

**Museum Exhibits as Informal Venues for Environmental Learning:  
Application of Models from American Museums to the Design of Exhibits  
at the Museum of Nature and Human Activities in Hyogo, Japan**

**by**

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## **Abstract**

### **Museum Exhibits as Informal Venues for Environmental Learning: Application of Models from American Museums to the Design of Exhibits at the Museum of Nature and Human Activities in Hyogo, Japan**

Maki Kitabayashi

Exhibits and educational programs in museums have possibilities for effective environmental education for visitors. Environmental education programs or exhibits that occur in museums are by nature informal, and the visitors' expectations are usually not "learning," but having fun. However, because of the way people experience museums, some learning is always taking place. In learning about environmental education in museums, aquariums, and nature centers in the United States, I have been observing the ways museums provide enjoyable and effective learning experiences for visitors.

Through the literature reviews of environmental education, informal learning, pedagogy, museum study, and exhibit design, I have summarized the factors that make learning lasting and effective. With this summary of effective learning, I have discussed the ways that museum exhibits can stimulate visitors' learning. I also conducted case studies based on visits to various museum exhibits and interviews of museum staff in the U.S.—University of Alaska Museum of the North, Monterey Bay Aquarium, and California Academy of Science. In this process, I focused on the exhibits that I thought were especially good examples of effective environmental exhibitions: their conceptual design process, their visual attractiveness, and their interactive labels and messages. Through interviews with museum staff, I also attempted to learn how these exhibitions were designed.

In the past, Japanese natural history museums have been designed as serious and formal places of observation. It has been my observation (in multiple museums) that visitors often do not expect active learning or engagement. However, Japanese natural history museums have the potential for effective informal environmental education not only through the content of their exhibits, but with the kind of engagement the exhibits could foster. As informal education settings, museums have huge potential for visitor participation, but it is necessary for museum exhibits to stimulate visitors to have fun and to learn at same time. I would like to suggest to Japanese museum designers and educators ways to make their environmental exhibits more engaging and effective.

I have been communicating with the Museum of Nature and Human Activities, Hyogo. Staff at this museum have expressed interest in my plans to make suggestions about more effective environmental exhibits. My thesis project explored "the topic of the styles of American museum exhibits (regarding environmental themes) and how they can be applied to the Museum of Nature and Human Activities, Hyogo, specifically in terms of effective strategies for engagement and learning in informal settings."

**Key Words:** Environmental Education, Museum Study, Informal Learning.

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## **Introduction**

Along with science, technology and public policy, environmental education for the public is an important strategy for preventing and solving environmental problems. One major goal of environmental education is that of fostering individuals' responsible environmental behavior (REB), which includes active engagement and participation. Individuals go through the following necessary processes to reach REB: awareness, knowledge, skills, attitudes, and understandings of both the biophysical environment and related issues. Individuals learn and reach REB through a process of integrating some or all of these elements through both formal learning and their life-long experiences. Although the aims of environmental education are straightforward, environmental education occurs over time in many different places, such as at home, in schools, in the natural environment, and in museums and other informal learning settings where people encounter environmental experiences and ideas.

As professionals of psychology and pedagogy who understand how people learn, we are now beginning to understand the factors that make for effective learning processes. Human learning grows out of people's previous experiences. As people have different experiences in their lives, and because they build on their experiences and prior knowledge in different ways, these factors are complex. However, motivation, social communication, personal connection, and the physical environments of learning need to be considered. As people become independent, life-long learners, much of their learning occurs in informal learning settings, known as "free-choice learning." Independent learners control how, what, when, and where they learn, and with whom. This learner-centered learning is actually very effective and it plays an important, and often unrecognized, role in society.

Museums are one important venue for free-choice learning. Museums are multi-faceted institutions that serve the larger society with many functions, such as research, the maintenance of special collections, and education. While each individual museum emphasizes unique functions within a community, any museum can provide an effective



learning environment for people as an informal learning center, or a place for “free choice learning.”

Museums have the potential for offering effective environmental education for visitors through exhibits and educational programs. The visitors’ expectations are usually not “learning,” but having fun. However, of course, some learning always is taking place as people experience museums. In order to ascertain the effectiveness of exhibits and educational programs in meeting their stated educational goals, an evaluation of museum exhibits is necessary.

In the past, Japanese natural history museums have been designed as serious, rather formal places of observation. It has been my observation (in multiple museums) that visitors often do not expect to be engaged in active learning or interaction with museums or interpreters in museums. However, Japanese natural history museums have the potential for effective informal environmental education, not only because of the content of their exhibits, but also because of the kind of engagement that the exhibits could foster. As informal education settings, museums have huge potential for visitor participation, but it is necessary for museum exhibits to stimulate visitors to have fun and to learn at the same time. Some Japanese museums try to provide enjoyable moments and an engaging learning atmosphere through interaction among scientists, interpreters, and visitors. However, these efforts are mostly occurring as experiments in a very small number of museums. Yet, at the same time, there is also an emerging realization about the potential and effectiveness of museum education by Japanese professionals.

In learning about environmental education in museums, aquariums, and nature centers in the US, I have been impressed by the ways they provide enjoyable learning experiences for visitors. I would like to suggest to Japanese museum designers and educators some ways to make their environmental exhibits more engaging and effective in reaching different communities of visitors. I also realize that Japanese museum professionals cannot simply import the American style of the exhibits and educational programs because of different cultural expectations and different participation styles of visitors.

I have been communicating with the Museum of Nature and Human Activities, Hyogo; this museum has been planning a new exhibit wing to expand its current area. Staff at this museum have expressed interest in my plans to make suggestions about more effective environmental exhibits. Therefore, my thesis project will explore how styles of American museum exhibits (regarding environmental themes) can be applied to the Museum of Nature and Human Activities, Hyogo, specifically in terms of effective strategies for engagement and learning in informal settings. In the 2004-05 academic year, I visited several museums in the U.S and had opportunities to interview museum staff members involved in exhibit design, interpretation, and evaluation. I examined what part of their successes can be applied in the process of developing exhibits in the Museum of Nature and Human Activities, Hyogo.

The Museum of Nature and Human Activities, Hyogo has a major opportunity to develop new exhibits to provide effective learning experiences for visitors. A successful, engaging new exhibit wing could help increase the visitor numbers and participation of the people in the community, and also increase people's environmental consciousness. The success of the exhibits in this museum could also help influence museum practice all across Japan. As people discover enjoyable experiences in this museum, the style of Japanese museum exhibits and people's attitudes toward museums could change over time, and more interactive exhibits could spread a promising approach in Japanese museums.

To explore this topic, I will begin by discussing environmental education and its relationship to museum learning in Chapter 1. In Chapter 2, I will discuss museums as centers of informal learning from different perspectives: museums as evolving institutions, effective environments for learning, exhibit design, evaluation, and the educational role of museums. In Chapter 3, I will explain the history and the current situation in Japanese museums and in the Museum of Nature and Human Activities, Hyogo in Japan (Hyogo Museum), as well as discussing the difficulties of applying the American style of museum to Japan, and other alternatives.

In Chapter 4, based on the discussion in Chapters 1 through 3, I will look at museums in the U.S as case studies. I will discuss how these museums provide effective

learning centers for the goal of environmental education through the observation of museum exhibits and interviews of the museum staff. Through describing the case study exhibit as a model, I will also discuss the possibilities that the Hyogo Museum can adapt the models of museum exhibits for their own exhibits. In my conclusion, I will summarize the necessary changes that would improve the exhibits in Hyogo Museum so it could be a more effective learning center for the goal of environmental education.

## **Chapter 1: Environmental Education and its Relationship to Museum Learning**

The field of environmental education (EE) emerged in North America in the 1960s as a result of Rachel Carson's *Silent Spring* (1962), which gave enormous prominence to the threats of pesticides. This movement began in response to other media attention to increasing environmental problems, such as pollution and urban sprawl. The fundamentals of the environmental education movement grew out of the realization that human behaviors were the root cause of most environmental problems and that education could be one strategy for preventing them.

In 1969, William B. Stapp et al. first attempted to define and conceptualize EE in a paper *The Concept of Environmental Education*. This paper offered the first definition of the field: "[E]nvironmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution." This statement put forth the claim that EE through individuals of all ages working together could be the solution for environmental problems.

This definition was further defined and elaborated upon in the 1970s by two subsequent international, intergovernmental conferences convened by the United Nations Educational, Cultural and Scientific Organization (UNESCO). The meetings were held in Belgrade, Yugoslavia in 1976 and Tbilisi, Georgia in 1978. The Belgrade gathering adopted *The Belgrade Charter; A Global Framework for Environmental Education* (United Nations Educational, Scientific and Cultural Organization-United Nations Environment Programme [UNESCO-UNEP], 1976), and the Tbilisi conference adopted the Tbilisi Declaration in 1978; both documents laid out the goals and key tenets of EE. The Tbilisi Declaration stated that the goals of EE were to "foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas; to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment; to

create new patterns of behavior of individuals, groups and society as a whole towards the environment (UNESCO-UNEP).

The goals of EE are now widely accepted in the field: awareness, knowledge, attitudes, skills, and participation. However, while these overall environmental education definitions put forward very idealistic outcomes, not much was defined in terms of an environmental curriculum or recommended practices. Therefore, Hungerford, Peyton, and Wilke (1980) proposed the superordinate goal of environmental education as “to aid citizens in becoming environmentally knowledgeable and, above all, skilled and dedicated citizens who are willing to work, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment.” They also made a new contribution to the theory of the field by setting out four different levels of environmental learning; ecological foundation level, conceptual awareness level about issues and values, investigation and evaluation level, and environmental action skill level—training and application. Although their discussion of the levels was for the development of curriculum for schools and universities, this discussion also helps to illuminate people’s learning processes, which I will discuss as pedagogy later in this paper.

The process of forming Responsible Environmental Behavior (REB) as a result of environmental education has been discussed by professionals in the field for many years. Hines, Hungerford, and Tomera proposed the model of REB in 1986. They argued that personal factors would make the difference in whether individuals would actually adopt REBs and they strongly recommended that the field pay attention to such personal factors as attitudes, locus of control, and personal responsibility related to the desire for taking action. However, they argued that cognitive factors, action skills, knowledge of action strategies, and knowledge of issues were also necessary. These factors develop the intention to act, and the intention to act with situational factors form the foundation of REB. The model was tested by Hwang, Kim, and Jeng in 2000. They concluded that “[A]n individual’s intentional locus of control level can bring about the positive attitude level that one has, and that the attitude level does change the intention to act.” However, as Hines, Hungerford, and Tomera admitted, “[T]he prediction of responsible

environmental behavior is not a simple process. It appears to involve a number of variables, none of which are likely to operate without interacting with others.” Although these detailed studies are not the focus of this paper, it is necessary to keep these factors in mind when an environmental education program is developed. Acting responsibly is not just a matter of cognitive knowledge, or certain skills, or attitudes and personal inclinations: rather, it is a complex mix of these factors.

In her environmental education class at The Evergreen State College, Jean MacGregor showed the “Ascending Staircase of EE outcomes” in Figure 1 below. This model helps to illuminate what kind of awareness, knowledge, skills, attitudes, and so on that environmental education programs might aspire to, and then what specific strategies may be developed to realize these outcomes. MacGregor points out that one stair on the staircase does not necessarily lead to the next higher one: different EE programs bring learners in at different levels.

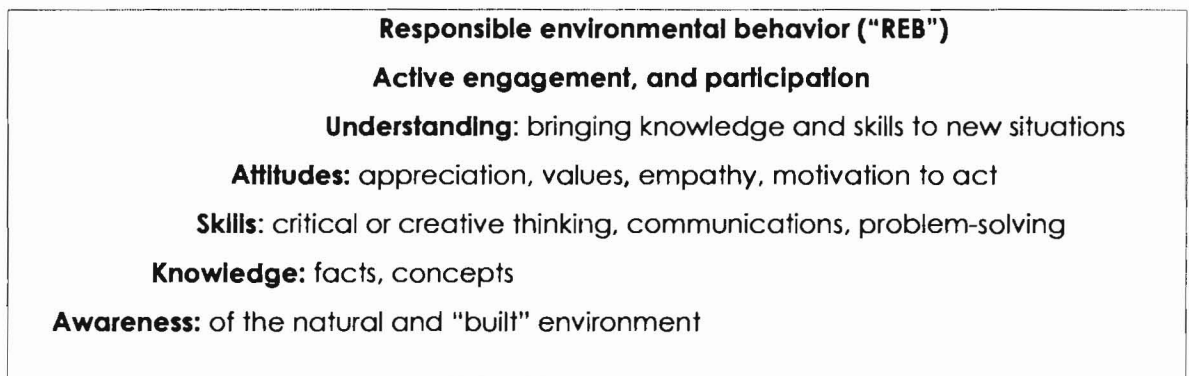


Figure 1. Ascending Staircase of Environmental Education Outcomes  
(Jean MacGregor)

For example, students can learn knowledge (facts and concepts) in school classrooms. However, if students are not aware of the natural and “built” environment, it is difficult for them to apply the knowledge to solve the problems. Similarly, even if people appreciate natural environment and have motivation to act, without knowledge they would not know how to act. However, it is also difficult to understand what REB is. For example, although recycling materials such as newspaper or glass can be seen as REB, some of these processes use harmful chemicals. Does this fact suggest that landfill

is better than recycling? Can we know which is better? Maybe the best thing we can do is less consuming. As people move up the staircase, they can make decisions by themselves about what is responsible. Societies, individuals, natural environment, and “built” environment are all integrating. In this complex system, there is no specific REB to solve the big problems.

Joy Palmer and Philip Neal (1994) explain the interrelated components of environmental education as a model in Figure 2. They set out various components of environmental education; educating *for*, educating *in* or *through*, and educating *about* the environment. These Canadian environmental educators argue that all these overlapping dimensions improve individual holistic development. In the process of developing EE programs, these considerations are necessary to make them effective.

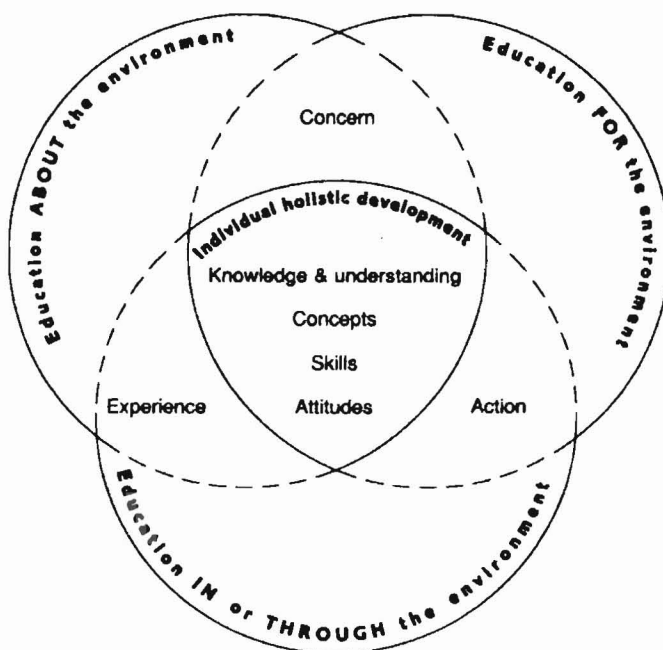


Figure 2. Model for Learning and Learning in Environmental Education  
Joy Palmer and Philip Neal (1994, p. 39)

The concept of environmental education is fairly straightforward, but the practice of environmental education can take many forms. For example, environmental education

can be seen as teaching specific strategies for the prevention or solution of environmental problems, but it can also be seen more broadly as the subject of a course about the natural world and its interrelationships. Sometimes personal experience in the natural environment might begin to accomplish the goal of environmental education.

Environmental education is offered in many kinds of educational venues, such as at home within the family, within formal educational settings such as schools and colleges, in the print or broadcast media, in social groups for both youth and adults, and in institutions for cultural enrichment. Each venue contributes a different piece, and sometimes the pieces add up to contradictory messages, but sometimes they add up to a very coherent message. (MacGregor, Personal communication).

The focus of this paper is on how museums attempt to educate the public about the environment, and how they attempt to move learners the ascending staircase toward environmentally responsible behavior. Are museums suitable venues for environmental education? The Tbilisi Declaration, which resulted from one of the major UNESCO conferences held in the 1970s, presents the following tenets of environmental education that are suitable to the educational styles of museums:

- (1) Museums are informal learning settings that can provide life-long learning for citizens. The Tbilisi Declaration states: “environmental education should be provided for all ages, at all levels and in both formal and nonformal education” and “environmental education, properly understood, should constitute a comprehensive lifelong education, one responsive to changes in a rapidly changing world.”
- (2) Museums evolve with their audiences (people in communities) as well as through their changing museum staff. The Tbilisi Declaration states, “Environmental education must look outward to the community. It should involve the individual in an active problem-solving process within the context of specific realities, and it should encourage initiative, a sense of responsibility and commitment to build a better tomorrow.” The museum can also provide flexible educational programs with EE components that introduce responsible environmental behaviors.



Museums have the potential to become places to achieve the goal of environmental education.

In the past two decades, across North America, museums, zoos and aquaria have started realizing that their exhibits and interpretive programs could play a more active and positive role in environmental education. To that end, the missions of many museums are increasingly moving toward the goal of environmental education. For example, the mission of the Monterey Bay Aquarium is to inspire conservation of the ocean. The mission of the California Academy of Science is to explore, explain, and protect the natural world. The Field Museum of Natural History in Chicago has a very long, detailed mission statement, which also refers to environmental education EE goals in an informal learning context.

