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An Investigation into the Qualifications Necessary for Science Hands-on Exhibit Guides from the Producer's Point of View

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Abstract: Science hands-on exhibits are increasingly popular, especially during vacation time. These exhibits hire guides to help visitors to understand the contents. In this study, the qualifications of the guides are investigated through interviews with the producers who run the exhibit. There were two main questions the researcher was interested in during the interviews. One was the importance of the science background of the guides. The second was the characteristics of guides that the producers consider important for successful exhibits. The results show that a science background is not an important qualification in the view of most of the producers. Many factors other than science, such as accountability or social skills, were considered to be of greater importance than a background in science.

Key words: hands-on, exhibit, guide, museum, qualification, facilitator

I. Introduction

Increasing attention is being paid to the learning in informal and/or free-choice settings such as museums or camps. These settings have been investigated in various aspects. For example, adults became more positive about the value of science, the scientist's work, and the scientist's communication with public (Rennie and Williams, 2006). In another study, science activities at a camp were enjoyed greatly by the participating children and had a positive effect on their confidence (Farman, 2005). Research results seem to agree on that informal science education does have positive effect on affective area.

Science hands-on exhibits are becoming popular in Korea, especially during vacation time. An exhibit is one of the important forms of informal and free-choice learning. Often science hands-on exhibits hire many guides to help visitors perform the activities and understand related science concepts. Young children in kindergarten or daycare often visit this type of exhibits as a field trip. Parents with young children also have high interest and bring their children to these science exhibits. In other words, the exhibits often become the first experience with science activities for a child and the guide becomes the first science teacher a child meets. Therefore, a guide is expected to play the role of the facilitator in an informal learning setting that the teacher plays in the classroom setting.

In this study, the qualifications for guides for typical science hands-on exhibits is investigated through interviews with the producers of the exhibits. There are two main questions in which the author is interested. One is the importance of the science background of the guides. The second is the characteristics of guides that the producers consider important for successful exhibits. The guides addressed in this article exclusively include only guides whose role is to help learning. The personnel with other responsibilities, the ones at the ticket booth or information desk for example, are not included.

In the following sections, a literature review is given regarding the importance of guides, as well as the informal and free choice learning. Then, the interview questions and the process will be described. Next, the results will be given, followed by the discussion and the conclusion.

II. Literature review

1. Learning in hands-on exhibits

Formal and informal learning is a categorization depending on the places and systems where learning

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happens. Formal learning occurs in schools or in similar facilities. It is well organized and evaluated regularly. Informal learning occurs voluntarily and accidentally. Informal learning is rarely evaluated. Learning at exhibits and festivals is informal learning (Wellington, 1991). Another categorization is according to the learning process. There are two types, formal learning and free-choice learning(Falk, 2001). Free-choice learning refers to non-sequential, self paced, and voluntary learning. Research regrading informal learning is sparse. According to recent statistics (Tsai, 2005), it accounts for only 3.7% of the articles in *Science Education, The Journal of Research in Science Teaching,* and The *International Journal of Science Education* from 1998 to 2002; however, some of the issues raised in the literature deserve attention.

Learning at an exhibit or a museum involves informal and free-choice learning. Unlike the general expectation, meaningful learning requires more than just hands-on experience directly connected to learning. The experience needs to be connected to the network of other experiences. These connections have to be accumulated in a meaningful way for learning to occur(Dewy, 2002). Otherwise, the experience offers visitors a feeling of joy and satisfaction with a low probability of actual learning. According to the research about the learning in exhibits, the descriptive display or explanation can give visitors satisfaction, but cannot offer high learning(Cox-Peterson *et al.,* 2003). For visitors to learn, there has to be more chances for active participation, and a particular role to play in relation with learning for visitors. For a young visitor, more learning occurs when she/he visits with parents rather than alone or with their peers (Crowley *et al.,* 2001).

Students preference about the displayed items was determined by the "fun way" to operate(Kim, 2003). The same article reported that 20% of the students did not read the description explaining the display. Students replied that they understood better when the guides explained the material than when they had to read it by themselves.

In summary, the following issues are to be considered for learning in a hands-on exhibit to be effective. Among them, the second and the fourth issues imply the importance of a guide as a facilitator.

- hands-on activities or descriptive display alone do not lead to meaningful learning, but have a positive effect in affective areas
- chances to participate and to play a particular role in relation with learning are necessary for learning to occur
- having young children visit with their parents is more effective in learning than having young children visit alone or with peers
- students understand better when the contents are explained by the guides

2. The role of a guide as a facilitator

When an exhibit is labeled as hands-on, it is expected to offer many hands-on activities encouraging the participation of the visitors. There are often a number of guides to help in the understanding the displayed item, and in facilitating the related hands-on activities. These guides also offer help in guarding the proper use of items and the safety of visitors.

