

# Development of an education guide for primary school students to be used in conjunction with a visit to dinosaur exhibition in Sirindhorn Museum

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## Abstract

This research aims to develop an education guide for elementary student's teacher or educator to use in Sirindhorn Museum, Kalasin, an important earth science education center in Northeastern Thailand. The education guide is based on theory of Constructivism. It started from summarize information from exhibition zones. By advance organizer, made a new storyline. Finally, planned lessons and activities. Exhibition's storyline is timeline of earth history differences from education guide's storyline which is paleontologists work. Thai Paleontologists, as guide's voice, will be inspiration for learner. Moreover new storyline made a new route in exhibition that provides new experience for learner who ever visited museum before. The guide designed to give a role for learner to be a junior paleontologist through 6 lessons. All lessons got information from Thai research and used Thai dinosaur example, especially from I-san to enhance learner appreciation in hometown treasure. This guide will be choiced for child-center education in education tour. Not only in Sirindhorn Museum but also adapt to be travelling exhibition, education kiosks or classroom activities. With Easy topics and fun activities will improve good attitude to science.

**Keywords:** education guide, primary school, museum, dinosaur

## Introduction

Taking children to visit a museum is to promote children's learning and stimulate them to be more enthusiastic to learn outside class. Although a museum is a place for learning, it is designed for general public. Therefore, the scope of contents is includes too much information for children to see all in a short visit.

An educational tour to a museum provides an opportunity for children to learn from real objects and have a chance to get some hand-on experience. This is a learning process that helps children to understand and remember better than just listen to what the teacher teach in class or read a book. An advantage of an educational tour is that helps children to learn from their own experience. According to the research by Somjai SaeNgo (1998)<sup>1</sup> and Chanoknarn Wongburanavat (2006)<sup>2</sup> the results are the

same in that children learn more from an educational tour and most importantly, children are more enthusiastic and not tried to learn. This is because they can have hand-on experience in another atmosphere outside classroom. Self-studying results in children's learning process including analyzing, classifying, problem-solving, projection and having creativity. Apart from gaining knowledge, children also learn to socialize with others.

Although an educational tour has a lot of advantages to children, its arrangement is quite a problem. The major problem of the teacher in organizing these tours is in the administration including the budget, staff and transportation. The secondary problem is that there is no place specifically right to the topics taught in school, or the place is too far away. The teachers also lack information about all sources available.

In Thailand, it is quite difficult to take students out for education tour in small groups for many trips. Mostly, the school will take a lot of students out at one time, maybe the whole level, three levels or the whole school. The number of student is about 100-600, depending on the size of the school. This can help to reduce the school burden of all arrangements including transportation, appointment with the museum (or other education sources), permission from students' parents, teachers, especially for the school where one teacher has to teach many classes or subjects. Therefore, preparation for an educational trip is a heavy burden for teachers, making them pay less attention to the students' learning process and let the museum officer take this responsibility instead. Sirindhorn Museum is a science museum focusing on some specific areas, so it is difficult for most teachers to completely understand all the contents in the museum. Thus, the ones who can help will be academic officers at the museum.

It is important that everybody should have the basic knowledge about the earth and its changes. Therefore, the ministry of education has set the core syllabus of the fundamental education in 2008, specifying that this topic about the earth must be one of the eight topics of core knowledge in science. Students from primary level to high school level must be taught about this.

The research on dinosaurs in Thailand is now at the international level. Compared to other countries in the Southeast Asian region which started their research project on this at the same time, the research of Thailand is the most outstanding. The research centre has been established to do this work and it is now developed further to be Sirindhorn Museum, a learning center accessible for everyone. Thai paleontologists are positive role models for the young both in their research work and as an inspiration to persevere with their work until they succeeded. Learning about dinosaurs also means learning about changes of the earth. This can answer questions about contents in the core syllabus of fundamental Education 2008. Also, the research process about dinosaurs has many steps which are fun and suitable for children to learn, especially learn by doing.