Accomplishing the goals of environmental education is not easy, but it is important and necessary as one strategy to prevent or solve environmental problems and to sustain natural systems. No one aspect of environmental education can achieve all of EE's goals, but museums can play a role in contributing to environmental awareness, appreciation and concern, which can lead to REB. Museums can also provide for the enjoyment of people, and their exhibits and educational programs can affect visitors' learning processes. Instead of discussing the entire field of environmental education, I consider museums as a specific venue of environmental education.

## **Chapter 2: The Museum as a Center of Informal Learning**

### **I. The Museum as an Evolving Institution**

The collection and conservation of objects, research, and display are historically seen as functions of museums. However, the priority or emphasis of these functions has evolved over time. At the beginning of museum history in Western society, museums were the collections belong to wealthy people or places for scholars to come and study. These early museums were generally not open to the public. As World Expositions became popular at beginning of the 20<sup>th</sup> century, museum directors began to realize the huge interest that the public had in exhibitry, and the wide public support that could be realized by making museums available to the public. The International Council of Museums, organized with the United Nations Educational, Scientific, and Cultural Organization (UNESCO-ICOM), an international organization of museums and museum professionals, was created in 1949.

The changing definitions of museums by ICOM help us understand how museum philosophy has been shaped in modern society. In 1949, the first UNESCO-ICOM definition defined what a museum contained but neglected to state any over-arching purpose:

The word "museums" includes all collections open to the public, of artistic, technical, scientific, historical or archaeological material, including zoos and botanical gardens, but excluding libraries,.....

(Constitution and By-Laws of the International Council of Museum, 1946, Article II-section 2)

However, in the 1950's, the idea of communication with the public began to develop. In the 1956 definition, a broadened philosophical view emerged as this statement indicates:

The word of museum here denotes any permanent establishment, administered in the general interest, for the purpose of preserving, studying, enhancing by various means and, in particular, of exhibiting to the public for its delectation and

instruction groups of objects and specimens of cultural value: artistic, historical, scientific and technological collections, botanical and zoological gardens and aquarium....

Article II - Definition (ICOM Constitution, July 9th, 1956, Article II-Definition)

More recently, modern museum philosophy was defined in 1974 as follows:

## Section II - Definitions:

### Article 3

A museum is a non-profit making, permanent institution in the service of the society and its development, and open to the public, which acquires, conserves, researches, communicates, and exhibits, for purposes of study, education and enjoyment, material evidence of man and his environment.

### Article 4

In addition to museums designated as such, ICOM recognizes that the following comply with the above definition:

- a. conservation institutes and exhibition galleries permanently maintained by libraries and archive centres.
- b. natural, archaeological, and ethnographic monuments and sites and historical monuments and sites of a museum nature, for their acquisition, conservation and communication activities.
- c. institutions displaying live specimens, such as botanical and zoological gardens, aquaria, vivaria, etc.
- d. nature reserves.
- e. science centres and planetariums.

(ICOM Statutes, adopted by the Eleventh General Assembly of ICOM, Copenhagen, 14 June 1974)

Throughout these decades, museum philosophy was shaped through communication and interaction with the broader society. However, there have been difficulties when these newer philosophies were adapted in already existing institutions. Museums serve different roles as institutions, and there are debates over the priority of these roles. Similarly, there is a debate about the different functions of universities and how professors balance their research and teaching. For museums, the conflicting functions have often appeared as “popularization” verses “scholarship.” The conflict between them emerged when museums first opened to public, and has been brewing more

or less ever since. According to Lisa Robert, “[W]ith the emergence of professional museum educators in the early 20<sup>th</sup> century, that conflict was transformed forever, as where the political and organizational structures by which museum had traditionally operated” (Roberts, 1997, p. 13).

When popularization of museums began at the beginning of the 20<sup>th</sup> century, museums were seen first as “indoor amusement parks” by visitors. They were not yet seen as informal learning settings for the general public. Although leisure experiences can positively influence people’s learning process, the purpose of a museum is not only to create positive leisure experiences for visitors. The traditional view of the museum, which focused on collection and research for scholars, put educators in a new position at first. They needed to literally educate the public that museums provided more than an elite place for research and more than simply a place for amusement. There were difficulties in this transition 100 years ago, and these same difficulties and tensions over the real and perceived purposes of museums still exist today. The tensions concern the museum’s mission, responsibilities, and methods of operation.

The newer perspective of education in museums, which is the focus of my study, emerged in the 1970s. Museum professionals realized that the museum, in addition to its curatorial and scholarly functions, is also a learning environment, where all of the following can take place: “instruction,” “education,” and “enrichment” (Screven, 1974). A priority function of museums became that of education through exhibition and educational programs. Theoretically, a consensus emerged that museums should serve society, not through the scholars and their scholarship with collections, but through communicating directly with the general public through exhibitions and interpretive programs. However, there was also a challenge here: As much as museums embraced this new educational mission, they have had ongoing difficulty developing an original style of education to maximize informal learning. Pedagogy of informal learning was, and still is, lacking.

In the first decades of this new point of view (the 1970s and 1980s), museums as learning centers were seen as museum-centered, but not as they are seen now, as visitor-centered. There was recognition of the necessity of having educators as legitimate staff in

museums, but the first museum instructors were school-teachers. They evolved a style of teaching in institutions very similar to formal learning in schools (Robert, 1997). The style of museum education is different from schools because museum education uses collections and exhibits. However, museum education occurred mostly in formal educational programs, not through exhibitions: "In the last thirty years, museum education professionals have focused on developing appropriate teaching methods for both face-to-face teaching (workshops, talks, drama) and distance learning methods (teachers' pack, loan boxes and kits), and on establishing a professional profile within the museum organization" (Hooper-Greenhill 1999, p. 4). These programs expanded the educational role of museums largely through increasing the accessibility to the specialties of museums with their collections, objects. As John Hennigar explains, objects are fascinating and not age-specific, and they have the potential as educational tools for people (Hennigar, 1980). However, educational programs in museums would generally limit the number of visitors in attendance, similar to that of a classroom setting, and the programs tended to be the extension of the school classroom with heavily didactic teaching. Museums had yet to recognize the possibilities inherent to informal learning.

With these difficulties, the theoretical or ideal museum education as an informal learning center was being applied and refined at certain "leading edge" museums, and these approaches were slowly accepted by museum professionals. New styles of museums emerged based on a pedagogy and psychology of informal and highly interactive learning. For example, the Exploratorium in San Francisco was begun based on John Dewey's theories of constructivism with Frank Oppenheimer's belief that "museums of science were vitally needed for the general public" in 1969. In the 1960's, the Boston Children's museum started getting objects out of cases and into children's hands in exhibit areas where children could interact, experiment, and follow their own curiosity. Although these museums were seen as special, in fact *experimental*, museums, they played a practical and very important role in the development of both museum philosophy and museum practice. In addition, zoos and aquaria are sometimes also seen as special institutions with leading-edge educational practices that focus on the visitor's

enjoyment. Obviously, zoos and aquaria have very special kinds of collections—living ones.

Discussions about museum philosophy are complex because so many different types of museums exist and their particular missions reflect different perspectives: “Museums are so extraordinarily varied in their origin, discipline, scale, governance, structure, collections, sources of funding, endowment, staffing, facilities, and community setting...” (Weil, 2002, p. 5). However, the baseline idea is that museums serve society and its ongoing development. Museums offer a public service. As different museums have different emphases and functions, each museum also needs to have an external function within a wider community. As the result of different emphasis of functions with internal and external factors, the degree of openness to the public and the degree of purposes of study, education, and enjoyment can vary depending on different museums. Each museum needs to find its own methods to serve communities in society with imperative factors, which are preservation, scholarship, and object-based public programming and education.

From a management perspective, Stephen Weil explains that some criteria for a good museum are the same as those for public service organizations or not-for-profit sectors. The criteria are purposive, capable, effective, and efficient. Being “purposive” means having a clear sense of what purpose external to themselves they are seeking to accomplish, which is especially important. Other criteria are capable (of commanding the means required to accomplish those purposes), effective (are demonstrably able to accomplish the purpose they seek to accomplish), and efficient (are able to accomplish those purposes in a maximally economic way). For museums, being purposive is the mission of the museum, and the other criteria rely on the mission. Therefore, it is important for a museum have clear mission.

The educational role of museums is my focus in this study. In the next three sections, I will explore the educational role of museums from different perspectives: pedagogy, exhibit design, and museum evaluation.

## II. Effective Environments for Learning in Museums

To provide effective learning opportunities for museum visitors, understanding people's learning process is important. Although the learning process is complex, I will review important learning theories and the venues of learning, related to environmental education and museum learning. For the goals of environmental education, to reach the responsible environmental behavior, there are different learning outcomes, such as awareness, knowledge, skills, attitudes, and understanding. These different outcomes of learning cannot be provided just in formal learning settings, but they can be provided through different learning experience of individuals in any place in any time of people's lives.

An early important advocate of education is John Dewey who offered a theory of education in a social context in *Experience and Education* (1938). He argued that experience creates people's own meanings. Based on existing knowledge from past experience, people construct their own meaning in the process of integrating new knowledge. When Dewey was writing, traditional classroom teaching was focused on remembering the facts, and assessments mostly asked if students memorized these facts. The traditional style of education saw learning heavily in terms of accumulating information without integrating understanding of facts. John Dewey "attempted to call attention to the larger and deeper issues of Education so as to suggest their proper frame of reference" (1938, p. 6). Dewey believed that if experiences are interesting, stimulating, and occur in non-threatening environments, people enjoy their learning process. Dewey's ideas are complex, but his argument—experiences foster understanding, new understanding is constructed in social contexts and added to prior learning—has gained widespread acceptance among educators in recent decades.

As a result that individual experiences relate to the process of learning, "learning" is difficult to measure, but we need to know *what* people learn. Most studies about education and learning have occurred in formal learning settings, such as school classrooms. In formal settings, input is what students are supplied, such as curriculum, instruction, and assessment tasks, and output is what students give back as finished work on assignment and assessment. In classrooms, assessment is a careful judging of the

quality and range of achievement through analyzing student accomplishments or demonstrations of knowledge and skills. Tests are one of the techniques to evaluate the achievement. In formal settings, teachers can control input and assess student accomplishment.

On the other hand, in informal learning settings, input and output are not as clearly defined, and facilitators to assess learners' attainment are often absent. In museums, the inputs are the exhibits and physical environment in the museum, but the output (visitor knowledge, skills, etc.) is not clear unless the museum conducts an evaluation. Setting goals, deciding what people might gain, and the outcome of learning are just as important for careful preparation as the inputs. As we try to understand effective learning process, we need to understand *how* people learn.

Recent studies on human learning affirm much of what Dewey advocated in the early part of the 20<sup>th</sup> century. Enjoyable experiences motivate people to have further experiences, which can further deepen learning. “When complex information is presented in a way that is enjoyable—intrinsically rewarding—the person will be motivated to pursue further learning” (Csikszentmihalyi and Hermanson 1995, p. 35) Motivating experiences with active participation can also help significant learning processes. “Doing” helps people to connect their past knowledge to current experience, rather than just being recipient of information. Recent studies also show “motivation affects the amount of time that people are willing to devote to learning. Humans are motivated to develop competence and to solve problems” (Bransford, J. D., Brown A. L., & Cocking, R. R., Eds., 1999, p. 48).

However, people are not just motivated by enjoyable experience, but motivation is developed for both extrinsic reward or punishment and for intrinsic reasons. Assigning tasks with a goal set by educators is extrinsic motivation. However, if learners understand the goal, the same task can intrinsically motivate learners. When learners are aware of what they are learning, they become independent learners who are capable and sustaining their own learning with intrinsic motivation. As independent learners understand the goals, they can take control of their learning by themselves in learner-centered environment.



The importance of helping people take control of their own learning, by engaging in and reflecting on active learning, is emphasized in recent studies as the practice of metacognition: "Metacognition refers to people's learning abilities to predict their performances on various tasks and to monitor their current levels of mastery and understanding" (Bransford, J. D. Eds., 1999, p. 12). This learning process focuses on learners' sense-making, self-assessment, and reflection on what worked and what needs to be improved.

Professionals are also finding out that learning processes "are affected by the degree to which learning environments are student centered, knowledge centered, assessment centered, and community centered" (Bransford, J. D. Eds., 1999, p. xvi). Much of this new literature on human learning and on the design of learning environments focuses on K-12 schools. However, most of these recommended practices apply just as well to informal learning environments. Learner-centered environments are reflected in the following quotes:

- Environments that pay careful attention to the knowledge, skills, attitudes, and beliefs that learners bring to the educational setting,
- Knowledge-centered environments intersect with learner centered environment when instruction begins with a concern for students' initial preconceptions about the subject matter,
- Knowledge-centered environments also focus on the kind of information and activities that help students develop an understanding of disciplines

(Bransford, J. D. Eds., 1999, p. 121-124).

Human learning is not limited to formal learning settings because learning is deepened by human experience. However, this does not mean that all random experiences support an individual's learning. Informal learning can provide more organized learning experiences than random experiences. According to the Informal Science Education Program (ISE) of National Science Foundation (NSF), Informal learning is as is defined as:

Informal education consists of learning activities that are voluntary and self-directed, life-long, and motivated mainly by intrinsic interests, curiosity, exploration, manipulation, fantasy, task completion, and social interaction. Informal learning can be linear or non-linear and often is self-paced and visual- or object- oriented. It provides an experimental base and motivation for further

activity and learning. The outcomes of an informal learning experience in science, mathematics, and technology include a better understanding of concepts, topics, processes, and thinking in scientific and technical disciplines, as well as increased knowledge about career opportunities in these fields.

(ISE of NSF, 1997)

Museums are one of the places where informal learning occurs with objectives (collection) and professional views. Museums also can provide enjoyable moments for visitors. As Judy Diamond has argued, “Informal learning provides no immediate external rewards, but it reminds us that learning can be fun, that it can be enjoyed as excitement, exploration, and play” (1999, p. 32).

John H Falk and Lynn D. Dierking, major contemporary theorists about museum learning, have put forward the notion of museum learning as “free-choice learning”. According to them, “Free-choice learning is the most common type of learning in which people engage. It is self-directed, voluntary, and guided by individual needs and interests—learning that we will engage in throughout our lives. Since it is the learning that we do when we want to, by definition it involves a strong measure of choice—choice over what, why, where, when, and how we will learn” (2002, p. 9). Free-choice learning happens naturally in society, these authors contend, and it is often very meaningful for learners because this process makes life-long learning into a reality, which is qualities of learning.

Free-choice learning has played an important role for people’s quality of life in the learning society. Free-choice learning situations can lead to significant learning for learners, from what we now understand are the most promising conditions for human learning. However, there are difficulties on how goals of informal learning can be set by the learners at the beginning of mastery, in the process to become mastery, because beginning learners might not know the goals. Informal learning centers can help set goals at the beginning for learners. However, the role of museums as learning centers is not just providing information for individuals’ learning. As a sector of educational institutions in society, museums must also support people in becoming life-long learners. According to Bransford, J. D. Eds., “[W]hen learners are aware of what they learn, learners can

become independent learners who are capable of sustaining their own learning—in essence, this is how human beings become life-long learners” (1999, p. xiv). Although there are not simple formulas regarding what works best with "free choice learning" in learning centers, keeping this idea in mind is valuable when museums rethink their missions and service to society.

Our growing understanding of human learning processes provides suggestions about ways to design effective informal learning environments. Our current theories about informal learning, free-choice learning, life-long learning, and a learning society all are contributing now to how exhibits and learning experiences are designed in Western museums. Museums have the potential to be highly effective informal learning venues through their exhibitions and educational programs. Museums also can be places that provide learning for the goals of Environmental Education. In the next section, I will explore how exhibit design can provide effective learning environments.

### **III. Exhibit Design**

In museums, exhibit designs can be prepared for an effective learning environment for visitors as well as for enjoyment. In this section, I will describe some important ideas for developing exhibitions from both the learning-process perspective and a practical perspective.

Each exhibition should have message or goal. Without a unifying message, exhibitions are just places where collections are displayed. Visitors can experience the collections at these places, or they can enjoy the exhibits if the exhibition was designed to motivate visitors to have fun, such as with interactive devices. Beverly Serrell, a leading thinker on exhibit design, explains how important it is for the exhibition to have a big idea, which she defines “A big idea is a sentence—a statement—of what the exhibition is about. Including a subject, an action, and a consequence” (Serrell, 1996, p. 1). The big idea might not be stated as a direct message for the visitors, but it is important for the overall design of the exhibition. For example, at a children's museum, children just have fun at exhibitions through playing. Although children learn from experience, if the connection between the exhibition and experience of children in the community cannot

be found in their real life, it is just playground, providing a random experience. If the big idea of the exhibition is designed with understanding of developmental stages of children, with intent to make a connection between the exhibition and individual's life, the exhibition can provide a more effective and lasting learning experience. Another example in a natural history museum is that various rocks of collection in geological exhibition can make sense only for visitors who are interested in geology. However, if there is a big idea, which can be presented in a meaningful way to other, less interested visitors, the exhibition can be designed to connect their lives or stimulate their interests—and perhaps create a more meaningful learning experience.

Falk and Dierking, the "free choice learning" advocates, propose the interactive experience model. They propose that interactive experience occurs within three contexts; physical context, personal context, and social context: "Museum experience occurs within physical context, a collection of structures and things we call the museum. Within the museum is the visitor, who perceives the world through his own personal context. Sharing this experience are various other people, each with their own personal context, which together create a social context" (Falk and Dierking, 1992. p. 4). Museums provide the interactive experience as its special learning environment.

