing the people to the natural processes of the environment and educating how human interventions affect the biodiversity, the natural history museum utilized rich artifacts and items that realistically showcase to the students how the diversity of the environment changed historically. The students shared their understandings and believed in the role of natural history museum to support their learning. Most of them found that environmental issues are real and an urgent concern which need to be solved for the present and future generations. These insights were elaborated by taking down a collection of environmental issues determined from the exhibits of the richness of biodiversity and its continuous declination including the global warming, human activities like mining and pollutions and the demands of overpopulation. The following responses were recorded from the survey and focus group discussion.

RJ: The animals are getting diminished because of human activities and results to extinction.

Cedric: Things displayed in the museum are supported by evidences that environmental problems are real and happening such as species extinction and global warming.

Jared: I was able to see the richness of the biodiversity before and if we look around us these days, it changes much. By realizing the change done by human beings, we can feel and be sympathetic for this Earth.

Benedict: By making an exhibit on the effects we are experiencing now, and possible outcomes in the near future, show how devastating it will be, if not prevented.

Ann: Museum showed the fossils of the extinct animals due to environmental problems, such example is the effect of overheat on reptiles like Lolong.

Demi: It emphasized that global warming has big impacts in our society and especially in the population of certain animal and plant species.

Ian: It made a big impact on why we should prevent the deforestation in our country as it affects the population of animals.

Nica: Some specimens showed are already endangered and some extinct species are only displayed in the museum to preserve their identity. The species were gone because of natural and man-made causes.

Mike: It exposed me in environmental issues that contributed to the decline of Philippines' flora and fauna such as emission of too much greenhouse gases, deforestation, mining, illegal fishing and high demand of resources due to overpopulation.

Daniel: Environmental issues seem more real and urgent because some animals are already extinct and the numbers of plant species are decreasing.

Inquiry-Based Learning of Natural History

During the museum tour, it was observed that STEM students elevated their curiosity on various exhibit materials by asking questions to the museum staff and appreciating the richness of the Philippine environment through self-reflections. These ideas have arrived to discuss the opportunities they received from the museum tour. Majority of the students found it interesting and ideal to raise questions to the museum staff by clarifying misconceptions and elaborating the meaning of certain structures and images inside the museum. Some expounded that this opportunity evidently enriched their awareness efficiently and realized through exchange of thoughts with the staff that the rapid developments in the society hugely affect the nature. The following responses were recorded from the survey and focus group discussion.

RJ: They allow me to ask questions about certain artifacts and evidences inside the museum that definitely enhanced my knowledge.

Cedric: We had the opportunity to ask them questions about the connection of the animals and plants on Earth in the past with the environmental problems.

Karen: It shows us how different our environment from before than now and shows us how our rapid changes in society kills our environment.

Nica: The knowledge shared by the museum staff raised my awareness and made it easier for me to understand about the effect of environmental issues to our biodiversity.

Interesting and Realistic Learning Scheme

Lastly, the students appreciated the museum visit as a form of educational innovation when they distinguish the characteristics of museum in catering their need for knowledge improvement. The students asserted that the information they gain from the natural history museum were based on facts with the support of physical evidence from the studies of science experts. They also appreciated the chance to learn on their own as they were allowed to view series of museum resources of their choice that are categorized according to ecosystems. The museum tour also supported to improve their interest on natural sciences because of solid visuals and specimens that made the learning process realistic. The following responses were recorded from the survey and focus group discussion.

RJ: The museum provided sufficient knowledge (pure facts) by showcasing physical evidences of environmental issues.

Cedric: We are free to learn the artifacts and pieces of evidence of environmental issues inside the museum and it is not just limited in books.

Jared: Museum features may be limited because it exhibits not all the information about environmental changes but learning inside is more interesting than in formal classroom.

Paul: I prefer learning in experiencing things like what we did in the museum because there are solid visuals that I can see and learn especially when someone is explaining the artifacts.