As mentioned above, hands-on experience itself gives positive effects in affective areas, which meets the one of the important goals of a science exhibit. As also mentioned above, activity alone is not sufficient for meaningful learning; therefore, a guide helping to perform the activity is expected to be the facilitator for learning. As already mentioned, informal learning is a less cultivated area in science education research(Tsai, 2005). However, research into the importance of a facilitator in formal settings has been accumulated. A facilitator in a formal setting has two essential roles: (a) to provide opportunities for individuals to engage socially in talk and activity about shared problems or tasks, and (b) to serve as an expert who mediates social discourse and leads students to conventional science ideas (Driver, Asoko, Leach, Mortimer & Scott, 1994).

There are plenty of examples showing that active student participation leads to positive results in their learning(Hake, 1998; National Research Council, 1996; Park, 1998). The second important role, serving as an expert, requires science content knowledge. The need of science content knowledge is repeatedly stated as a basic requirement for a person teaching science (Kwak, 2006, and the references therein).

By implying these characteristics of good facilitator, a guide is expected to have skills to lead the visitors to participate actively and to gain a good understanding of the science content. The author investigated the qualifications of guides in two aspects. One is the importance of the science background of the guides. The second is the characteristics of guides other than science knowledge necessary for a successful exhibit.

Ⅲ. Research Method

The author visited eight science hands-on exhibits during the first half of 2006. These exhibits represent probably all of the science hands-on exhibits held during that period of time in the area near Seoul. Simple notes were made about the various characteristics of each exhibit. This note is made to understand the context of the investigation, not to answer separate research questions. Notes include the role and the actions of the guides, the characteristics of visitors, the displayed items, and the responses of the visitors to the display. After the visit, the author managed to contact producers of six exhibits for interviews. Interviews were performed by visiting or by telephone. Each interview took about 20 to 30 minutes, and the author took notes during the interviews. The following is the list of questions used for the interviews.

- Selection of guides: qualifications and criteria
- Education and training of guides: time and methods used
- Important characteristics of the guides
- Preference in major and support from science professionals

Ⅳ. Results

1. Selection of guides

The selection of guides is rather simple. An advertisement is put on the Internet describing an hourly based part-time job. Anybody at the college level interested in the job can submit an application form. After the forms are reviewed, final selections are made through an interview process. A guide for exhibits is a popular part-time job among college students for two reasons. One is the fixed working hours. The other is the time that the job is available, which is often the vacation time for students.

When an exhibit is successful and begins a tour visiting small cities, sometimes a request is made to university departments of early childhood education to hire students as guides. Only one exhibit requested that 50% of the guides provided by the university be majoring in science or engineering. The producer of this exhibit said the scope of questions from the visitors could be wide, and therefore science majors had to be present.

2. Training of guides

Training consists of two parts. One is pre-exhibit training, and the other is everyday meeting during the exhibit. Education to maintain public order and path line takes about half a day. Acquiring the necessary science knowledge that takes more time: the guides spend from two to five days studying the science content before the exhibit starts. Basically, a manual prepared in advance is distributed and the guides study it. The production of the manual is done by science experts, or translated from foreign material.

Once the exhibit begins, daily meetings are held to facilitate smooth operation. The science content may be discussed during the meetings, but this content not the main focus of these meetings.

3. Characteristics of the guides

The most important characteristic that the producers count is accountability. Good attendance, being on time, and no turn-over were other crucial factors for producers. Therefore, diligence and the responsibility are the most important considerations. The willingness to serve visitors is also very important. The next important factor is the showmanship and the activeness to create good relationship with visitors.

The career as a guide was not important. A guide with experience as a guide in previous exhibits has both positive and negative aspects. The positive aspect is that an experienced guide usually creates a good relationship with visitors more easily. However, candidates with other work experience, such as wor-

king in a discount store or a cafe, can create a good relationship also according to a producer. On the other hand, negative aspects exist. Candidates with experience tend to expect higher pay for the same work. Sometimes a conflict occurs between a newcomer and an experienced one. Also, the experienced candidates are more difficult to educate because they are convinced that they possess expertise.

4. Educational background of the guides

The candidate's major or the educational background was not important. From the producer's point of view, the willingness to learn the related material and the relationship with visitors are important. Some guides majoring in the sciences created problems because they lacked a service-oriented attitude, and were weak at showmanship and establishing relationship with visitors, The education for content knowledge was conducted through manuals. A manual contains explanations concerning the related concepts, and frequently asked questions and answers.

There was only one producer who recognised the need of content knowledge to deal with the variety of questions from the visitors. 50% of guides in that particular exhibit were science or engineering majors. 50% were non-science majors because of the reasons already mentioned above. During the exhibit, a retired science teacher was present at all times to help the guides.

In general, because the target of the exhibits was young children, the producers said that high-level content knowledge was unnecessary. They said a few days was sufficient for guides to learn the necessary information.

5. Summary of the results

Science background of the guides.

In the view of most of the producers, a science background is not an important qualification to be a guide. From two to five days were spent in studying the science content for the exhibits. This training was conducted by reading the manuals. A manual includes the description and short explanation of the displayed items and activities, as well as frequently asked questions and answers.