"Interpretation" is one of the important ideas in creating effective learning environments in informal settings. The philosophy of interpretation has grown in the United States as public parks and associated exhibits and visitor centers have evolved. Exhibits, signage, self-guided trail leaflets, and live interpreters work to explain and bring alive natural or cultural history. In *Interpreting Our Heritage*, Freeman Tilden explains his six principles below:

1. Any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile.
2. Information, as such, is not interpretation. Interpretation is revelation based upon information. But they are entirely different things. However, all interpretation includes information.
3. Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical or architectural. Any art is in some degree teachable.
4. The chief aim of interpretation is not instruction, but provocation.

5. Interpretation should aim to present a whole rather than a part, and must address itself to the whole man rather than any phase.
6. Interpretation addressed to children (say, up to the age of 12) should not be a dilution of the presentation to adults, but should follow a fundamentally different approach. To be at its best it will require a separate program.

(Tilden, 1977, p. 9)

There are some important elements in these principles related to providing effective learning experiences in museums. For example, the first principle relates to the importance of connecting personal experience with the learning objectives of an exhibit. The fourth principle says that interpretation is more than just presenting information or knowledge, and it is not instruction, but provocation, which helps grow feelings, such as surprise, amazement, or curiosity. With provocation, the visitor would get the motivation to learn more. Although there might be live interpreters in museums, my focus is interpretive exhibition, which themselves should reflect the elements of Tilden's interpretive principles. Beverly Serrell explains interpretive exhibition as "displays that tell stories, contrast points of view, present challenging issues, or strives to change people's attitudes" (1996. p. 9).

Making "hooks" with the visitors (that is, capturing their attention long enough for learning to take place) in exhibitions is important for visitors' learning. If visitors were interested in the topic (of the exhibit) because they already have interest and understanding in the exhibit's topic, they would carefully observe the exhibition. They possibly will integrate the information or knowledge in the exhibition with their already-existing knowledge. The presentation of an exhibition also can "hook" the visitors through enjoyable aspects of the exhibit, or through looking attractive or even beautiful. Even if visitors might not understand the topics or message of exhibitions, if presentation of exhibitions can make the "hooks" at the beginning, visitors spend more time in an exhibition instead of just walking through the exhibitions. "[T]he more time people using an exhibition, the more opportunities they can create for themselves to learn" (Serrell Beverly, 1998). "Hooks" are necessary to keep visitors to stay in the exhibition.

Providing exhibits, with which visitors can use different senses such as seeing, listening, smelling, and touching, is an important technique for making "hooks" for

visitors. With cognitive map theory, a widely adopted view of how people process information, brain researchers have delved into how into our brains determine which stimuli are attended to and which are ignored: “Before focusing attention, the brain stem passively receives many sensory stimuli from our sense organs. The brain cannot process all the information so it actively scans the stimuli searching for anything that requires immediate attention...During this search the brain is constantly switching its focus between external events and internal memories and interests” (Beck and Cable, 1999, p. 17). As people use different senses, they remember what they experience.

There is a danger, however, in just focusing on making the exhibit aesthetically attractive. Presentations, which can employ “hooks,” also need to have messages that are clear and instructive: “Visitors should be able to understand what an element is about, grasp its context in the whole exhibition, and find it personally meaningful and useful” (Serrell, 1996, p. 5).

It is necessary to know visitors’ views and reactions toward a given exhibit. Alt and Shaw studied a long list of exhibit attributes, which could be communicated to all visitors without ambiguity (Alt and Shaw, 1984). They asked what visitors thought about the exhibit and sorted answers into eight categories: attractiveness/noticeability, overall evaluation, clarity and ease of comprehension, evaluation of subject matter, required visitor response, emotional reactions, visual effects, and appeal to different age groups. This study provides important information for exhibit design.

Exhibitions also need to appeal to visitors who have different preferences or styles of learning, integrating ideas, adapting knowledge, and forming meaning from a learning environment. Among a wide of variety of learning styles, one widely used in educational circles is the Learning Style Inventory created by David Kolb, and elaborated by Bernice McCarthy. They formed four types of learners: imaginative learners, who favor feeling and reflecting; analytical learners, who favor reflecting and thinking; common sense learners, who favor thinking and doing through applications; and dynamic learners, who favor creating and acting (Kolb, 1984), (McCarthy, 1997).

If exhibitions accommodate visitors’ learning styles by providing different approaches to learn about the objects, exhibitions can be effective learning environments.

For example, imaginative learners might enjoy social interactions that permit conversations with others. Analytical learners might value the presentation of facts and sequential ideas or theoretical questions. Dynamic learners might enjoy a laboratory environment, where they can try what they want to do. Some exhibits try to accommodate all these kinds of learning styles at once.

The design of the physical structure of the exhibition, includes sequence, pace, and noise levels, such of these affect the comfort levels of different learners. The best thing the design of the exhibition can do is providing different choices for visitors, and make also the appearance of choices clear.

To provide an effective learning environment, any exhibit needs a big idea or a clear overall message. Effective interpretation, clear goals for visitor learning, making “hooks” to involve visitors, knowing what visitors want, and a knowledge of visitor learning styles help us understand what to pay attention to as we design each exhibits and the overall exhibition. However, exhibit designs cannot fully control visitors’ responses or how much they learn. As informal learning centers, museums can provide opportunities for visitors’ learning, but museums cannot force learning. In other words, museums develop exhibits as input, but museums cannot control outcomes. Nevertheless, it is important to evaluate how each exhibit is coming across, and whether and how visitors’ learning is occurring. In the next section, I will explore some methods for evaluation processes in museums.

#### **IV. Evaluation**

“Visitor evaluations provide clues to the effectiveness of exhibits and programs, and provide insights into how people learn in informal educational settings” (Diamond, 1999, p. 11). However, evaluation research also is an important aid for management decisions in determining the viability of any institution (Loomis, 1986). As museums change their roles as educational institutions in society, museum evaluation has become increasingly necessary. It seems there are differences between VISITOR evaluation and EXHIBIT evaluation. However, visitors and exhibits interact with each other, and we cannot evaluate them separately. Therefore, I will discuss museum evaluation as a whole.

Evaluations are generally categorized into three types: front-end, formative, and summative. Front-end evaluation provides background and baseline information for future program planning. It can tell about visitors' prior knowledge and experiences, their styles of learning, and their expectations regarding the institution. The primary goal of front-end evaluation is to learn about the audience before a program or exhibit has been designed in order to predict how visitors will respond once the project has been developed. This information can help assure that the final product will meet visitor needs and project goals.

Formative evaluation provides information about how a program or exhibit can be improved. It occurs while a project is under development. The evaluator measures visitor responses to models, plans, or prototypes of the program or exhibit. A prototype is a working vision, usually of an interactive exhibit. Information from formative evaluation is used to make changes that improve the design of a program or exhibit.

Summative evaluation tells about the impact of a project after it is completed. It is conducted after an exhibit has opened to the public or after a program has been presented. Generally the results of a summative evaluation will be used to improve future activities through an understanding of existing programs (Diamond, 1999). The purposes of evaluation for particular exhibitions usually determine what types of evaluation are undertaken. As with other research projects, budget and time also determine how evaluation is conducted and communicated internally and externally.

Another aspect of museum evaluation relates to the identities of institutions in wider external communities. Museums might use evaluation for marketing and institutional self-study. The use of market research helps to increase visitation. Research about public perceptions, barriers to visitation, and the social nature of visitation, can help improve the roles of museums as institutions. Public outreach programs can be more effective if market research identifies the public's needs more clearly.

There are also management criteria for museums as public service organizations (mentioned in the beginning of this chapter), such as the qualities of being purposive, capable, effective, and efficient. As institutions, museums have two fundamental functions: as a research and learning environment for scholars, and as an educational



setting for the public. The coexistence of these two different responsibilities as an institution can create tensions related to institutional structures and priorities. For example, a simple evaluation might not provide enough information to make decisions, such as how to balance budget priorities and staffing between the museum research and collection and the exhibits and education programs. It is necessary, however, to seek the best acceptance of museums. It is always important to keep in mind that evaluation strategies are tools for improving both the exhibits and the museum as a whole.

## V. A Discussion about Educational Role of Museum

To summarize this chapter, the roles of museums in society have evolved dramatically in the last 100 years. Most museums have some combination of collections, research, exhibits, and educational programs for both scholars and the general public. Although it is sometimes difficult to balance these functions within a museum as an institution, educational roles for the public recently became important. The focus of this study is the educational function of museums.

The relationship between universities and museums is another issue. Each museum has different relationships with communities and universities. *Museums and Universities*, edited by Janet Solinger, explains educational programs in museums as continuing education. There are possibilities that museums and universities cover each other's role, because both institutions have some of the same functions in society. In the other words, museums and universities can share research, education, and collection. How they share or work together, however, depends on specific contexts of universities and museums in different communities.

Museum exhibitions create occasions for education. Exhibitions provide free-choice learning for visitors. Museum educators develop educational programs as effective learning environments. My focus on the educational roles of the museum is educational perspectives of exhibition, especially for the goals of environmental education. I summarized the aspects of lasting and effective learning according to contemporary literature and the aspects of museum learning offer in their exhibitions as effective learning environments in Table 1. In the next chapter, I will try to apply these

environments in a more practical sense for the Museum of Nature and Human Activity,  
Hyogo.

Table 1: Aspects of Museums Learning that has the Potential to Create Effective Learning Environments

Part A. Museums as Venues for Learning

<b>Aspects of lasting and effective learning</b>	<b>Aspects of museum learning environments</b>
Learning occurs socially	<ul style="list-style-type: none"> <li>• Most museum learning occurs in a social context; visitors often come to museums in groups (family groups, school classes, youth groups, groups of friends)</li> </ul>
Learning is continuous throughout peoples' lives	<ul style="list-style-type: none"> <li>• Museum can serve all ages</li> </ul>
Learning is interactive, and involves personal communication	<ul style="list-style-type: none"> <li>• Many museum exhibits invite visitors' interactions</li> <li>• Interpretive exhibits communicate with visitors</li> <li>• Interpreters communicate with visitors</li> </ul>
Learning occurs in a non-threatening environment	<ul style="list-style-type: none"> <li>• Museum exhibits can provide an enjoyable learning environment that is non-threatening.</li> <li>• Most exhibits invite learning without extrinsic pressures such as tests, grades, or competition among learners.</li> </ul>

Part B. Exhibits as Effective Vehicles for Learning

<b>Aspects of lasting and effective learning</b>	<b>Desired aspects of museum exhibits and programming</b>
Learning relates to and builds on learners' previous experience or personal lives	<ul style="list-style-type: none"> <li>• Museum exhibits should build on visitors' knowledge and relate to their lives</li> </ul>
Learning with doing (exploration)	<ul style="list-style-type: none"> <li>• Museum exhibits should be hands-on. (Encouraging visitors to do something by themselves)</li> </ul>
Learning stimulates motivation and curiosity	<ul style="list-style-type: none"> <li>• Museum exhibits should help to develop visitors' intrinsic motivation and curiosity</li> <li>• Museum exhibits should provide extrinsic motivation with interactive devices, puzzles and questions (stimulating visitors to find correct answers or explore problems)</li> </ul>
Learning is controlled by learners themselves (Learner-centered)	<ul style="list-style-type: none"> <li>• Museum exhibits should let visitors understand what they are learning</li> <li>• Museum exhibits should be designed so that learners experience them in a self-paced way</li> <li>• Exhibits should provide choices for different visitors</li> </ul>
Learning uses different senses	<ul style="list-style-type: none"> <li>• Museum exhibits should invite learning through multiple senses.</li> </ul>

## **Chapter 3: History and Current Situation in Japanese Museums and in the Museum of Nature and Human Activities, Hyogo**

### **I. Brief History of Japanese Museum Focus**

The definition of Japanese museums is based on the first ICOM definition (1949) in 1951. The definition appears as a federal law, which is a part of Social Education Law. Therefore, fundamental museum functions are the maintenance of collections, and their preservation for research and educational displays for the public. However, researching is the primary institutional emphasis in Japanese museums, and generally education for the public is considered quite secondary. Historically, most of Japanese natural history museums have had only researchers, and few (to none) specially trained curators, educators, exhibit designers, and preparators who preserve and prepare the collections. Beginning in the 1950's, researchers themselves developed the style of Japanese museums although it was not easy for them to handle all the functions of museums. Although education occurs in Japanese museums, most still focus on research. Their function is generally considered to be scholarship. Although each museum has a different emphasis, the tendency of most Japanese museums has been not to emphasize the educational function. However, this pattern is changing as museums are now starting to be seen as informal learning centers.

One external factor that influenced this changing trend began in 2002, when, the Japanese school system started 5-days a week curriculum for "education free from pressure" (The Ministry of Education, Culture, Sports, Science and Technology, 2002). The Ministry was attempting to reduce the content-heavy and test-filled curriculum in order to provide children with more time to explore careers and find personal meaning in their lives. Although there are debates about this new approach, museums began to be seen as an alternative learning place for school children. It seems that museums as informal learning centers, however, were not ready to provide the learning opportunities expected of them by the educational establishment. Another external factor was that as retired workers increased, the museum's role as a place for life-long learning also

increased. However, without a history or cultural norm of educational professionals in museums, there were practical difficulties for institutions to evolve as informal learning centers.

Another pressure for museums in their attempt to become more education-focused emerged from their management systems. Most of the natural history museums in Japan are governmental institutions. Therefore, they have not had to seek much financial independence. When the local governments in Japan were financially stable within the Japanese economy, there was little pressure to become financially independent as an academic institution. However, as the governmental economic situation changed in 1990's, the government started asking the museums to provide public services to sustain the museums as well as work toward greater financial independence. In order to provide services, museums began to focus on a variety of educational offerings such as seminars, packages for school classes, and researchers' lecture series. However, while educational staffs at museums grew, many exhibits remained the same. Over time, there has been a realization of the necessity for exhibits themselves to change as museums evolve from displays of static collections to active, informal learning centers. The focus of this study, The Museum of Nature and Human Activities, Hyogo is no exception to this story of Japanese natural history museums.

In recent years, there has been a realization of the necessity for changing museums among museum professionals. The Japanese Association of Museums set up a special committee to discuss and explore ways for museums to adopt an "ideal museum style" (2003). The committee produced a report that explained the necessity of having focused mission statements and management plans. Unfortunately, zoos and aquaria staff members were not represented on this committee, and it seems as though access to this highly-academic association is not opened to the practitioners. However, this report represents a beginning of the discussion of museum professionals from the academic and educational fields associated with museums.

Hiroyuki Iida, associate professor of education in Tsukuba University, conducted a survey, which was part of the "ideal museum style" project. He surveyed museums' self-evaluations, such as their mission statements, management plans, and policies.

According to the survey of 581 museums, 38.6% of museums have formal mission statements, 27.0 % have formal management plans, 31.5 % have a formal exhibit design plan, and 25.6 % have formal educational policies. There might be a necessity to change this situation because without written policies, it is hard to share ideas among museum professionals, not to mention improving the process of communicating with the public. Although museum evaluations are not yet popular in Japan, written statements are also important for the evaluation process.

Interestingly, three private companies in Japan are now publishing magazines about museums, which contain leading-edge ideas about museum exhibition as well as roles of museums in society. Two of them are an exhibit-design company and a group of exhibit-design companies (Tansei Institute and Institute of Cultural Environments). Another company provides seminars, consulting, and publication about museums (UMPromotion). They provide articles including interviews of museum professionals not only with Japanese professionals, but with U.S and European museum professionals as well, and they also conduct research about museum effectiveness. Unlike American museum exhibit development, in which internal design staff create most of the exhibits, these private exhibit design companies have resources about museum exhibitions. They might take the initiative not just to design the exhibit but to shape its entire message as well and even provide the exhibit objects to present context, such as georamas and visual images.

Some positive movements within Japanese museum professionals are emerging. Yoshihiro Miki, who has worked at the Boston Children Museum, the Seattle Art Museum, and the Japanese American National Museum, writes about exhibit and visitor evaluation and management process in the U.S in his book and articles (Miki 2001, 2003, and Murai ed, 2002. p. 75-116). There is also a practical museum (Neo Museum), which experiments with providing “visitor-centered” learning centers, based on the educational theories of Nobuyuki Ueda. He studied education at Central Michigan University and Harvard University (Ueda, 2001) before opening the museum.

There is also increasing realization about the importance of scientists’ roles in society. Yugo Ono, professor of environmental earth science at Hokkaido University,

suggests the need for the involvement of scientists for environmental problems (Ono, 2003). He emphasizes the necessity of scientists being as in informal learning centers, such as visitor centers and sites for eco-tourism. With his understanding of the necessity of changing human behavior to solve environmental problems, he also suggests learning ancient cultural perspectives, such as about the native people in Hokkaido, in addition to learning about guiding scientific principles. Although he does not focus on museums as learning centers, his point is that scientists should become interpreters for the public of their understanding of science and culture.

Unfortunately, as noted earlier, museum evaluation, especially exhibit evaluation, is not yet popular in Japan. However, Japanese museum professionals have just started realizing the necessity of evaluation within the past few years (Murai ed, 2002). Japanese evaluation tends to focus on management perspectives, such as visitor numbers and ratings of quality as a public service. This is because evaluations were seen as a responsibility to explain museums as governmental institutions. These evaluations often use quantitative methods, but not qualitative. However, it is not easy to evaluate public service and education without qualitative methods. The evaluation of education or learning outcomes often requires qualitative methods and summative evaluations of visitor experiences. Evaluations also tend to be assessments of the institution, which provide information for political decision-making. Evaluation, however, should also be used for improve the quality of the institution.

## **II. The Museum of Nature and Human Activities, Hyogo**

This museum is fairly representative of most prefectural museums in Japan. It is a fairly traditional but reaching for new practices and methods of visitor engagement.