Sirindhorn Museum is constructed in a beautiful and modern design. There is an exhibition of impressively large skeletons of dinosaurs with an interesting video presentation. This museum is quite large, maybe too large for those who are not really interested to walk around. Visitors have to walk past eight sections of the exhibition including 50 exhibitions set without any way out before the main exit. All visitors have to walk, following the directed route. Also the route is narrow and some part is so narrow that you have to walk one at a time. So, if there are 30 students walking one by one to see the exhibitions, how can the teacher teach them, not to mention 600 students? What the teacher can do is only to let them walk and see at their leisure or use a worksheet to control their behavior.

However, the worksheet also has some weak points. According to Griffin (2007)<sup>3</sup>, a worksheet is one of the causes that obstruct the students' learning process. A worksheet will be useful if it is well designed and correctly used. Teachers usually have two obvious purposes for using a worksheet in a museum. These are for a survey and for noting down all the main points collected from the museum. Nevertheless, according to a survey, teachers usually use a worksheet irrelevant to the school syllabus, which blocks students' inspiration and reduces a chance to relate their experience to their knowledge. Choices and learning process monitoring are also decreased. As for noting down all the main point, it is different in that all the questions are more open and related to the topics being taught in school. The worksheet obstructs social interaction and sometimes the learning process. This is because while filling in the answers they talk less, see less, or even stop and do not go to the aquarium. This happen more often than with those who do not have to fill in the worksheet. The teacher's expectation of the worksheet<sup>4</sup> (Parson and Muhs, 1994) referred to in Griffin, 2007<sup>3</sup>) also blocks the students' learning process. Some students said that they felt like they were under pressure while trying to find the answers.

In an interview, some grade 10 students (equivalent to Prathom 4) Said, "We have to go here and there to search for some information, so there's on time left for

us to study other topics that we are interested in.” and “We haven’t learn much because most information flows past our eyes to our pen<sup>3</sup>”. As for other students at the same age, when asked about what they don’t want the most in going on educational trip, their answer will be a boring lecture, worksheet, and homework. In addition, from four in five projects studying the result of distributing worksheets for students to fill in during their visit to the museum, only 3 out of 440 students said that the worksheet help them learn and understand the exhibition better. The reason why students who get the worksheet have different behavior from those who do not is that the worksheet will limit their interest to only to find the answers to fill in the worksheet as assigned rather than to see what they themselves are interested in. Finding the direct answers from the exhibition sets and activity set do not promote students’ learning and analyzing process (Randal, 2004 referred to in Griffin, 2007<sup>3</sup>)

Learning in the museum is children’s first-hand experience of the exhibition sets. However, the exhibition sets designed for general public may be too difficult for children to understand both the content and the vocabulary used, especially for science museum. Some words such as saurischian, or stromatolite are difficult to pronounce; then what about their meanings? For children that understand only there are seven days in a week and cannot think that there are twelve months in a year, will they understand how long the time is for five thousand million year? How was the Jurassic period which is not the fun park in the movie really like? Teachers in cooperation with museum staff can help children to gain constructive experience.

There are only two staffs to take visitors to see around the museum and two others at the excavation site. When a group of visitors arrive at the museum, the museum staff will give a welcome speech, give a brief introduction about the exhibition and may take the visitors to see around the museum if they are in small number, they will be welcome and briefed on the exhibition by staff from other sections who come to help. Then, the visitors will be allowed to see the exhibition at their leisure.

To learn at leisure is good in that visitors can choose to see what they are interested in and want to know it in detail. This can lead to further learning about other related topics. This method will work only with those who already have some basic knowledge and experience for self-studying. However, as for small students, they may need a guide to help them to learn in a new and unfamiliar place.

To help children to enjoy learning subjects related to their lessons and use their short period of time at the museum effectively, the museum academic service section should arrange an educational program to suit for each group of the museum visitors. Educational programs can be arranged in many ways such as guided programs, camping, experiments and learning guide for teachers. This research is carried out to develop a teaching guideline for both teachers and the museum staff using the information and material in the museum as teaching media. The process in developing these guidelines can be an example for other museums to create their own educational guide and programs to be used in their museum.

## Research Method

A quantitative research using content analysis and inductive analysis was adopted to establish the foundation of core knowledge applying constructivism theory. By studying the contents in the museum, the research developed a mind mapping structure for the handbook, then the lesson plans and activities.