Benedict: It is different when you see the actual things compared to pictures observing plant specimens.

Karen: I was able to experience (see physically) artifacts and evidences physically and not just theoretically (imagine or see in pictures).

Ann: In formal science classroom, learning science use imagination, videos or pictures. In museum, we got to see the real fossils and replicas of animals and plants.

Nica: I personally visualized the specimens and fossils which ignited my interest to see and learn more compared with the formal classroom teaching which required us to memorize the information (lesser value).

Daniel: The museum was more realistic and conducive for studying especially in terms of biodiversity and contribution of environmental problems.

Conclusion and Recommendations

The main goal of this study was to analyze how the natural history museum supports the interest of STEM students towards environmental issues. The reports of the students were analyzed and emerged in four themes: solving environmental problems by means of education, causes and effects of environmental issues, inquiry-based learning of natural history, and interesting and realistic learning scheme. It was indicated that the natural history museum do support the interest and learning of STEM students towards environmental issues at some aspects. The idea of situated learning theory became the foundation of this study, thus, it was proven at some point that the practice of exposing the students to their environment as part of learning process can positively support their education. As stated in the research questions, natural history museum as a form of non-formal classroom setting could possibly answer the inquisitiveness of the students most especially on environmental problems.

The need to enhance the educational system worldwide is such a challenging task to every educator since that every nation has its corresponding framework and educational philosophy that should be inculcated by the members of different education sectors. There is no big difference with regard to educational practice of countries based on the developmental ranks as agreed by the studies conducted in a highly developed country, the United States. Kivunja (2015) mentioned that using deliberate and direct teaching of thinking skills could be more effective as the students are exposed with their environments which allow them to democratically engage on particular issues in the society with the guidance of facilitators based on de Bono who is known in the field of teaching critical thinking skills emphasized.

Educational system worldwide needs to cultivate the critical thinking and problems solving skills of learners based on the requirement of the 21st Century Economy. Likewise, the attainment of success today and in the future world is something that could be addressed by extending pedagogical approaches which are circling on the determination of what is valid or not, fact or fiction, real or hype and relevant or non-sense from the available knowledge resources. This study suggests the practice of situated learning theory through field studies as pedagogical approach in order to promote the learning of students.

According to the studies conducted, Mujtaba et al. (2018) suggested that there should have opportunities that will nurture the connections between the natural history museums and schools. This can be done by providing sufficient professional development to its staff and teachers to assist in expressing common objectives for the betterment of students' learning and engagement. Therefore, the manner of organizing field studies and immersion programs to natural history museums, parks or gardens should be promoted in order to educate the students on the actual condition of the environment.

As presented in the results of this study, the students with proper way of partaking to field study gained relevant and real-world knowledge on natural history and were able to enrich their critical thinking skills. Therefore, the right way of organizing field trips together with suitable objectives can certainly achieve positive educational outcomes as necessity in the modern educational system. Besar (2018) recommended that a mixture of participatory and acquisitive education models may be the most effective methodology to classroom instruction.

It is suggested that the future education curricula will involve environmental studies starting from primary level, since education at early stage is crucial to forming individual behavior. It is indeed, that educators take an important role in guiding and promoting environmental awareness to the younger generation. Aside from that, although the results show an impact to the students, it is still uncertain on how long it will retain to them. Thus, it is important to have a sustainable source or program about environmental awareness. That is why it is suggested that the government should be involved to create environmental awareness among its citizens by making collaborations with different agencies and organizations to have a campaign or initiate activities that promote environmental awareness such as on line dialogue approach to gather information and foster discussion. The use of technology is likely to be used as a means of disseminating and exchanging information.

Finally, the educators from basic to higher education institutions are suggested to involve themselves in various development programs such as research activities, trainings, workshops, environmental exposures and graduate education to develop innovative teachings like situated learning activities to conduct environmental education in a more practical way.

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