Hyogo Prefecture is located in the west of Honshu Island, Japan's main island. The Prefecture extends from Seto Inland Sea on the south to Japan Sea on the north, and it contains mountainous areas. The natural environment of Prefecture is diverse, and the residents' life styles also are varied. The Museum of Nature and Human Activities, Hyogo opened in October 10, 1992 in Sanda City. The location of the museum is in a rapidly developing suburban community where natural environment still remains, but

most residents commute to work in cities, such as Kobe and Osaka. Access of visitors is limited mostly to residents in the Prefecture, because there are limited other attractions in Sanda City. Most visitors are residents in the area or students on school field trips. The phenomenon of very few general museum visitors and few tourists is characteristic of many other Japanese, too, especially natural history museums. It is important to increase visitors to the museum by improving it as an effective learning environment.

The purpose of this museum is to help residents of Prefecture Hyogo and others to appreciate the beauty and dignity of the natural environment around us. Here visitors can enjoy unique exhibits and educational programs about nature and human life. This mission relates to the goals of environmental education as well as to the objectives of a governmental institution.

The museum is set up as the University of Hyogo Prefecture, Institute of Nature and Environmental Science. Staff members of the museum are also professionals with formal appointments in the university: 20 researchers hold additional posts in the university, and 17 researchers are full time for the museum. Therefore, this museum functions as an academic institution.

University professionals usually conduct research in their academic field and teach students in the university. The purpose of the museum, however, is based on the idea that the professionals can make the results of their studies directly available to the public. Museum visitors, however, often do not expect learning in the museum but come more for entertainment. In addition, the general public cannot understand most of the studies being conducted by the university professionals, because they do not have same background or understanding of the topic. Thus museum staff have a problem in presenting their results to visitors.

The museum also lacks educators, exhibit designers, curators, and consistent of floor staff. Three "museum teachers," all retired school principles, lecture to school groups. They are hired by a non-profit organization (volunteer group), so they are not officially staff of the museum. The department of life-long learning has four staff members, who are clerical staff of the prefectural education board and do not have experience as educational practioners. In addition, the staff members of the department of



administration are also clerical staff of the Prefectural education board. Staff of the Prefectural education board are subject to periodic transfers. The floor and guide staff are temporary employees of the museum dispatched from personnel agencies. Therefore the staff members who interact with visitors most often do not have full understanding of the museum.

The staff of other departments, such as planning and coordination and life-long project office, are comprised of researchers who hold the post in addition to their priorities in academic. Within this structure, an overall educational objective for the museum exhibits is lacking. Therefore, the professionals (researchers) need to learn to “come down” to meet visitors’ understanding. In turn, visitors need to be enabled to take museum learning more seriously.

Under the slogan of “Next Museum Concept” by the administration of the museum, the museum has been working on, over the past five years, a plan to become a “consortism museum” that would have a major influence in a creation of a sustainable society. This planning became public in a report with two main objectives: support life-long learning and enrich “think-tank” about nature and environment. According to the report, to support life-long learning, the museum should improve the exhibits, enrich the collection, enrich practical sites for life-long learning, such as by working with parks in the Prefecture, and train of community leader for life-long learning.

In 2000, the museum started “seminars”: providing the programs, such as lectures, hiking, and other activities. Researchers have the seminars for publics who are interested in the topics. The museum also opened a “museum school” for school children to provide educational programs for special interest groups, such as about insects. In addition, the museum started a “caravan program,” taking exhibits out to other location. In this process, the museum has begun to work together with local groups. This program has increased visitor numbers and created a visible outreach program. There are also educational packages for schools and the opportunity to ask a researcher to give a classroom lecture.

My focus in this paper is on one part of the process to improve this museum: designing exhibits as effective learning environments. The museum now has several

permanent exhibits, arranged into five themes: Chronicles of Nature in Hyogo, Man and Nature, Culture of the Generation, The Biological World, and Our Planet with Life. Each theme has several exhibits in designated exhibition areas. Each of these areas is described in more detail below. This array of topical exhibits, however, lacks a larger message or a big idea. In the other words, themes are presented as if they were chapters of a textbook. Information is presented in ways that are static and generally do not engage the visitor. I will briefly describe the different exhibit themes.

First, the “Chronicles of Nature in Hyogo” highlights the distinctive natural beauty of the Tajima, Tanba, Harima, Hanshin, and Awaji areas with large panels, videos, and georamas. There is a stuffed animals exhibit with about 20 mammal species formed in the Prefecture displayed on a stage inside of a fence. Most of the other exhibits are not actual objects of the collection but pictures with labels or replicas and models inside cases.

“Man and Nature” reviews the history of man and his environment using similar techniques of display. One exhibit about wildlife extinction relates to the Washington Treaty, conservation on International trade in endangered species of wild fauna and flora, decorate with the objects, which banned trading of endangered species. This exhibit has a very strong message, protecting wildlife through Washington Treaty, although the message is very straight and almost didactic.

“Culture of the Generation” features intriguing ideas, ranging from urban redevelopment to personal enrichment. All of these highlight living in harmony with nature. Most of exhibits in this area are small georamas and models in glass cases with explanations on labels. One exhibit shows how much a family with 5 members consumes in a week. This exhibit is decorated with the water bottles, foods, and the extensive packaging of consumer goods. Again, the message is very straightforward and almost didactic for recycling and less consumption.

The “Biological World” features wildlife in rivers. There are also exhibits that introduce us to the wide variety of fauna found in the biological world. Fish behavior is explained in a glass case with replicas, and explanations are provided with textbook

quality. There are computers in this area to research more detailed information, which children enjoy by finding correct answers from the choices on the screen.

“Our Planet with Life” explains that the earth appeared more than four billion years ago, and it has been home to a succession of plants and animals. The georama recreates for us the rich abundance of life in the beech-tree forests of Mt. Hyonosan. There is also the exhibit of development of life on earth, from its origin over three billion years ago to the appearance of man, as traced with a succession of fossils. This section includes a large screen that shows the video of about this theme and some hands-on exhibits for children to play in the “Borneo Jungle.”

As well as the exhibition above, the museum has an Information Center and Reference Room. In the Information Center, visitors can watch videos featuring wild life in Hyogo and obtain information about items in the museum. At the Reference Room, visitors are invited to examine a variety of plant, animal, rock, mineral, and fossil specimens. Visual materials dealing with environmental education are also available.

Overall, the exhibits in this museum tend not to be interactive. For example, exhibits do not have big ideas or conceptual frames. They make little use of the objects in the museum collection. Many exhibits are display panels filled with text-heavy labels focusing on academic content that is dense and dry. There are many glass case exhibits, and the messages are often didactic, but not inspiring. Few exhibits let visitors learn or explore on their own. One of the reasons might be the process of the development of these museum exhibits. This museum does not have its own exhibit development staff and did not even have educators when the exhibits were developed in 1992. The museum hired a private company to design the exhibits. These individuals probably did not fully understand the mission of this museum or its communities. In this difficult process, the messages and intentions for visitor learning may not have been carefully developed or tested. Exhibit designing company working closely with museum education staff is one of the keys to developing interactive exhibits.

### **III. The Emergence of Leading Edge Museums in Japan**

In museum practice, leading the way have been Japanese zoos and aquaria, which have been changing for some years to increase visitors' enjoyment and learning.

Asahiyama Zoo has become especially popular as it focused on animal behavior, which stimulated curiosity in visitors. This change of the way to exhibit animals was done mostly by animal keepers. Professional educators, however, were necessarily involved in the process.

This zoo has a clear mission, which is to provide a place for recreation, education, conservation of animals, and research. Because of this success, other zoos started following it. For example, Ueno Zoo, the most visited zoo in Japan, began to adopt this same exhibit style. Ueno Zoo focused on exhibiting animals in their original natural environment. However, visitors sometimes cannot observe the animals in this style of exhibit because the animals often hide in the bushes or stay on top of trees. The Ueno Zoo also has been a leader in providing live interpretation about the animals on display. There are also successful aquaria to attract visitors' enjoyment, such as Kairyukan. However, the attractiveness was often seen as a management tactic simply to increase visitor numbers, not to become a more effective educational institution. There is also a debate among professionals at natural history museums about whether it is necessary to have live animals to attract the public. There is also a debate over whether natural history museums should enter the world of entertaining at all. However, it might be necessary for museum professionals, who are often researchers or scientists, to better understand that zoos and aquaria are also museums, which are doing leading edge work in making their displays more educational and meaningful.

Hands-on exhibits have been adopted as an effective strategy for museum exhibit design as successful examples in the U.S. and other countries. However, only the design of the hands-on was adopted, but not with in depth ideas of why hands-on exhibits provide enjoyable and effective learning. Without the educators, professionals in learning processes, most of the exhibits seem focused on physical interaction between visitors and exhibits. In the other words, hands-on exhibits seem to be developed as a more common

technique of exhibits, but not as a technique to stimulate certain learning outcomes. Educators are necessary in the process of developing exhibits.

There are also other leading edge museums in Japan. The Lake Biwa Museum, the Prefectural Museum of Shiga, carefully developed both its mission and its exhibit styles before it opened in 1996. The museum focused on creating a visitor-centered learning place. For example, the museum has programs in which residents of the prefecture collect data, which is used by scientists in the museum. Exhibits are designed in highly interactive ways with interpreters who converse with the public. This is based on this museum's philosophy that visitors are also part of the museum. In this museum, interpreters also get ideas from visitors to improve the exhibits. Both the museum and the community are deeply connected by Lake Biwa, Japan's largest lake and the third oldest lake in the world. The residents of the community have been strongly connected with the lake both culturally and biologically. This museum has educators, researchers, interpreters, and administrative staff, and these groups work effectively together for the fundamental purpose of existence of the museum as the institution. This museum also plays a role as a research institution in the scientific community on lake research, with parallel research efforts on Lake Baikal, Lake Tanganyica, and the US Great Lakes. Although there are many successful elements in this museum, the most important lesson might be that this museum developed its own style of incorporating different successful elements from different resources within the community.

As well as these elements, the Lake Biwa museum also leads professionals in the Japanese museum field. The museum held the first workshop and symposium about museum evaluation in Japan and produced the first major research report on museum evaluation (Lake Biwa Museum 2000, no. 17). The museum invited professionals from other countries as well as other Japanese museum staff. The museum did mockups in an exhibition, and later produced a detailed research report about this exhibition (Lake Biwa Museum 2000, no. 16)

The National Science Museum in Ueno is in the process of large-scale renovation. This museum is a heavily academic museum with exhibits focusing almost entirely on their collections of specimens. The specimens were previously displayed without

interactions with visitors. The exhibits in new building, however, have incorporated more interactive strategies, which might engage visitors more and stimulate their curiosity. For example, there are interactive devices, which use PDA systems to listen to dialogues between a National Science Museum researcher and an interviewer about the exhibition. Visitors also can record information about the exhibits as they view them. After visitors leave the museum, visitors can access the information of the exhibit, which stored on an IC card through the Internet.

The styles of exhibition have also changed. For example, an exhibition, "Solving the Mystery of the Dinosaurs," provides labels that describe scientists' views with familiar words for the public. The exhibition, "Evolution," has an exhibit, which displays different strategies of survival depending on species. The labels were written with familiar words as well as drawings. These inventions are expensive, but as I observed visitors were enjoying and spending time to read at the exhibits, it seems the exhibitions provide effective learning environment.

There are also small-scale museums, which provide effective learning environments for visitors. One is The Osamu Tezuka Manga Museum, which is a city museum in Takarazuka City. Osamu Tezuka is Japan's most well known cartoonist, who produced Atom Boy and other popular cartoons and anime. He was also a medical doctor and once hoped to become an entomologist. His stories have strong messages of caring for natural environments and other creatures on the earth, which relates to the goal of environmental education. The city developed the museum to communicate Osamu Tezuka's messages for his contemporary fans and also to the next generation. This museum has a message and impressive displays of collections of his cartoons. Although this museum does not focus on the academic functions of a museum, the exhibitions are designed for visitors' enjoyment, and invite visitors to imagine they are in his stories. The museum also contains a library with his cartoons and videos. Because the museum is not just presenting a collection of cartoons and has a recognizable and coherent message, it is both unique among museums in Japan and widely recognized as very effective in engaging visitors and communicating meaningful ideas.

#### **IV. Difficulties of Interpretation in Japanese Museums and Possible Alternatives**

The importance or effectiveness of interpretation in Japanese museums is now realized by museum professionals (Onodera, 2003). Interpretation in museums had become a focus of study in 2003, when I began to research museum interpretation in the U.S. museums based on Tilden Freeman's *Interpreting our Heritage*. After developing a beginning understanding of U.S. styles of interpretation, I attempted to research Japanese approaches to interpretation. As I observed interpretation in museums and zoos as well as conducted Japanese literature reviews, I found two major differences between Japanese styles and U.S styles of interpretation.

First, Tilden Freeman developed six principles for interpretation within National Parks (Freeman, 1977). His ideas about interpretation are not simple, but they represent a rich and deep philosophy about American natural, cultural, and historical heritage in the informal learning settings of national parks. Therefore, Tilden's ideas cannot be easily "manualized," and it is difficult to reduce his ideas to simple formulas. When Tilden's principles were adapted or imported for use in nature education in Japan, only the principles themselves (the six introductory sentences) were circulated. Thinking behind these ideas was not presented or discussed by professionals, and interpretive guidebooks only listed the principles. Even if the principles were translated correctly, they are still difficult to apply in practice because people do not understand Tilden in any depth.

Another important difference centered on cultural differences between American and Japanese visitors to informal learning centers. Japanese are acculturated not only to learn from a didactic style of teaching in the classroom but also to learn in this way in museums. It is fundamental to always respect elder people, and to respectfully listen to individuals with authority and expertise. Therefore, informal, conversational communication between learners and interpreters does not occur as smoothly as it does in many American settings, where visitors naturally feel they can listen to, converse with and even challenge interpreters. As a result, interpreters in Japan tend to just provide knowledge and information and visitors tend to respectfully listen; there is often little interaction.

In my undergraduate study, I researched the interpretation in the Lake Biwa

Museum. I observed that visitors actually did not know how to respond informally with the interpreters at that museum. I noted that the Lake Biwa Museum was developing its own style of the interpretation, but the style was different from interpretation in the American museums.

In this chapter, I have explained the current, changing philosophies of practice in Japanese museums in general, and the Museum of Nature and Human Activity in particular. There are many positive movements toward change, examples of promising practices, and discussions are beginning to take place regarding the changing museum. It may take time to change, however, as museums in the U.S. have been working toward this direction for well over 30 years. There is not just one way to improve museums as effective learning environments but multiple ways as all museums are different in each community.

I was involved with the work in Museum of Nature and Human Activity in Hyogo as an intern after I started learning about environmental education and interpretation. I now focus on how to make the exhibits more effective as a learning environment. In next chapter, I will explore some possibilities for designing exhibitions with examples of museums in the U.S. as case studies.



## Chapter 4: Case Studies

In this chapter, I will describe some exhibitions and museums in the U.S., which I visited during January and February of 2005. Each museum has a different emphasis and serves different communities and has different applicability to Hyogo Museum. I observed exhibitions, learned the process of developing exhibitions and saw different roles of the museum staff through interviews at the University of Alaska's Museum of the North, the Monterey Bay Aquarium, and the California Academy of Science. I also observed exhibitions as effective learning environments at the Field Museum and at the Museum of Science, Boston, particularly the "Nature Walk" exhibition at the Field Museum and the "Natural Mystery" exhibition at the Museum of Science.

I visited the University of Alaska's Museum of the North on January 31<sup>st</sup> and February 1<sup>st</sup>, 2005. I interviewed Terry Dicky, who is the coordinator of the education department; Wanda Chin, who is the coordinator of Exhibition & Design department; Amy Geiger, who is the manager of Visitors Services department; and Sophie Osborn, who is the assistant manager of the Visitors Services department. The University of Alaska's Museum of the North is the most similar to the Hyogo Museum in size, content, structure, and aim to attract a diverse audience. Both museums have scientific research departments, and some staff members have joint appointments with the university. Other departmental structures, such as education, administration, and visitor service are also similar, although their roles and emphasis might be different.

I visited the Monterey Bay Aquarium on January 28<sup>th</sup>, 2005 and interviewed Jenny Ramberg and Jaci Tomulonis, who are exhibit developers/writers. The Monterey Bay Aquarium has a clear mission on environmental education. Each exhibition supports the mission with its own messages. The exhibitions provide visitors with experiences for environmental education. The aquarium evolved the exhibit philosophy to reflect changes in society and visitors' expectations. The aquarium also evaluates exhibitions; therefore, staff members develop their new exhibitions based on feed back on effectiveness.

I visited the California Academy of Science on January 29<sup>th</sup> and interviewed Lisa Hubbell, who is a program evaluator; and Marco Centin, who is an exhibit designer. The

California Academy of Science emphasizes both scientific research and exhibition for educational purposes. Scientists initially develop the exhibitions, and their scientific research is presented in these exhibitions. The Hyogo Museum also aims to focus on both scientific research and its educational role. However, there are difficulties balancing them; therefore, the styles and the development processes of exhibitions at the California Academy of Science is a good example for the Hyogo Museum to follow.

## **I. University of Alaska's Museum of the North**

### **1. Overview of the University of Alaska's Museum of the North**

University of Alaska's Museum of the North is located on the University of Alaska Fairbanks campus. Since the creation of the university in 1917, the museum was included in its charter. In 1980, the museum was moved to this location. Its collection has been expanding since 1926 and is the heart of the museum. The natural history collections of aquatics, botany, mammals, birds, and earth sciences have a total of 253,300 specimens. Collections of cultural history include a total of 762,000 artifacts (750,000 of which are archeological objects) within the Alaska Native Heritage Film Center, Archeology, Ethnology, Fine Arts, and History departments.

As the museum guide describes, the museum is a place that signifies many things to diverse audiences.