The collecting of data was done in two steps. First is collecting data at the site, observing the excavation of dinosaur fossils by paleontologists and observing students’ behavior while visiting the museum.

The collected data were then analyzed and simplified to be used to develop a handbook which will be checked by Suravech Suteethorn, an expert on dinosaur. After that all data will also be checked by Mr. Sakchai Juangarm, a curator at Sirindhorn Museum and Mr. Chalermchai Jitrach who is in charge of the activities at Sirindhorn museum will check the appropriateness of the patterns of activities which will be adopted to be used in the museum.

## Result of the study

According to a study of the project on dinosaur museum development at Phu Kum khoa, the contents in Sirindhorn Museum are organized in a story line according to geological time. They are about changes of the earth in each period of time from the earth's formation, the birth of organisms, and their evolution to all the present living things. The exhibition in the museum is divided into eight zones as follows.

Zone 1: The universe and the earth

Zone 2: Life begins on earth

Zone 3: Paleozoic: The era of ancient life

Zone 4:

4.1 Mesozoic: The era of the reptiles and dinosaurs

4.2 Thai dinosaur

Zone 5: Life of dinosaurs

Zone 6: Restoring life of dinosaurs

Zone 7: Cenozoic: The era of mammals

Zone 8: The story of man

The content in the story line in Sirindhorn Museum is like a movie telling the story of the earth with no abridgement. It is organized in chronological order making it easy to understand all the evolution process and see the changes of the earth as well as the adaptation of living organisms to the changing environment. However, the narration of the earth in general is quite difficult for children who still young to understand although it is about the earth where they are now living in. Apart from dinosaurs that they know, the remaining matters are so new and distant. Moreover, passive reception of information will make children lack of motivation to get new information, making it difficult to relate new information to their previous experience.

In designing the learning guide, the voice used to tell a story is as of a paleontologist, creating a Thai researcher doing a research on dinosaurs in Thailand. This will make it more familiar to children and inspire them that they, too, can do it as Thai researcher can also do the work at the international standard. The selected topic for the study is dinosaurs the ancient animals that most

children know and are the most interested in so as to promote their imagination and attract their attention.

A new story line has been created to go with the voice, using the same contents in Sirindhorn Museum, but with the organization according to steps that the researcher takes in doing their work so that young children will learn about a research process and can think systematically. Children will know the steps that a paleontologist works and activities are created in such a way that they can get some hand-on experience.

The researcher gathered all the data concerning the excavation process of dinosaur fossils from the permanent exhibition at Sirindhorn Museum. Researcher also joined the paleontological survey team of the Faculty of Science, Maharakam University to survey sources of open rock in some areas in Kalasin and excavate dinosaur fossils in Phu Noi, Kalasin. The process can be divided into four stages: survey, excavation, conservation and research.

The activities are designed by using the process of learning by discovering with some clues. In each sequence of the content, the objective of learning is specified, and information is provided to help young students with some questions in doing activities as supplements. The activities are divided into six base activities:

### 1. Survey of fossils

In a survey of fossils, students must know what they are looking for and where to find it. Therefore, it is necessary for them to learn about rock so that they can know in what types of rock fossils are. Then they have to study the geological map to find the area covered with that kind of rock. At present, the use of satellite and a computer program like google earth make it much easier to find the wanted area. After the area for a survey is indicated, it is also necessary to survey the place on foot to see whether there are enough fossils to excavate. This stage takes time and the students must be patient. The survey of the area in their own locality and reporting to the authorities when discovering some fossils are also important in assisting with paleontological research in Thailand.

## 2. Fossils

Fossils are important evidence in studying about changes of the earth and living things on earth. Learning about how fossilization of these living things has occurred enables us to understand that this process includes many suitable factors and long period of time to gradually make them become fossils. The fossils found are like prehistoric stone inscription that can help us understand about the changes of the earth.

## 3. Dinosaur excavation

Systematic excavation and data recording are very essential for paleontological research. Careful excavation will not damage the dinosaur fossils and the data about their lining up, location and direction are also useful in indicating the environmental condition and the cause of their death. Therefore, paleontologists excavating dinosaur fossils must have knowledge about physical features of dinosaurs. Moreover, they have to be patient, calm and careful. To develop all these skills entails a lot of practice.