Characteristics of guides other than science knowledge

Factors other than science knowledge such as accountability or social skills are considered crucial. Showmanship, a service-oriented attitude, and a relationship with visitors are important characteristics. A student's major is of little concern as a qualification. A preferred major, if any, would be early childhood education, because the majority of the visitors are young children.

V. Discussion

Results shows that the majority of the producers consider the student's major unimportant. It would appear that being a guide for a hands-on science exhibit is simply a part-time job for college level students, with minimal payment in most cases. The requirements to qualify as a guide were minimal. The basic accountability common to any job, such as being dependable in coming to work, was required. The other requirements were a service-oriented attitude and the social ability to establish good relationships with the visitors. This result needs to be interpreted carefully because it is in contradiction with the importance of expertise in content knowledge regarding science education. The interpretation is made in two aspects. One is the level of knowledge utilized during the exhibits. The other is refining the role of guide in the exhibits.

1. Knowledge level utilized during exhibits

As mentioned above, there are two essential characteristics of a facilitator (Driver, Asoko, Leach, Mortimer & Scott, 1994). One was the social ability to provide opportunities for individuals to engage. The other is the science expertise to mediate social discourse to conventional science ideas.

It has to be noted that the exhibits investigated in this article were mainly for young children. The interpersonal behavior of a teacher greatly influences student attitude, one of the necessary conditions for learning (Brok *et. al.* 2005). On the other hand, science knowledge is rather descriptive at the elementary level. Hence, content knowledge can be studied if the guide is willing to learn, although she/he cannot be

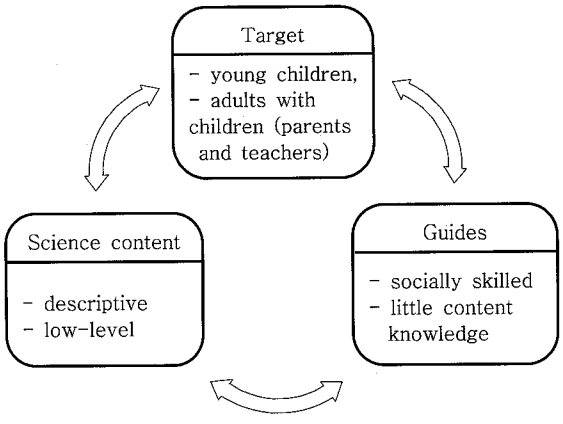

Fig. 1 *Perpetuation of an easy-level exhibit*

prepared for open questions. Also, the activities are limited to simple tasks without much challenge. One may say the cycle of an easy-level exhibit is perpetuated as in Fig. 1. Although this seems to operate, the question of learning higher level knowledge and scientific process needs to be addressed. In other words, a channel to higher level science activity needs to be developed in hands-on exhibits. Otherwise, it is unlikely that meaningful attention will be paid to the science knowledge level of guides in the near future.

2. Refining the expected role of a guide

In this research, it is assumed that the guide is expected to play a role as a facilitator. The existing knowledge concerning the role of a facilitator and their recommended behavior has been gathered through studies in formal learning settings like school classrooms. What is expected in the informal learning or free choice learning happening in exhibits can be quite different. For example, in a classroom, the students are confined within a closed area for a fixed amount of time. In the exhibits, a visitor spends an average of two minutes on one item, and is free to move onto the next item at any time (Rennie and Williams, 2006).

The purpose of the visit is also different between formal and informal learning settings. Children come to school to learn. Visitors often come to exhibits for social interaction, entertainment, or attitudinal agendas (Falk, Mousourri, & Coulson, 1998; Schauble, Beanem Coates, Martin, & Stirling, 1996).

It is probably true that a large portion of accumulated research regarding the facilitator in formal learning can be shared in free-choice learning. However, it is necessary to investigate the characteristics that differentiate these two learning environments in terms of the expectations for a facilitator. The findings from the current investigation, the importance of social skills for example, suggest a possible framework for the qualifying and the necessary training of guides as facilitators in science hands-on exhibits.

VI. Conclusion

As qualifications for guides in hands-on science exhibits, basic accountability as an employee and relationships with visitors are considered important by the producers of exhibits. Expertise in science is hardly counted as being important. A possible reason for this view is that the main target of most exhibits is young children; furthermore, the expected knowledge level is simple and descriptive. It appears that the cycle of an easy-level exhibit is perpetuated as in Fig. 1. This leaves the question of learning higher-level knowledge and scientific processes to be investigated. The activities are limited to simple tasks without much challenge, which reveals the need to develop to higher-level science activities in hands-on exhibits.

A guide in an exhibit is expected to be a facilitator for meaningful learning. However, research regarding facilitators has been mainly in the context of formal learning. It is suggested to investigate the characteristics that differentiate formal and free-choice learning in terms of the expectations for facilitator. The findings from this investigation may serve as baseline to develop criteria for qualifications, and the necessary training of guides as facilitators in hands-on science exhibits.

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