For scientists and scholars, the museum holds a treasure-trove of specimens and artifacts that contain keys to understanding cultural and biological diversity. For University students, it is a place to learn about Alaska's natural and cultural history. For residents, it is a place of great pride, a storehouse that displays their heritage with respect and preserves it for future generations. For children, the museum is the favorite destination of school trips during which they use the hands-on collections of genuine dinosaur bones, furs, and Native artifacts. For tourists, it is an exceptional preservation of Alaska's complexity.

(University of Alaska Museum, 1996. p. 3)

The mission statement includes all the functions of the museum described as following:

to acquire, conserve, investigate, and interpret specimens and collections relating to the natural, artistic, and cultural heritage of Alaska and the Circumpolar North. Through education, research, and public exhibits, the Museum serves the state, national, and international science programs. The Museum develops and uses botanical, geological, zoological, and cultural collections; these collections form the basis for understanding past and present issues unique to the North and meeting the challenges of the future.

(University of Alaska Museum of the North, 2005)

There are currently 18 departments including Special Projects, Alaska Center for Documentary Film, and Communications. These departments focus on the following fields of studies: Earth Sciences, Entomology, Ichthyology and Aquatics, Mammals,

Ornithology, Alaska Frozen Tissue Collection, Herbarium, Archaeology, Ethnology & History, and Fine Arts. Some staff members of these departments are University of Alaska Fairbank's faculty, who hold joint appointments.

The Museum of the North is the most similar to the Hyogo Museum in size, content, structure, and aim to attract a diverse audience. Both museums have scientific research departments. Other departments, such as Education, Administration, and Visitor Service, are also similar although the roles and emphasizes might be different. Most of the collections of the Hyogo Museum, however, are natural history collections, and the emphasis on cultural collections is much less. The content of "human activities" in Hyogo Museum tends to focus on science and technologies, not including the cultural context. Exhibits and educational programs with cultural context have the potential to effectively relate visitors' experiences to personal lives. Conceptual design, which includes cultural context as an elements, as well as scientific elements in the exhibit provide an effective learning environment for visitors. The physical designs of exhibits, such as interactive devices including labels, are also an important factor of an effective learning environment.

In this section, I will describe: The roles of the Education Department as an educational institution, and in the development of exhibits; Exhibit and Design, various elements (exhibits) as conceptual design and physical design; Blue Babe exhibits, how the science is effectively present in this specific exhibit; and Discussion of application to the Hyogo Museum.

## **2. The Roles of the Education Department**

### **a) The roles of the education department in the museum**

The mission of the education department is stated as below in the Museum Education Profile (2004):

Education is one of the primary missions of the Museum, and the goal of the Education Department is to facilitate access to information about Alaska's social and natural phenomena. The Education Department is dedicated to providing life-long learning experiences to learners of all ages. Through the interpretation of Alaska's natural and cultural history collections, we provide a variety of inquiry-

based activities to engage visitors in learning about the people and places we call home.

(University of Alaska Museum, 2004)

The mission statements of the museum itself and of the education department are very similar, focusing on life-long learning. The education department tries to provide a variety of inquiry-based activities, which ask questions and stimulate visitors' curiosity. Programs attempt to answer these questions. This inquiry based strategy, revolving around stimulating questions is a visitor-centered technique that ideally stimulates visitors to make discoveries, solve problems, or build a sense of wonder

Public programs include University of Alaska Museum of the North Lectures, Saturday Family Programs, Open House, Gathering North, Junior Curators Camp, Summer Interpretive Programs, and Family Fun Fest. For example, Summer Interpretive Program happens 3-4 times each day during summer. It includes the Northern Inua, Dynamic Aurora, and Explainer Talk Series. Explainer Talk Series is a 20-minute program, starting with 5-10 minutes introduction of the topic with slides and powerpoint shows. After the introduction, the visitor can have the opportunity to use hands-on collections. This program can change visitors' attitudes toward the collection through their experience to touch them. It is a free program, and most visitors are tourists who visit Alaska during summer. Visitors are physically in Alaska where they might experience the topics outside the museum, so this program can motivate visitors to enjoy learning.

The Education department has two different School Tour programs, which are designed to reach K-12 students: Docent Led Tours by docents and Tours on Your Own by teachers. The program goals include strengthening the understanding of the northern environment and fostering awareness of the social history of Alaska's Native and non-Native peoples. These programs provide opportunities for students to personalize their topics of learning, more than in a classroom setting with exhibits and the hands-on collection. The museum also has resources, such as Teacher Resource Guides, Docent Resource Guides, Science kits, and Hands-on Collections.

## **b) The Roles in the Education Department in the Development Exhibition**

In my interview with the coordinator of the education department, Terry Dickey, he talked about the involvement of the Education department in the process of developing exhibitions. Curators, the Exhibit team, and the Education team are all involved. A curator, who is one of the scientists, develops an outline and a story and organizes objects to support it, such as photos, maps, and illustrations. The objects are the specialty of the museum: "if there is no object, it is a wrong story as an exhibit" (Dickey 2005). Scientists have information and can tell an interesting story, but they sometimes want to tell the story to other scientists, but not to the public who visit the museum. The story should involve people, art, culture, and values, which are hooks, which bring people into the objects. Without a hook, there is no connection to personal experiences.

Educators need to make sure that labels are written and placed appropriately to maximize visitor understanding with appropriate reading level, vocabulary, and length. Information has to be brief; if people want to have extensive information, they can go to libraries. For example, the label of the grey whale skull is very brief and uses daily vocabulary. The grey whale skull is a hands-on exhibit in the Western and Arctic Coast Gallery. Although the label has the scientific name, distribution, habitat, and food, the food was described as "shrimp-like animals." Because this particular exhibit might be attractive for children, this way of explaining the food is essential for them to understand the labels.

Dicky told me that organizing the information for the visitors is important as well as presenting information about the objects. If visitors organize the information by themselves, it might be different from what the scientists found out or the presentation of objects. It is important to present the objects in the way the scientists organized with educators' work to present them.

### **3. Exhibit and Design**

#### **a) Configuration of the Museum: Wayfinding and orientation signs**

The main exhibit area is divided into the five geographic regions of Alaska; Southwest, Western Arctic Coast, Interior, Southcentral, and Southeast. Each exhibition highlights the distinct natural and cultural history of these regions. Both natural and cultural objects are displayed in a way to present the regions, but not as topics of studies, such as geology or ecology of the areas. The exhibit area is organized into specific cultures, and specific cultural groups, in specific regional areas. This configuration of exhibitions makes sense to shows the relationship between the natural environment and people's lives, specifically the culture in these regional areas.

There is a brown bear exhibit at the entrance of the gallery. The bear is 2.67 meters tall, which is impressive, inviting visitors to enter the museum. There is also a gallery guide, which shows the configuration of the divided exhibitions with a regional map of Alaska. Without information about the galleries, visitors might not feel as if there are in a non-threatening environment. Providing the information about the configuration of the museum helps visitors know what they are going to see in exhibitions, which they can observe in self-paced way.

On the wall, facing to the museum's store, there is a History of Alaska exhibit with object collections and photographs with labels. Some of the group title labels are "The First Immigrants," "European Exploration 1741-1840," and "Territorial Days 1912-1959." Human history is general information to the visitors as part of their personal background although other science topics might be attractive to the visitors who have their own specific interests. Providing the human history aspect of Alaska at the beginning can help relate to most visitors' previous knowledge.

Most of the galleries have a regional profile panel, such as Physical Geography, Climates, Animals, and People and Economy with regional maps. Although the exhibits themselves in each gallery can be as distinctive as different regions in Alaska, it is important to give the overview information about specific regions. This profile can help visitors have some background about the regions in the exhibition.

The museum has audio guides in English as well as Japanese for Japanese tourists. Audio guides can be a powerful tool for interaction between the exhibit and visitors. One of the reasons is that visitors use a different sense: listening. However, more importantly, audio guides can enhance the information in the exhibits. In each exhibit, the voices are different; therefore visitors can distinguish each exhibit in the gallery. At the beginning of the audio in each exhibit, people are told who is talking, such as a curator, scientist, or Native person in the region, so visitors can know what perspective of story they are going to hear. Because there are many different topics or elements, visitors might be confused about what the exhibit is about by moving around in the exhibition.

**b) Various Elements (exhibits) of Exhibition, Western and Arctic Coast Gallery, from the Perspectives of Conceptual Design and Physical Design**

I focus on the Western and Arctic Coast Gallery as a good example of an effective learning environment for the Hyogo Museum. In this particular exhibition, the regional profile panel (title labels and introductory or orientation label) has the subjects “Group Identity and Interrelationship,” “Location and Divisions,” “Village Life,” and “Social and Political Organization.” This exhibition focuses on the cultural aspects of this region, human life, and the natural environment. There are many exhibits, which have different topics, in this exhibition. They are not, however, just laid out as the elements of the region; instead they show relationships to one another. I will explain how some of the exhibits in this exhibition show relationships one to another. I will also point out how these exhibits provide an effective learning environment.

There is an exhibit with marine mammals, such as polar bear and seals, displayed on the ice pack. Captions provide information about each species and their habitats with maps, the arctic environment and their adaptation, and relationship among them; seals as food resources of polar bears. The captions also provide information about global warming, which affects the habitat of polar bears. However, the manner of describing the global warming is not just emotional, such as messages of protecting the polar bear. The captions and photographs provide information about how the scientists are studying global warming.



Information on captions are not limited to the objects (marine mammals), but also include extended topics, such as their habitats and global warming. It is a good exhibit, because visitors can learn about a broader and more abstract idea (global warming) through their experience to observe these objects (marine mammals). The topic is an environmental issue, which scientists analyze, and it is challenging people to recognize it as a problem related to/ caused by their life style. Through connecting the issues to the objects that visitors observe, visitors' experience can be personalized.

There are also hands-on objects in the exhibit. Visitors cannot only touch the furs and skulls of these animals, but also artifacts, which use the fur as a material. Each hands-on object has labels, which has an identification label on one side and detailed information about the species or the artifacts on the other side. Ms. Wanda Chin, coordinator of the Exhibit and Design department, explained me there is a premise that visitors learn in different ways such as touching, hearing, and observing. As effective learning uses different senses, this exhibit provides opportunities for visitors to learn through multiple senses. Visitors also have opportunities to compare different shapes of skulls, as well as comparing the stuffed animals.

In my interview with Ms. Wanda Chin, she told me that she tries to integrate a lot of design: design by nature, such as physical skeleton as biology and design by decoration of artifacts. She told me there was a realization of appreciation in design. For example, there are various displays of mammals, and visitors can compare different species through observing features of the animals. Visitors can also compare different design of artifacts, such as clothes, which are often made out of skins of different animals. As visitors observe different species of animals, visitors also observe the different designs of clothes. Visitors can realize the different designs of clothes come from different animals. There are visitors who enjoy the designs as arts, and there are visitors who enjoy the designs of different animals. We often think these designs, by nature and by humans are different, but integrating a lot of design in an exhibition can make connections between these two different kinds of designs.

The glass-case display of baskets, which are artifacts, can also make this realization for visitors, because the materials of the baskets are plants. Visitors can

observe the baskets as the artifacts objects, which they would use in their daily lives. The objects, which visitors use in their daily lives, can make a “hook” to attract visitors’ observations. However, visitors can also relate to the materials, where they might have background about the plant species. The captions provide as information plants’ species, which visitors can find in this region. The baskets have “hooks” to visitors’ daily lives, and the identification in labels and captions provide the information effectively to make the connections between the baskets and plants. This can help to the curious to observe plants outside of the museum. In the other words the exhibition can provide visitors have different views toward the plants.

There is a glass-case display of objects, such as parkas, boots, and snow goggles. Visitors can connect these to their personal lives, because visitors still wear them although the materials and shapes are different. All materials, which were used to make the objects in the glass case, are what Eskimos found in the region. The objects can inspire visitors’ curiosity to observe what the materials are.

The case of masks shows different impressions of faces, shapes, and materials to make the masks. Wanda told me how this display changed over time. The old display of the masks was more beautiful or fancy as artifacts although there were more wide varieties of mask making. Current displays provide more varieties of masks, and people do not stereotype the masks. In this process, traditional Native American short stories were added in captions. These stories provide in depth perspectives on masks as cultural artifacts. Depending on how the objects are displayed with captions, objects can enhance the messages of exhibits.

Traditional views of gender roles are explained in an exhibit through displaying knives, which men and women used. Although gender issues are sometimes seen as controversial, displaying different knives for different purposes also shows the traditional gender roles. An audio guide for this exhibit enhances visitors’ experiences by providing conversations while people were working. The story was developed to extend the focus on gender roles, but not by just showing the objects. As the exhibit provides the topic of gender roles, the way visitors relate to their previous experience or personal lives can be extended.

There is an exhibit about "Dinosaurs of Alaska," which is many children's favorite topic. Although the exhibit is not big and it does not show the total size of the dinosaur skeletons, the topic of the dinosaurs can attract children as the first "hook." The content of the exhibit focuses on scientific findings, which might be difficult for young visitors, but this first "hook" can motivate them to learn more. In this gallery, which displays other mammals' skeletons, visitors can also compare the skeletons of different species. In other words, the visitors might not be learning only about the dinosaurs, but expand the opportunities to see the dinosaurs as one of many animal species. The exhibit can stimulate the curiosity to learn more about dinosaurs, but this experience can be an experience for visitors to discover evolution, which is a broader idea to understand about the species.

There is an exhibit, which explains the studies of the Frozen Tissue Collection department, which explains the importance of a systematic collection. The topic is scientific, and visitors might need a biology background to understand the exhibit. One of the captions explains the necessity of the study for wildlife management, which is an important issue as an environmental problem. Although it might be necessary to have more support for visitors to understand the topic, it is important for the museum to show science and research, how hypothesis can help to discover new things, and what is going on in the academic field. Because the museum should serve a wide variety of visitors, it is a necessary exhibit in the museum. Different levels of the topic are necessary for visitors who might have advanced interests in science. As the study of biology uses different vocabulary, the attractiveness of the exhibit is clear for that certain interest group.

Another big exhibit displays a kayak, an umiak, and hunting. If visitors have ever seen a kayak in the ocean, they immediately can relate their personal experience to this kayak, which is displayed in the exhibit although the materials are animal skins. Captions explain the different styles of kayak in different regions depending on local construction techniques, behavior of the animals hunted, and sea conditions. This provides information about the diversity of kayaks, but also expands on the diversity of the natural environment in different regions. Video programs, such as Whale Hunting, Cutting Whales, and Whale-Hunting story, which were recorded in 1975, are also provided in the

exhibit. In the video programs, people hunt whales with the umiak, a large, open boat designed to carry several people, which is displayed in the exhibit. The visitor's experience is not just observing the object but also observing how the umiak is used. This experience can help visitors understand the exhibit more in depth with sounds and observing the movement in the video.

There are captions about whale hunting in the gallery: "Arctic Whaling Culture" and "Commercial Whaling." Although these captions do not exist in the exhibit of the kayak and umiak, these captions provide in-depth information about whale hunting, which is an important part of the culture in the region. These labels include modern whale hunting, which is sometime seen as a controversial issue from the conservation perspective. By providing information describing whaling by Native people, however, this issue seems balanced as different perspectives. Providing different perspectives about an issue can help people to understand the issue and develop their own opinions for the issue.

From the conceptual design perspective, the Western and Arctic Coast Gallery has many different topics and elements of the region. These different topics and elements can make "hooks" for a diverse audience through relating their personal lives or previous experience in different ways. As the individual visitor has different interests and experience, it is important to provide various "hooks." Each exhibit also provides broader views of the topics relating the objects in the exhibit. There are also various hands-on objects, which allow visitors to use different senses. The audio guide and video programs also use the sense of hearing. Through providing various conceptual design and physical design to make an effective learning environment, the exhibition can stimulate the motivation and curiosity of visitors in different ways. For visitors who try to understand all exhibits in the exhibition, they might feel as if it is jumping around or presenting many disconnected topics. However, providing many topics are different approaches for different visitors who have different interests and emphases of the topics. If visitors can get the idea about the exhibition, visitors can control their own learning.

#### **4. Bison exhibit (Blue Babe—A Case Study) as an Example for Designing Scientific Findings into an Exhibit**

Bison exhibit (Blue Babe—A Case Study) in the Interior Gallery is an exhibit, where I particularly focused on the way to present scientific findings to the public. The exhibit is about a 36,000-year-old mummified Alaska steppe bison, which was recovered from permafrost. The visitors can walk around the glass case to observe the object. Exhibit labels and captions, which explains what scientists know about this bison and how they found out, are on the wall around the exhibit. Labels and captions include the maps and drawings and other objects to explain the facts. In this exhibit, the mummified bison was nicknamed as Blue Babe, which may make it feel more familiar, to make personal connection with the object more than just describing it as one of the objects, which scientists study.

Most group titles labels, such as “Chronological Age” and “Biological age,” have subtitles. “Chronological Age—When did Blue Babe Die?”, “Biological age—How Old was Blue Babe at the Time of Death?”, “Climatic Factors—What was the Climate like when Blue Babe was Alive?”, “Predation—Who Killed Blue Babe? ”, and “Preservation.” For example, “Chronological Age” explains how scientists know it was 36,000 years old with the scientific technique of Carbon 14 Process dating with the figures. “Predation—Who Killed Blue Babe? ” explains why it appears that an American Lion attacked and killed this bison through showing the figure of fangs. The label suggests checking how it matches the remaining evidence, chewing marks and tooting punctures on the bison’s rump and back by themselves. When explaining the American lion, it also provides information of the climate at the time when the bison died. As visitors see the object in the case, the blue color of the bison is noticeable and makes visitors wonder why it is. The color of the object is instantly the “hook” to motivate the visitors to know the reason. “Preservation” explains “blue mineral vivianite formed on the skin when the body reacted with the minerals in the silt during its long burial.”