## 4. Casting models for fossil preservation

The preservation process is an important step to keep the fossils in perfect condition ready for further examination. Preservation involves expertise in many fields. It requires both the knowledge of science and art. Models of the original fossils must be cast skillfully so that they can be used in analyzing the features of the bones while the original fossilized bones are safely kept. Another advantage of the models is that they are light, making it easy to do a research.

## 5. Identification of dinosaurs

Fossils will worth nothing unless they can give some important facts. The identification process of dinosaur species starts by identifying which parts of bones are the fossils and then arrange all of them to form a complete skeleton as much as possible. After that, compare them with those previously found. If they can match, identification can be made. If not, new names can be given as in the case of all the eight new dinosaur species found in Thailand.

## 6. Thai dinosaurs and the environment of Thailand in the past

Paleontology does not deal with only the study of ancient living organisms but it also refers to the study of the environment and landscape. These data have an effect on creating an image of paleontology. Nobody has seen how those organisms which have been extinct for millions of years look like. Only the data gathered from both the past and present are not sufficient. Thus, in casting dinosaur models and describing the earth at that period, imagination and art work are used to revive those extinct dinosaurs.

A name is used for each activity using a Thai saying like "Dive for a needle in the ocean." With an activity to survey for fossil, or "The slower, the better machete you can get." With an activity about fossil formation. The saying used can explain the meaning of the content and they are all well-known, making it easy for students to relate to their own knowledge. The students can be motivated to participate in the activity by some questions. For example, "This activity is called 'Dive for a needle in the ocean.' Who can give the meaning of this saying? And know it relates to dinosaurs?"

Each activity has been designed to include all the three types of learning form discovery approach: Enactive mode, Iconic Mode and Symbolic Mode<sup>4</sup>.

### 1. Learning about a survey for fossils.

Activity : Dive for a needle in the ocean.

Symbolic mode : giving a name to the base using a saying and discussion

Iconic mode : showing a chart of rock cycle to explain about rock formation

Enactive mode : allowing students to touch and examine rock samples

### 2. Learning about the fossils.

Activity : The slower, the better machete you can get.

Symbolic mode : giving a name to the base using a saying and discussion

Iconic mode : showing a chart of rock cycle to explain about rock formation

- Enactive mode : allowing students to touch and examine fossil samples
3. Learning about dinosaur fossil excavation
- Activity : To sharpen an anvil into a needle.
- Symbolic mode : discussion and recording of data collected at the site
- Iconic mode : drawing a map of the excavation site
- Enactive mode : excavation of dinosaur fossils
4. Learning about fossils preservation
- Activity : To sculpt water into an object.
- Symbolic mode : giving a name to the base using a saying and discussion
- Iconic mode : showing a chart of the casting process of a model
- Enactive mode : casting a model
5. Learning about identification of type of dinosaur
- Activity : Take a goat to butt a sheep.
- Symbolic mode : discussion and investigation to identify the type of dinosaurs
- Iconic mode : comparison of chicken bones and dinosaur bones
- Enactive mode : putting all the bones together to make a skeleton
6. Learning about Thai dinosaurs and the environment of Thailand in the past
- Activity : Add some eggs and colors
- Symbolic mode : giving a name to the base using a saying and discussion
- Iconic mode : showing a chart of presenting the process of filling in muscles and skin
- Enactive mode : painting and drawing skin texture of a dinosaur

This guide when used as supplement to studying the contents in Sirindhorn Museum can help students to learn more deeply. The museum may also provide supplementary activities to make learning more fun and enable visitors to the museum to learn by themselves

more than just walk around the museum. In using this guide, visitors can choose only the topics that they want to study deeply. After studying this guide, they can be allowed to see round again at their leisure. Walking freely after learning from the guide, visitors will have a chance to find more information for the topics that they are interested in during the briefing session.

The activities have been designed in such a way that they can be complete within three and a half hours, which is a period of time suitable for students, visit. However, this can be adjusted as appropriate. Each activity is complete in itself, so visitors can choose only those activities that satisfy their needs.