Although some of the science might be difficult for visitors to understand, the style and objects provide an effective learning environment. The “hooks” are provided by the object, which visitors are interacting with as part of their experience. The organization of

the exhibit, such as the way of questioning and laying out the information, can provide an interesting science story, which attracts young visitors. The question style also motivates visitors to find out the answer by themselves. The labels and captions also let visitors to observe the bison in the case, pointing out where they can find the evidence. Wanda described the way as the detective style, which also provides the parts of scientific study. Careful observation is visitors' exploration, and it is not just receiving the information, but doing something by themselves. Visitors can control their learning as they do activities by themselves.

## **5. Discussion of Application to the Hyogo Museum**

### **a) Visitor-Centered Exhibit**

One of the challenges at the Museum of Nature and Human Activities, Hyogo (Hyogo Museum) is how scientists (researchers) can develop a visitor-centered exhibit. Although the lack of educators and exhibit designers in the museum are big issues, Wanda Chin, coordinator of Exhibition and design at Museum of the North, provided one perspective of the relationship between science and humans. In western culture, science is sometimes seen as separate from humans. Science, however, is the way to understand nature, which is fundamental to human life. Although the sciences as academic fields have special vocabulary, objects of science and culture are integrated together in this museum. Through integrating two areas together, the objects in exhibits can relate science and daily life to each other. It is one of the ways the visitor-centered exhibits can be developed.

Wanda told me her own experience that she had difficulties intellectually in understanding scientific concepts as academic fields because these concepts were separated from her real life. Her personal question, which tries to get two areas, to study and understand together with the real world influenced exhibit design at the Museum of the North. Her weakness of understanding scientific concepts helped to develop educational concepts and philosophy because she can realize challenges for visitors from different perspectives. As an exhibit designer, Wanda developed the visitor-centered exhibits way with working together with scientists. However, without exhibit designers,

scientists at Museum of Nature and Human Activities, Hyogo need to work hard to understand the visitors' perspective about science.

### **b) Exhibits Improvement**

The exhibits in the Museum of the North are improving through changing the objects on display and the contents and styles of labels over time. Changing the exhibition is necessary to enhance the appearance in the correct cultural context as well as for the purpose of preserving the collection. With limited space, new ones replace old exhibits. In this process, museum staff need to examine which exhibits can adjust with new ones in a timely fashion as visitors expect. Content of the exhibits as well as the style of the exhibits can make "hooks" with visitors. For example, people started learning about global warming issues. The museum can take advantage of this and provide scientific information. Because visitors already have some background about the issue in their daily lives, such as in the media, the exhibit does not need to provide all the information. As the tendency of over time, the nature of the elaborate exhibit changed from an informative to an inspirational exhibition over time.

However, after 20 years in its original gallery, major innovations are needed. Therefore, the museum is building new exhibit spaces. The new gallery will specifically regard the art and design aspect in a cross-cultural (regional) manner. The experiences through small changes of each exhibit over the years can help design a whole new museum space. Even the limitations of economic factors and human resource sometimes provide successful exhibits. It is important to accumulate the experience to improve the exhibits so that when big innovations are necessary, experience can provide clear ideas in the process of developing exhibits.

There are difficulties to experiment with small changes in exhibits at Hyogo Museum due to the financial and human resource limitation. However, it is very important for a museum to be timely about the topics of exhibition in the society as well as community. As the museum exhibits get old without timely improvement, the exhibits as well as the museum itself might be given the cold shoulder by the public. As a result,

the role of museums in communities may be in doubt. Exhibits play the main role of education in the museum, and improving exhibits is the top priority of the museum work.

### **c) Effective learning environment in the community as a specialty of the museum**

Evaluation is also a helpful tool to develop effective learning environment. Wanda mentioned the importance of understanding the interaction between the exhibits and visitors. She also told me her realization through her experience of workshop about the evaluation at the Museum of the North. People who live in the community take visitors to the museum. The people who live in the community have their own picks of their favorite topics based on their own experiences in the community. A museum can represent the topics that individuals in the community want to share with their families or friends. They can bring their personal stories with their experience to the museum. It is necessary to consider exhibits as a part of the community.

Labels and captions are an important factor in connecting visitors and exhibits. Wanda who is experienced exhibit designer at the Museum of the North told me her opinions about labels, which is important for the Hyogo Museum. She tries to put minimal information on the labels, although some captions have long stories. Full narrative stories compete with the object and space. Therefore, if people want to read the full stories, they can purchase the book, because the museum is the place for objects, and does not focus on the information.

The current labels and captions at Hyogo Museum are in textbook style: full narrative stories with a lot of information and difficult vocabulary. This style attracts only visitors who have special interests. If visitors want specific information, they can get them in libraries or special seminars by the scientists. The exhibits, however, are the learning environments for various visitors, and exhibits should be presented for a diverse audience that might not have special interests. Providing a “hook” with visitors’ daily lives with everyday words can help attract diverse visitors. Currently, most objects in the exhibits are replicas or georama, and they do not present the specialty of museum, the collections of real objects, as one of their functions. The Hyogo Museum can more focus on the specialty of the museum through exhibiting the real objects.



## II. Monterey Bay Aquarium

In 1977, four marine biologists at Stanford University's Hopkins Marine Station in Pacific Grove proposed an aquarium devoted to Monterey Bay. As well as the marine scientists, local residents soon formed the non-profit organization, Monterey Bay Aquarium Foundation, to pursue the project. The aquarium stands at the historic site of a cannery. The people in the community engaged with projects from the beginning. One of the reasons might be because Monterey Bay itself is an important part of the community as its physical environment.

Since opening the aquarium to public in 1984, the exhibit has been a unique showcase of regional marine communities. Instead of focusing on specific species in different regions, the aquarium developed the approach that focused on the immediate environment, Monterey Bay. The hope of founders was to expose people to the diversity of life in the Bay. Therefore, the message of the aquarium would be about Monterey Bay, its habitats, communities, and marine life. This unique approach of exhibition was supported and developed by the aquarium's mission: "The aquarium has always been mission-driven, message-driven and visitors-driven" (Ramberg, Rand, and Tomulon, 2003).

"By the mid 1990s, it was clear to scientists everywhere that the world's oceans were in greater jeopardy than we would know" (Ramberg et al, 2003). As the world changed, in 1997, the mission statement was changed from "The mission of the Monterey Bay Aquarium is to stimulate interest, increase knowledge and promote stewardship of the world's ocean environment through innovative exhibits, public education and scientific research" to "the mission of the Monterey Bay Aquarium is to inspire conservation of the oceans." Both mission statements relate to the goal of environmental education. Although the goal of conserving the oceans is broad, the statement specifies the role of this institution, aiming at what this aquarium does. The aquarium is conscious about their existence in the society.

As the aquarium tries to develop visitor-driven exhibitions, so it is important that the aquarium know about its visitors. The aquarium conducts evaluations of exhibitions

that provide information on who visitors are, and how the exhibitions provide a learning experience. Summative evaluations can especially improve the future development of other exhibitions through providing feedback.

For the purpose of knowing how the mission and message are reflected in the exhibition, I will explain the process of developing exhibitions at the aquarium with its evolving philosophy. I also would like to point out how the mission and messages are communicated with visitors in exhibitions. I will emphasize how the exhibitions provide “visitor-centered” effective learning environments.

## **1. Process of Developing Exhibitions with its Evolving Philosophy**

Philosophical discussions are often separated from actual applications in developing exhibitions. An article, *Mission, Message, and Visitors: How Exhibit Philosophy Has Evolved at the Monterey Bay Aquarium* by Jenny Ramberg, Judy Rand, and Jaci Tomulonis (2003), who have experience working at the aquarium, explained the changes of exhibit philosophy over time. The exhibit philosophy reflected the concept about conservation and the role of the aquarium in the society.

### **a) What Exhibits Can Do and Different Ways to Send Messages**

The visitors’ “take away message” is “conservation of ocean,” which is a big idea. The aquarium has been working to focus and to define what “conservation” means. The mission contains and can become many different messages. In the process of developing exhibitions, discussion about what exhibitions can do to save the ocean is necessary. The three kinds of things exhibitions can do are inspire, engage, and empower (Ramberg and Tomulonis, 2005). The exhibit designers develop exhibitions based on the questions:

“What is the way to inspire visitors?”

“What kind of experience visitors to find out about animals?”

“What kinds of exhibits to empower visitors to take action?”

Inspiring, engaging, and empowering are different ways to send environmental messages and to deliver the mission of the aquarium to inspire conservation of the

oceans. In my interview with the exhibit developers, Tomulonis and Ramberg told me that there is recognition over the last decade that “being negative is not necessarily working in terms of helping people feel that they should be taking care of environmental problems.” It is necessary that people feel a connection with nature in positive ways. Because there is no one particular way to connect people and nature, the aquarium provides different ways to send messages to different people.

Tomulonis and Ramberg told me about development of stewardship with nature using the reference, *Beyond Ecophobia* (Sobel, 1996) and Chawla Louise’s research. According to *Beyond Ecophobia*, before children learn that environment is being destroyed, they need to feel a connection with nature in a positive way. According to Chawla (1998, 1999), environmentalists, people who actively participate in environmental issues as adults, tend to have spent time in nature in their childhood and they share nature with others as adults. Providing positive experiences with nature and helping children to spend time in nature is necessary for conservation of the oceans. The exhibition *Splash Zone: Rock and Reef Homes*, was developed for children and their families to provide opportunities “to explore the ocean world in the hope that those experiences will inspire a caring relationship with the ocean.” (Ramberg et.al., 2003, p. 316) On the other hands, the exhibition *Jellies: Living Art* provides opportunities to enjoy the arts. There are different ways to inspire visitors.

The aquarium tries shifting from “you are the problem” to “you are the solution” to provide positive experiences for visitors. It is necessary that people feel connections with nature, so that they realize they are a part of nature and responsible for it. To make people realize that they are a part of nature, as one of their approaches, humans in the picture and video are displayed in the exhibition to help people to show people in nature.

## **b) Evaluation**

The aquarium conducts evaluations, which can provide feedback on how visitors learned from the exhibition. The evaluations help improve the particular exhibition but give clear ideas for future exhibitions as well as experiments to seek ways that exhibitions can promote ocean conservation. For example, *Jellies: Living Art*, which was

developed in 2002, reflected the front-end evaluation that showed 35% of people want to see jellyfish with no information. However, information from scientific literature was included in conservation messages. However, in the summative evaluation of this exhibition showed that conservation messages lasted as their learning after visitation. It proved there is not one way to deliver conservation messages (Tomulonis, 2005).

Evaluations also helped people to understand better exhibit planning, which can help to shape the philosophy. As four Ph. D. scientists first conceived aquarium, it was not an easy process to make the exhibitions visitor-centered. A staff, designer and writer, worked to convince the scientists that they were not should not be writing scientific papers, but it took many years for approve group members grow to understand that they are writing for visitors, not for themselves. To help them to understand, evaluations have occurred. It is important for the staff to understand its visitors— how much people can actually observe when they are walking through, and why they are going to the exhibit in the first place, etc.—staff realize that is not necessary to be educated (although it is part of it) because people come to the aquarium with social groups and for social reasons. For example, *Planet of the Jellies*, which opened in 1993, was a beautiful exhibition, and staff did what they thought they should do: provide a lot of information. However, the evaluation showed that people did not read the information.

### **c) Process of the Developing Exhibitions**

The staff involved with the development of new exhibition are different every time, the figure shows the different roles of the each staff members. The core team is responsible for the project from beginning to all the way through at the end, and ensuring the exhibition is successful when it opens. The core team has the responsibility to make sure that the project is gets done on time and within budget. The staff of the extended team represents every other department of the aquarium. Some departments work closely with the core team. Exhibit developers work with scientists, who are in the sister research institution. For example, Tomulonis, exhibit designer/writer in core team, worked with 12-15 scientists for the development of *Jellies: Living Art*. It explains why the core team is the center of the exhibit development process.

Although scientists' views and findings are reflected in the exhibition, exhibit developers are specialized educators who design informal-learning centers by developing content, story line, and interactives. Husbandry is another member of the core team, and they know about animals and exhibitions. The production manager and sometimes the project manager work with details of delivering the project, such as schedule and budget. Many staff are involved with the process of the exhibit development.

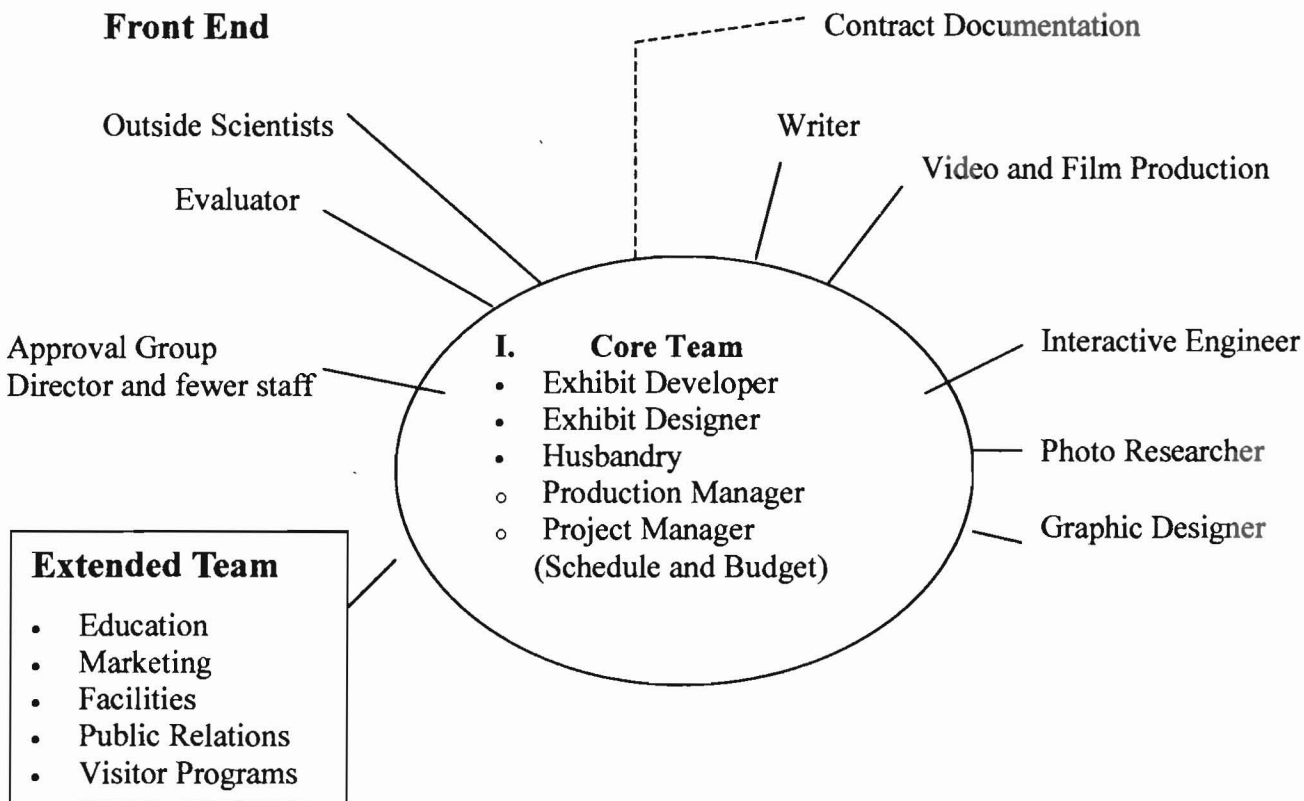


Figure 3. Roles of Each Staff Members for Exhibit Design Process

The exhibitions were practically developed based on the mission and message in a visitor-centered way. According to the article *Mission, Message, and Visitors*, “[E]ach time exhibit developers start a project, we ask: ‘Why do we want to do this exhibition?’ (mission), ‘What do we want to communicate?’ (message), ‘Who are we doing this for?’

(visitors) before tackling the fourth question, ‘How are we going to do it?’ (strategy). Backward design can provide an effective learning experience (Wiggins & McTighe, 2001). Design processes “start with the end—the desired results (goals or standard)—and then derives the curriculum from the evidence of learning (performance) called for by the standard and the teaching needed to equip students to perform.” The exhibition is not curriculum, but a free choice learning center. However, starting with identifying desired results, and determining acceptable evidence, then planning the learning experience and instruction is parallel to the development process in the aquarium.

## **2. Different Ways of Communication of Mission and Messages in Exhibitions**

The mission of the aquarium is “to inspire conservation of the oceans.” All exhibitions in the aquarium support this mission. However, each exhibition has a different atmosphere with particular messages and topics. Ways to inspire, engage, and empower are different in different exhibitions. The combination of different exhibitions with different ways of presenting throughout the aquarium gives the information to different people as well as different exhibits within an exhibition. I focus on three exhibitions: *Jellies: Living Art*, *Sharks: Myth and Mystery*, and *Vanishing Wildlife: Saving Tunas, Turtles, and Sharks* to see various ways to send messages.

*Jellies: Living Art* is an exhibition that inspires visitors with the amazing ways people express their passion for the ocean. The exhibition “provides an affective experience: a mood of wonder and exhilaration” (Ramberg et.al., 2003, p.317). Jellyfish species are displayed, and these creatures directly show their beauties as well as their behavior. Panels provide scientific information, such as their life cycles, feeding strategies, their stings, and the role in the ocean all with non-scientific vocabulary that are familiar to visitors. Arts, such as glasswork by Dale Chihuly, are also displayed in the exhibition. The arts are inspired by the jellyfish and beauty of ocean life. For example, Ernst Haeckel’s lithographs show the beautiful symmetrical designs of jellyfish. These artwork inspire appreciation for the natural world.

The design of the exhibition does not differentiate arts or nature’s shape as beauty, which visitors appreciate. Various types of objects, such as live jellyfish and arts,

are displayed in various ways. For example, the life cycle of jellyfish is displayed as a moving picture-story device inside of a glass-case with velvet curtains. Scientific illustrations were also displayed on the glass case as a combination of science and art.

*Sharks: Myth and Mystery* is an exhibition, which provides different cultural views about sharks. The exhibit design was divided into six regional areas (Pacific Islands, Amazon, Pacific Northwest, Australia, Africa, and Central America), and into an exhibit about Western Myths. Although there are live sharks in the exhibition, the exhibition was designed to present different cultures through interaction with sharks. Visitors can experience the stories, music, dances and art of different cultures. The pictures in the exhibition contain the people in the regions: therefore, visitors might realize that the relation between sharks and human. Exhibit of Western Myths shows the movie “Jaws” to “hook” visitors’ attentions.

Through explaining how people in different regions have been interacting with sharks, the exhibition also sends information on environmental issues. For example, the panels on protecting habitats for sharks in Hawaii and on protesting oil drilling in the Pacific Northwest provide visitors with information about the necessity for conservation of sharks. The Western Myths exhibit provides different perspectives about sharks in western culture. The exhibition inspires connections between humans and sharks.

*Vanishing Wildlife: Saving Tunas, Turtles, and Sharks* is a conservation exhibition, which delivers a “conservation action message” for visitors to adopt the action in their daily lives. A display features live giant tunas, sea turtles, sharks, and other open-ocean fishes. Interactive panels and videos graphically portray how our growing demand for seafood, combined with destructive fishing practices, and threaten these animals’ survival in the wild: “These experiences were designed to surprise, raise concern, and even incite anger” (Ramberg et.al., 2003, p. 314) However, the exhibition also provides positive movement, such as new fishing strategies.

Although feeling anger is not an enjoyable experience, front-end and formative evaluation shows that visitors “felt the images were appropriate and necessary for conveying the problems. The images inspired them to want to do something about the problem” (Ramberg et.al., 2003, p. 314). Toward the end, the exhibition provides

messages on direct conservation actions, showing how they can take action in their everyday lives. The information includes how visitors can make better choices about what they consume and about conservation organizations that visitors can join and support. There are also handouts, which provide information for visitors to take home.

Although each exhibition has specific messages and uses different strategies to send the messages, all messages are related to the mission of the aquarium, “to inspire conservation of the oceans.” As well as relating the mission of the aquarium to the environmental education goals, this configuration of the exhibition supports the “Ascending Staircase of Environmental Education outcome” (Chapter 1). Responsible Environmental Behavior (REB) is developed by the individuals’ learning of awareness, knowledge, skills, attitude, and understanding through their experiences. Although in my interview, Tomulonis and Ramberg told me that the exhibitions are doing a good job of inspiring and engaging, but the exhibition itself might not be a best way to empower.

The location of the aquarium on the shore of Monterey Bay, the design of the architecture, and openness to the ocean, all immediately give visitors a sense of where they are. With providing visitors a fundamental sense of where they are, the configuration of the exhibition can provide effective learning for environmental education. Of course, visitors come to the aquarium with different expectations and can choose which exhibitions they want to see by themselves as an informal learning center. Providing choices for visitors, however, can uplift visitors’ REB. The relation or connection to the mission of the aquarium can enhance visitor experiences.

#### **a) “Visitor-Centered” Effective Learning Environment**

One dimension of effective learning is that it relates to and builds on learners’ previous experiences or personal lives. Through conducting evaluations, the aquarium has clear ideas about “what visitors know” from previous experiences or personal lives. Therefore, many “hooks” are provided in many different ways in the exhibitions. The messages in exhibitions that I described above related to people’s lives in different ways. *Vanishing Wildlife: Saving Tunas, Turtles, and Sharks* displays seafood on the table, which people have seen in their daily lives. At the *Sharks: Myth and Mystery* exhibition,



myth and mystery, which are developed by humans, are displayed. For example, in the Western Myth exhibit, shark stories in media and drawing are displayed. As well as the messages of the exhibitions, the labels also provide words that visitors use in their daily lives.

Providing learning with doing (Exploration)—doing something by themselves is also important for effective learning. The *Sharks: Myth and Mystery* exhibition encourages visitors to dance and to listen the stories and music. There are also rooms for families to do activities related to sharks. As well as observing real sharks in the tanks, there are varieties of things to observe in the exhibition. Observing the live animals is not just receiving information, but visitors explore their behavior first hand. *Vanishing Wildlife* provides some flip boards, which have questions on the boards. Visitors flip the top to find the answers to the questions. The *Jellies: Living Art* exhibition provides opportunities for visitors to explore how the artifacts are inspired by ocean. It might be a different way to enjoy art.

Live animals themselves have power to attract visitors and to stimulate the motivation and curiosity to observe them. Live animals can be “hooks” that visitors start observing, but the design of the exhibitions provides different perspectives about the animals. Providing brief information about species or related issues with animals can help visitors connect their experiences and gain knowledge. Through observing the animals, visitors might feel affection for the species. However, without the information on conservation of the species as well as ocean itself, visitors’ actions might be biased as animal rights, but not on broader issues of environmental problems. Motivating visitors to gain knowledge can help move up the ascending staircase of environmental education outcomes. Flip boards can gain extrinsic motivation to find answers to questions.

The titles of each exhibition at the entrance provide a clear idea of what the exhibition is about. Visitors can choose which exhibition they want to observe. As well as the titles, the atmosphere of each exhibition is distinctive, and it is clear what they do within the exhibitions. Visitors can control their experiences in aquarium by themselves. Different choices for different visitors are provided. For example, visitors can observe live animals, read the information panels, do activities, such as dancing or drawing, and

enjoy the arts. Exhibitions allow visitors to do what they are interested in a self-paced way.

### **3. Application for Hyogo Museum**

#### **a) Mission, Message, and Visitors**

The aquarium has clear ideas about its mission, message, and visitors. Exhibitions are approached and designed as products of these clear ideas. As well as having a clear mission and messages for visitors, exhibits reflect both the mission and the messages. are reflected in exhibition. Understanding mission, message, visitors, and how they are reflected in exhibition is helpful for the Hyogo Museum to improve its exhibitions.

The Hyogo Museum does not have an official mission statement, although it seems that there is a consensus among the staff. The consensus is that “the purpose of this museum is to help Prefecture Hyogo residents and other people appreciate the beauty and dignity of the natural environment around us.” Other discussions, however, focusing on becoming a “Consortism Museum,” and it seems that “sustainable society” might be new mission. In either case, it is necessary to have official mission so that the museum can develop exhibitions based on the mission.

In the process of developing its mission, staff must work to understand the people in the Prefecture and a broader view about society. Although it is important to have discussions that relate to the structural management as a Prefectural museum and as a part of the university, reflecting and understanding the people is also important. Conducting evaluation is essential, as is increasing the time that staff spend at the exhibition. Educational programs can help the staff to sense the visitors, but it is necessary that staff spend time to observe the interaction between visitors and exhibitions.

As the museum develops its mission, it is necessary that the museum focus and define the mission. Especially if the idea of mission is broad, it is necessary to focus and define what the museum can do. It is also necessary to let people know how they can make a difference for the big ideas with specific message in the exhibition. Without the mission statement, it will be difficult to develop the messages in the exhibitions. To provide effective learning, it is necessary to have “goals” for exhibitions in order to

develop them. It seems there is a tendency for exhibitions to be developed depending on what is in the collection, not starting from the message “goal for visitors’ learning.”

Although it is difficult to develop the exhibitions aiming at a broad idea, it is necessary that the museum provide a positive, hopeful way that people can make a difference. The view of only the science or technology might discourage people from participating their own action. Exhibitions that do not reflect the public are not enjoyable for a broad range of visitors and it discourages them. Providing only facts on what to do inhibit the processes of how people move up to REB.

Tomulonis and Ramberg told me that it took a long time before scientists and the administration understood that they develop exhibitions for people, not for themselves. Developers convinced them with evaluation. Although it might take a long time without museum developers and evaluation practice, it is important that museums move understand that the museum must go to public as well as visitors come to museum.

#### **b) The Exhibit Development Process and the Role of the Staff**

As the museum does not have exhibit developers within the institution, it is difficult to develop exhibitions as the Monterey Bay Aquarium does. Rather than depend on outside developers, it might be necessary that at least some museum staff focus on the process while they develop the exhibition. It seems almost impossible that staff could also work as a researcher or administrator when they engage the development process. It might also be necessary that the educators and floor staff engage the process, because they have experience of communicating with people.

At the same time, the educators need to understand that the exhibit is not a formal learning center but an informal learning center. On the other hand, although floor staff communicate at exhibitions, they are not educators who are professionals of pedagogy. It is necessary they engage the process as all professionals work together. Evaluation can help know what visitors learn at exhibits as well as understand visitors’ expectations, which can be used to improve the exhibition.

I emphasized how the exhibition provides a “visitor-centered” effective learning environment at the aquarium. However, as I understand the importance of clear mission

and relating messages to it, focusing on physical design of the exhibition is not as useful as understanding the process. Japanese museums have a tendency to focus on schematic exhibit designs and devices, such as interactives and audio- visuals. These features, however, are costly to develop and hard to improve through small changes in exhibitions. It might be detrimental to focus on physical designs of exhibits without understanding the concepts.

### **III. California Academy of Science**

#### **1. Overview of The California Academy of Science**

The California Academy of Science was founded in 1853 to survey and study the vast resources of California and beyond, as the first scientific institution in the West. The institution opened the museum in 1874. In its long history, the museum changed locations several times; it moved to Golden Gate Park in 1916. However, the museum is temporarily located in downtown San Francisco for the alteration of the museum at the site. Natural History Exhibits, Steinhard Aquarium, and Morrison Planetarium are open to the public as well as educational programs at the institution. In this section, I will focus on the Natural History Exhibits.

The mission of the institution is “[T]o explore and explain the natural world.” Although it is a short statement, it clearly shows the roles of the institution. The California Academy of Science has all the functions of a museum; collection, study, and education. There is a statement that says, “The California Academy of Sciences is devoted to the study, display, and interpretation of scientific collections, which inspire people of all ages to explore the rich variety of life on Earth” (California Academy of Science, May. 2005).

The collections, “provide essential tools for comparative studies in biodiversity, and are ranked among the world's largest.” There are eight scientific research departments in the fields of anthropology, aquatic biology, botany, entomology, herpetology, ichthyology, invertebrate zoology & geology, and ornithology & mammalogy. The scientists “discover, collect and study invaluable specimens of animals, plants, minerals and anthropological artifacts from around the world” (California Academy of Science, May. 2005). As a scientific institution, although it seems very like an academically oriented museum, it does not limit the uses of the collections to scientists. The exhibits in the museum do not separate the educational role from their scientific roles. As an institution, these different functions are all connected and presented in the exhibit. It was stated: “Educational exhibits and events bring the message of Academy research to the

public with the goal of inspiring concern over our natural environment. Special exhibits and public programs provide unique opportunities to discover information ranging from the evolution of life on Earth to endangered species, human cultures and planetary exploration.” The actual exhibits in the museum show successful examples as the statements explain their aims.

## **2. Exhibit Design**

### **a) The Role of Scientists in the Process of Exhibition Development**

The exhibit design department develops the educational roles of the exhibit, which provide engaging experience that support the Academy’s mission. Although it is sometimes difficult to support the main message in each exhibit, the topics come from academic research: exhibits are designed around the research interests. After the museum will be in the new building, it tries to stretch the research aspect more into exhibit design.

Although the exhibits seem to succeed in presenting academic research, there were previously difficulties in the process of integrating research aspects into exhibit design (Centin and Hubbell, Jan. 2005). Understanding how they had difficulties, and how they started changing can be helpful for the Hyogo Museum’s challenge.

Direct involvement of scientists in the development process started several years ago in exhibit “Expedition to Madagascar.” The museum started planning the exhibit as a computer kiosk before scientists went on the expedition, and three photographers were sent with the scientists. Scientists were engaged in the process of developing the content of the exhibit. The scientists were excited to engage the process of developing the exhibits because it tied with their work. When they are involved with exhibit design, scientists are more excited about getting their research to the public.

Previously, scientist felt exhibit design took time away of from their research. They were less eager to participate in planning exhibit when they did not feel they got any credit for it. They published articles in scientific journals but did not communicate with the public. It also required the Administration to value the time researchers spent working on exhibit. Newer, younger curators who are interested in communicating with the public also influenced this change in direction.

## **b) Exhibition Development Process**

I will now summarize how a full team functionally works together to develop an exhibition in this museum. I described the process of exhibit development from the literature in chapter two of this paper. How the practical process is applied in an exhibit, however, is important for Hyogo Museum to know for their own processes.

The teams start with five possible titles, an overall concept, possible approaches as well as a main message, and several supporting messages. Although main message, “big idea” is defined, the title is not concrete. This is important to point out, because the message gives the direction of the project, but titles are broader. Supporting messages provide more detailed directions for the projects.

Ideas for exhibit topics are generated from multiple sources. Solicitation/collection of ideas come from: Academy curators and staff through open meetings and informal networking; trustee and fellows through meeting agenda items and open door meeting; museum visitors and members through survey by evaluators; and proposals from outside entities. Ideas for exhibit topics are also based on strategic analysis of the needs of the Academy and its public.

In informal review, exhibition ideas are evaluated for compatibilities, such as fit with Academy mission, potential to appeal for visitors, fit with overall exhibition mix, and potential for funding. Research department researchers and program evaluators prepare a front-end report to identify key subject areas and establish the basic content framework. Front-end evaluations “identify strength of audience interest (by segment) levels of knowledge and awareness, understanding of concepts and naïve notions and recommended areas of emphasis and possible approaches to address audience interests.”

The core team and resource team work together to produce concept designs. They include front-end evaluation, preliminary exhibition outline, preliminary diagrams, conceptual drawings, design approaches, and preliminary schedules. The preliminary exhibition outline is considered with main and supporting messages, content outlines, identification of critical exhibit elements, (such as interactives, artifacts, and audio-

visuals), and exhibit learning and outcome goals related to the California State science (curriculum) framework.

The core team also produce schematic designs. Schematic design includes: exhibit components (such as interactives, multimedia and AV); objects and specimens; floor plan; elevations; models; initial copy draft, such as titles and sub theme identifiers and label descriptions. Information about budgets, revised schedules, facility report, and a formative evaluation are also elements of the schematic design.

As a project reaches the stage of design development, all detailed elements are in deliverables. The final exhibit list describes every component, label, artifact, specimen, piece of equipment, graphic, and furniture. The list also includes the final copy and title of the exhibition. The final design package includes floor plans, elevations, production drawings, detailed drawings, multimedia storyboards, and graphics. In this stage of the process, the preliminary production/fabrication plan, preliminary maintenance plan, and preliminary operating plan are established as well as the educational programming plan and marketing plan.

Finally, fabrication and construction starts with final dimensioned construction drawings. The construction administration oversees all bids and contracts and, when contracts are final, produces a Master Project Schedule and Budget. Before the exhibition opens to the public, the teams work for evaluation and remediation. The project does not finish as the exhibition opens to the public, but evaluation and remediation continues as a project. The maintenance plan is revised, and the build plan continues to changes during production, installation, and remediation.

This museum has its own program evaluators. According to Lisa Hubbell, whether the museum conducts an evaluation depends on the exhibit. If there is enough time, they do formative and front-end evaluations. In general, front-end and formative evaluations are the best investment of time because they are fed quickly into immediate decisions. They also have much more impact on how the people working on the exhibits envision what they are creating for visitors. Especially, the teams directly involved with the formative evaluation as team members were collecting the data evaluators coach how they do the process.



However, they do not always do a summative evaluation unless there is something that they think they will learn to apply to another exhibit. It is much harder to do summative evaluations because there is no immediate application for it, and it takes time to work on actual analysis. The evaluator also does behavioral mapping of the whole museum, walking through every 15 minutes to see where people are stopping, writing down how many adults and kids are present, and if they are reading, touching, or interacting with the exhibits, or interacting with staff members.

### **3. “Ants: Hidden World Revealed” Exhibition**

I will focus on “Ants: Hidden World Revealed” to explore the development process of an exhibit, such as scientists’ roles, as well as observing how the exhibition was designed as an effective learning environment. Six colonies of live ants are displayed in which visitors can observe distinctive nest building and food collecting behavior. One of the species is the Argentine ant, which is invasive to California. There are also other exhibits, such as “Conservation Biology in Madagascar,” “Ant anatomy,” and species that relate to ants, such as “Ant eater” and “Ant Plants.” Visitors can also participate in the “Bay Area Ants Survey.”

#### **a) Development Process**

Brian Fisher, an entomologist, is deeply involved in the process of developing this exhibition. This particular exhibition was developed as an experimental case, a fast project, which took a small team less than one year. The team members are the team designer, director of the exhibition who developed content, researcher, and external graphic designer. However, after physical development, the staff in the education department committed to developing survey program and a model class project as well as exhibit evaluators to improve the exhibition.

With an evaluator’s guidance, the team conducted a formative evaluation to know some of the things to use in the exhibit to address questions people have. They set up cards that have some of objects and asked people to carry a tape recorder and talk about

their impressions and any questions they had as they walked up and looked up to the every card. The team used the information to decide how much interpretation to put with those objects. Everything they learned from watching and listening to the visitors went straight back into the decisions they were making.

The idea of the topic “ants” came from field research by Brian Fisher, who has been researching in Madagascar and found new ant species on his expedition. Although there are exhibits about his research, the exhibition is not about his research or findings, but about ants. The exhibition also provides opportunities for visitors to experience, observe, and learn about ants, which the scientists are excited about. The exhibition was designed to show how the entomologist is excited about ants. The San Francisco Chronicle had coverage of Brian Fisher’s discovery in May 26, 2003, as well as coverage of his exhibition (April and October 2004). Although I cannot assume that sharing their studies with the public can be incentives for scientists to be involved with the exhibit designing process, it is important for the institution to share findings with public.