The contents for learning about science are divided into 8 units and the content in the guide is directly related to unit 6, which is about changes of the earth. The objective of this unit is to enable young students to understand about various processes happening on the earth surface and inside the earth. These related processes can result in changes in the climate, landscape and shape of the earth. This guide also suggests the process in searching for knowledge and scientific mind. The students will be able to present the information they have learn and apply their knowledge in many ways. Teachers can also adapt the contents to match with the lessons in class according to their level. Apart from the direct connection with unit 6, The changing process of the earth, the contents in the guide also include information in other topics. For example, Unit 1 deals with living organisms and their living. This includes their evolution, classification, biodiversity and extinction. Unit 2 talks about life and environment. It is about the connection between life and environment, and ecosystem. Unit 3 deal with substance, their properties, and state of substances. Unit 8 is about the nature of science and technology as well as scientific thinking.

This guide book also enable these student to gain knowledge in other areas of core syllabus of fundamental Education as follows :

- Thai language : reading, writing, listening and speaking

Art : visual arts, creation of visual arts using an imagination in casting dinosaur models.

Profession and technology : learning about a profession form paleontologist

Society, religion and culture : relating the extinction of dinosaurs to the concept of Buddhism about the three characteristics, namely impermanence (*anicca*), unsatisfactoriness of suffering (*dukka*), and non-selfhood (*anatta*)

As for the general public, they can also apply this knowledge in the same way. However, because this education guide has been designed for young students in senior primary school, the content organization is suitable for those who do not have any basic knowledge in this field. Therefore, it is a good start to give some basic knowledge for them before they study further in a higher level.

## Discussion and conclusion

This learning guide can help teacher who take students to visit Sirindhorn Museum in terms of information source of learning, objective and relevancy. This used to be one of problems in taking students to learn outside school and gain not much knowledge as expected. This guide is, therefore, beneficial to teachers, students as well as the museum. The teachers can use it without wasting their time finding more information, reducing their pressure in taking students out on educational trip. Students also have more chance to learn outside school and have more fun when the teachers are less strict with them. Beside, the museum is advantageous in that it can be used as teaching media, which is one of its objectives as a learning source.

The use of a museum as teaching media in full scale is still not widely known in Thailand. Mostly, teachers will only let their students see around the museum. From the study, it is found that teachers can make use of the exhibition in the museum in teaching, and it can be developed in many ways.

In carrying out this research, the researcher found that it was not difficult or complicated to prepare an educational guidebook and it did not need a lot of investment. To make the museum education section to take an important role in the construction of various learning pattern in the museum so that the museum can provide academic service to suit different groups of visitors. The researcher hopes that the educational guide from this research can be example for other museums to develop some learning materials in their museums.

It is also found that the information about dinosaurs in Sirindhorn Museum can be digested to make it easier to learn and, with supplementary activities, more enjoyable. In addition, the contents in the museum can be integrated with many subjects in Science, Thai, Art, and religion.

To create this educational guide, the researcher is at an advantage in that researcher used to help prepare contents for the exhibition in Sirindhorn Museum, and has joined in with some paleontologists to collect data concerning the excavation site. This make quite easy for researcher because researcher has already known both the contents and the excavation process. However, as for all the activities, she has consulted some experts about some academic aspect and activities. There have been some changes in the contents and some activities have been added to make them more complete.

At first, for the topic of bone preservation, the researcher suggested cutting the stone from the bone with a chisel, but it was too difficult to teach about the use of the tool and this method needs certain skills. Therefore, casting model was used instead. This activity is not difficult and it also promotes artistic skill.

The problem and obstacle are that the researcher does not have expertise in education, so it is difficult in finding educational theory to support her research. Although she worked in close co-operation with some experts in dinosaur and Sirindhorn Museum working staff, there was a lack of co-operate from users, which were schools, teachers and students. However, the research has been completed and the result is a learning guide about dinosaurs. Moreover, it is expected that this learn-

ing guide will be a prototype to be developed further for Sirindhorn Museum and also a starting point to cooperate with school so that this museum will be more effective learning source.

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