#### **b) Exhibition as Effective Learning Environment**

The first things the visitors see at the entrance of the exhibition are large pictures of ants. These pictures are large printed color pictures and electronic microscope pictures. These pictures can show detailed body structures of ants, which visitors usually do not see when they observe the ants in their daily lives. Although ants are familiar species in the area, these pictures can stimulate their curiosity as well as motivating visitors to learn more details. Short captions provided for each picture explain interesting features, such body structures and behaviors. The words on the caption are also familiar words, not scientific vocabulary. This introduction part of the exhibition is a “hook” to visitors.

The exhibition space is separated into several sections by fabrics with pictures, but not rounded by fixed walls. Therefore, visitors can sense the size of the space. Each section has a different kind of atmosphere with devices, such as hands-on stations, computer stations and display cases. It is obvious how to use the devices; therefore visitors can know what they should do at the exhibition. Visitors can choose what they want to observe or to do in the exhibition at their own pace. The display cases of ants’

colonies can invite younger visitors to observe them with cushions on the floor and magnifying glasses, which are attached to the case. There are also microscopes on a station in different section, which invites visitors to observe specific body features of ants. The exhibition provides choices for different visitors. Different visitors can do different things at the exhibition. The exhibition provide a learner-centered environment.

As well as the configuration of the exhibition, the labels in the exhibition do a very good job at the interpretive approach. Beverly Serrell describes in *Exhibit Labels*, “Interpretive labels address visitors’ unspoken concerns: What’s in it for me? Why should I care? How will knowing this improve my life”( Serrell, 1996, p. 9). She also described that “interpretive labels speak to visitors in an appealing voice—not preachy or pedantic, but not simplistic or condescending.” I observed examples of good labels as Beverly Serrell described in her book: “starting with information directly related to what visitors can see, feel, do, smell, or experience from where they are standing,” “using short paragraphs and small chunks, not large blocks of information,” and “setting up a conversation.” The vocabularies are not scientific words, and it seemed like visitors want to read the labels. I observed that parents read labels for children without interpreting the information for them. The vocabulary and writings on the labels are visitor-friendly, so visitors do not need to process the information to understand as they read. The experience of reading activity smoothly becomes part of their learning process.

The information on labels are well organized to present the topics or objects. Each exhibit of the exhibition has captions, which also has texts with a heading of information as well as objects, images (photos and movies), and illustrations and graphics (diagrams and maps). Without reading all of the information on the labels, visitors can know what this information is about. Therefore, visitors can skip the detailed information if it does not seem interesting to them. Again, it helps visitors to control what they do in the exhibition.

At the display case of the ant colonies, visitors can explore the behaviors of ants by themselves as well as getting information from the panels. Visitors also look through the microscope, and hands-on devices, which allow them to put together ant body structure. The visitors are not just receiving the information, but they are exploring. There

are also video programs, where visitors watch scientists collecting ants in their field research.

An exhibit highlighting social structure of ants can relate ants' society to the visitors' lives in human society: "At the Harvest ant display, visitors will be able to discern the detailed division of labor within colony" (California Academy of Science, 2005). Army ants have different appearances and diets depending on their roles, such as army, worker, and queens in the colony. One caption explains their migration pattern as "Army Ants Are Nomadic." Visitors can reflect the images of ants' migration related to human society. Presenting their interesting social structure to be a "hook" for the visitors.

Argentine ants are an invasive species in California. The ants are displayed with kitchen accessories, which visitors can directly relate to their lives. However, the information in this exhibit is presented as scientific findings. The labels provide information about what scientists found out and how they know, explained with words familiar to the public. The information includes why this species could affect and dominate native species. The topic of invasive species is one of the environmental issues. Through exhibiting live ants as objects of invasive species, which visitors observe around their house without knowing the species, visitors can recognize the problem in their lives.

The label also provides information about this ant, which visitors might find inside their homes, with the heading "Safe Ways to Deal with Unwelcome Ants." The information includes avoiding the use of pesticides: "Pesticides are not good ant deterrents and some of these chemicals eventually end up in the San Francisco Bay ecosystem." The captions then offers several ways that visitors can try to deal with them. As the captions include "San Francisco Bay ecosystem," visitors might realize their individual action (use of pesticides) can influence the broader world. The learning in the exhibition can make a difference in their daily lives.

There are other panels, which explain ants as parts of an ecological system. The titles of the panels use familiar words, such as "Ant plant" and "Ant eater." Although there are not many objects, the information on the panels provides a broader view or

different perspective about ants, which might attract visitors who might have different interests, but not particularly ants.

A section of the exhibition “Conservation Biology in Madagascar” is based on entomologist Brian Fisher’s fieldwork. Video programs show his research in Madagascar as well as the importance of conserving biodiversity and the life style of the people in the region. Brian sends the message to visitors in the program, not just showing and explaining his work. Conservation of biodiversity is also an important environmental issue, but people usually cannot feel the problem in their daily lives. The idea of biodiversity does not connect to visitors’ personal lives. However, showing the scientist’s face on the panel as he talks on the video program at the site of field research can help visitors to connect to this idea.

There is an educational program that invites visitors to participate in the research by surveying ants. If visitors are interested in participating in this program, they learn how to collect ants and get collection kits from the staff at the naturalist center. This survey helps to discover and map the distribution of our remaining native ant populations and the spread of the Argentine ant. The exhibition can open visitors’ eyes toward ants; the experience of learning interesting features of ants can provide curiosity and motivation to observe the ants around their home. Providing the opportunity to participate in survey research put visitors’ experiences on a firm basis, because they do activities by themselves outside of the museum.

#### **4. Discussion of Application to the Hyogo Museum**

The Hyogo Museum also aims to integrate function, collection, study, and education, as a museum in the society. There are many difficulties for the Hyogo Museum to apply the methods of the California Academy of Sciences for producing displays and interpretations of scientific collections. Although the management structure such is different, as absence of educators and exhibit designers, learning the process of developing exhibits and observing how scientific findings are presented would be a good example for the Hyogo Museum.

### **a) Development Process of the Exhibition and Roles of Scientist**

Without teams to develop exhibits within the museum, schematic design is emphasized, but not concept design, when exhibitions are developed in Japanese museums. Schematic design physically appears as products of design, but concept design is important to send messages to visitors. Without careful development of concept design, however, the exhibition might not provide an effective learning environment but just a fancy style of exhibition. It is important to understand effective design of exhibitions as steps of a process that supports the final product. It is necessary for Hyogo Museum to understand an exhibition as a final product that was shaped in the process of generating topics, informal reviews, and concept design.

There are differences between the museum structures of the California Academy of Science and the Hyogo Museum. As the Museum does not have exhibit developers, the process above is very challenging to apply. In the Hyogo Museum, exhibit developers, including designers, are contractors who do not belong to the community. Managers or directors of projects are Museum researchers, who might not have much experience in developing exhibitions. There is a difficulty in communicating between researchers and the contractors because there are few things to share between them without a carefully developed concept design. The Museum staff need to lead the project to present their message as an institution. As a first step, it is important that Hyogo Museum understands the elements of the development process so that Museum staff, including research scientists, can be involved in the process.

### **b) Effective Learning Environment**

There are many elements that relate to and build on learners' previous experiences or personal lives. Visitors have seen "ants" in their daily lives, although they have not understood ants at the level provided by this exhibition. The information about ants' social structures were described with words that visitors use in their daily lives and can imagine applying in their daily experience. Environmental issues, such as invasive

species and biodiversity, were also presented in ways visitors can relate to their personal lives.

The exhibition provides opportunities for exploring. Colony displays allow visitors to observe the ant colonies from different angles, such as from the floor, sitting on the cushions on the floor or using magnifying glasses, which attach to display cases. Other devices, such as microscopes and video programs, also provide visitors ways to explore by themselves. The atmosphere of the exhibition invites visitors to explore by themselves.

The most significant stimulations to motivate visitors are the facts about ants. These facts seek to tap the intrinsic interests of visitors. The exhibition seeks to increase intrinsic motivations by providing interactive devices. Providing opportunities for ant surveys can motivate visitors to participate in research after they leave. The information about dealing with unwelcome ants, while avoiding use of pesticides, can also motivate visitors to make individual decisions in their daily lives.

The atmosphere of this exhibition allows visitors to do what they want to do. It is clear what visitors are to do in the exhibition. Visitors can use the interactive devices by themselves without seeking information on how to use them. The organization of information on the labels also helps visitors make decisions quickly on what they want to do. The words of label headings are familiar to visitors, so, without losing sight of what the exhibit is about, visitors continue reading carefully if they are interested or they move on if they are not. Visitors can control what they do by themselves in the exhibition.

#### **IV. Model Exhibitions at the Field Museum and the Museum of Science, Boston**

The “Nature Walk” exhibition at the Field Museum and the “Natural Mystery” exhibition at the Museum of Science, Boston display similar objects in different ways, as the Hyogo Museums does. They might be good examples that the Hyogo Museum could learn from through observing how these objects are displayed in the exhibition, and be provided effective learning environment.

The Hyogo Museum has exhibitions that display stuffed animals and dioramas separately. The stuffed mammal species are displayed on the stage without connections to their habitats. There are more than 10 glass-case dioramas, which show some species and their habitat types. However, the glass cases are small and show limited species in their ecological systems. The space and objects in the glass cases do not give the sense that the visitors can be part of the environment. The objects in the glass case are separated from the visitors like separate pages in a textbook. There is a large diorama, which shows a forest scene with stuffed mammals and other insect collections. This diorama changes its colors imitating morning or sunset, and it is filled with the sound of birds. However, there are not any devices or signs that invite visitors to observe carefully.

Some devices, which invite visitors to observe carefully in the “Nature Walk” exhibition at the Field Museum, can be good models for the Hyogo Museum. “Nature Walk” is “a nature trail through prairies, wetlands, woodlands, and ocean shores to discover the wonders of the wild.” Stuffed animals are displayed in glass cases in an ecological setting, such as wetlands and woodlands. From the trail, visitors can observe more than 10 glass cases, each with a different habitat type. The sizes of the glass case are varied, but all cases are big enough so that people feel themselves in the habitats. The “Local Woodlands Four Seasons Diorama” is especially remarkable. This exhibit was developed in 1902, focusing on habitat accuracy and lifelike poses.

There is a clear title label, an introductory label, and group labels. The captions are placed in various ways and provide different levels of information in easy-to-read styles. At each exhibit or glass case, there is a large panel that locates the scene with maps, provides brief information about the scene, and tells interesting facts about specific



species in the scene. There are also flip panels, "Animals in this scene," which tell how many mammals, birds, insects, and amphibians are in the scene. The flip panels also include information about the plants species. The content is about the ecological systems as habitats of species.

As well as flip panels, there are hands-on devices at children's eye-level for them to touch. There are also yellow triangle signs, which ask the visitors if they can find certain objects in the glass case. For example, "What can you find in the tree holes?" and "Can you find...1 squirrel, 1 snake, 1 deer antler?"

Throughout the exhibition, the language is familiar. Displaying the stuffed animals within their habitats can help visitors learn not just but also can deepen their understanding of the habitats. Visitors also can sense that the stuffed animals are not just "dead animals" or objects for study.

Various panels allow visitors to explore objects, and hands-on devices allow visitors to find out some facts themselves. The question style of the panels stimulates a visitor's motivation and curiosity. Even though there is no reward for finding objects in the cases, visitors might be excited to do so. Especially for visitors who came as a part of social group, telling other members of the group what they find is one of the ways to interact with other members.

With different kinds of panels, each providing different information, visitors can know what they can do at the exhibition. These observations can be self-paced. Through providing various styles of labels and panels, visitors can choose what they want to view or how much time they want to spend at each exhibit.

One of the newer exhibitions at the Hyogo Museum is the collection, “Naturalist’s Fantasy.” These exhibits are collections that were donated by naturalists and that supported research at the museum. The exhibits include information on the collectors’ personalities and the meanings of the collections to their research and to their lives. However, it seems the information is provided to introduce the collections and their personalities, but not the ways that visitors can relate to their own lives. Although the collections themselves can be attractive to see at first glance, only visitors who are already interested in the topic would observe them carefully. Without devices to invite visitors to observe carefully, those who are not interested are unlikely to find the collection interesting.

Science exhibitions at the Hyogo Museum are separated from other exhibitions. They are designed exhibition is designed for visitors who are interested in science or who want to become scientists. The exhibits are designed to motivate visitors to become scientists, but scientists rarely consider making their exhibits understandable to the general public.

The Museum of Science, Boston is also an academic-oriented museum. The “Natural Mystery” is an exhibition about collections and science that provide an enjoyable, but also educational, learning environment. It is an interesting approach to connect the scientists’ work with visitors’ activities in their daily lives. This exhibition can be a good model for the Hyogo Museum to follow.

The website describes “Natural Mystery” exhibition as “Natural Mysteries invite you to put your organizational instincts to work” (MOS 2005). Organizing, collecting, sorting, and grouping are universal human activities, but they are also scientific skills. Scientists classify (organize things into groups) to uncover the natural world’s hidden patterns and meanings. The exhibition also highlights the message that “The natural world is full of mysteries. How we make sense of it depends on the kinds of order we create . . . . or reveal.”

At the exhibition entrance, there are questions, such as “Who collects them?” or, “Where people see the collection? ” such as spoons and forks are that found in kitchens.

The activities of the collection are introduced not as specialties of scientists, but as the scientists collecting objects as extensions of human activities so that they can become specialists.

There are specimen cases of mammals and insects, and there is also an earthquake recorder, which is collecting data. For example, one of the exhibits, "All Sorts of Minerals," explains how the minerals are organized in their boxes. "Mammal Skull Mystery" provides hands-on devices, and opportunities to discover the different shapes of mammal species. Another hands-on activity, "I Spy" invites visitors to organize the objects as cards indicate. Exhibits in this exhibition are designed to attract diverse audiences and provide effective learning for visitors.

## **Conclusion: Recommendation**

Museums are one important venue for informal environmental education. With the specialties of museums—collections, research, and exhibits and interpretive programs—museums have rich resources for environmental learning. Museums are also social institutions in communities, and thus they can foster collective learning among school classes, family groups, and social networks. At their best, they also might move visitors (informal learners) toward the idea of ascending staircases to reach responsible environmental behavior.

As one venue for environmental education, the Hyogo Museum has recently adopted a mission related to environmental education. The Hyogo Museum already wants to strengthen its exhibits and enlarge its environmental education approach. The following are my recommendations for the Hyogo Museum to make the exhibits into an effective learning environment for environmental education.

- 1. The Hyogo Museum's new exhibits could be models for active, effective learning about the environment and environmental protection based on informal learning theory.**

It is important that the Hyogo Museum recognizes the museum as an informal learning center and takes advantages of the opportunities to provide an effective learning center. Understanding and including the educational perspectives inherent in the museum exhibits might be essential as I summarized effective learning environments in museums in Chapter 2.

- 2. Research staff at the Hyogo Museum need to understand visitors and become more "Learner Centered."**

With a lack of educators, researchers need to learn to "come down" to meet visitors' understandings instead of requiring visitors to "move up" to take museum learning more seriously. In other words, researchers need to

understand the visitor-centered museum by themselves without the educational, and designing staff members who integrate their academic studies into a visitor-centered exhibit style.

Evaluating the exhibit is essential to improve the museum exhibit itself as well as to shape the museum's role in the community. Evaluations, however, are still very challenging in the current situation, namely that Japanese museums currently have no form of self-evaluation or evaluation by the public. Without specialists, the staff members who are mostly researchers in Hyogo Museum do not have adequate human resources to conduct evaluations. However, even though the time spent evaluating exhibits is limited, as researchers' work, it is important for the museum staff to observe both exhibits and visitors' behaviors in the museums. The Brooklyn Children's Museum published *Doing It Right: A Workbook for Improving Exhibit Labels*. This workbook provides steps to evaluate museums' effectiveness at communication through exhibit labels. The workbook was prepared based on the Children's Museum's own work in exhibit assessment, and the workbook provides the steps that any museum staff can undertake by themselves. Using such a handbook might help the staff to see the value of continuous exhibit evaluation and motivate them to do more of it.

**3. Exhibits seem most effective when designed collaboratively by a team that includes researchers, museum education staff, and exhibit designers to deliver messages.**

Museum exhibits should be designed to have clear messages and to deliver the message to visitors. In the process of developing the messages as well as designing an exhibition based on the message, the exhibit development team within the museum is essential. Without the core team to develop museum exhibits, researchers and other staff, including the administration department and floor and guide staff, need to work together. Although the Hyogo Museum currently depends on a private exhibit-design company, the museum staff

members should become involved with each step of the process of exhibit design.

**4. To accomplish the above recommendations, the staff structure, including the management structure, might have to change.**

The involvement of staff members in the administration department and floor and guide staff members is difficult, because they typically would work for the museum for only 1-3 years. It might be necessary to find ways to encourage these staff members to be involved with the development process, even if staff status cannot be changed due to the management necessities. Fundamental changes of management structures in the museum are important, if the researchers do everything by themselves, it will be too much work for them.

There are difficulties and limitations in the Hyogo Museum to improve the exhibits as effective learning environments for the goals of environmental education. However, the museum profession is rethinking how it structures both exhibits and educational experiences for visitors. As increasing environmental challenges confront society, museums and other environmental learning centers are becoming more focused on their potential role for environmental education. The Hyogo Museum has both many opportunities to become involved in these trends and many challenges. I hope this paper offers some useful suggestions for the exhibit expansion that is being planned.

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