A Wider Perspective on Museum Learning: Principles for Developing Effective Post-Visit Activities for Enhancing Students' Learning

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Introduction

Many museum-based studies, which have investigated learning arising from visitors' museum experiences, have restricted such learning to visitors' experiences in the museum itself. Such a view is limiting of actual learning, which has the potential to extend beyond the formulation of knowledge in an in-gallery context. In this paper we discuss a view of learning that recognises the dynamic interplay of visitors' prior knowledge, their experiences during a museum1 visit, and their subsequent life experiences. We discuss some aspects of students' subsequent experiences which teachers are able to capitalise upon, namely planned, classroom-based, post-visit activities.

Defining Learning

A distinction has been made between formal learning, such as might occur in the formal setting of schools, and informal learning, such as might occur in the informal environments of museums and similar locations (Wellington, 1990). However, Dierking (1991) argued that the distinction may not be appropriate because "learning is learning, and it is strongly influenced by setting, social interaction, and individual beliefs, knowledge, and attitudes" (p. 4). In doing so, she stressed the complexity of the learning process in which setting plays an important, but not necessarily dominant role. In similar manner, Hofstein and Rosenfeld (1996) pointed out that informal learning activities, typically developed for out-of-school locations, can be experienced by students in school classrooms. They made the important recommendation that "future research in science education should focus on how to effectively blend informal and formal learning experiences in order to significantly enhance the learning of science" (p. 107).

Schauble, Leinhardt and Martin (1997) contrasted "museum learning" and "school learning" although the distinction is somewhat vague. They appear to equate "museum learning" with learning in museums, but a number of research studies (e.g., Anderson, Lucas, Ginns, & Dierking, in press; Falk & Dierking,

1 We use the term "museum" to include facilities such as history museums, art museums, science centres, aquaria, planetariums, and zoos.

1997) have established that learning may continue well past the time span of a visit to a museum. While acknowledging visitors to a museum may learn from an exhibit, Rennie and McClafferty (1996) posed the question whether learning has occurred if they cannot "link that knowledge to situations beyond their visit" (p. 74). The answer surely depends on the definition of learning that one chooses to adopt. It is clear that researchers interested in learning associated with visits to museums and similar locations need to recognise that learning is multifaceted and unbounded by time, institution or social context.

Explicit definitions of what is meant by the term "learning" have been notably absent from much of the published literature on learning in museums and similar locations during the 90s. For example, Lucas, McManus and Thomas (1986) implied, but did not state, that learning constitutes the acquiring of ideas. If so, research on learning in museums would attempt to assess the amount of information acquired by visitors to museums but Lucas et al. pointed out that "knowing *how* people learn might be more important than knowing *what* they learn" (p. 343, emphasis in original). In some research reports (e.g., Serrell, 1997) it appears that the process of learning is of interest, and in others (e.g., Gilbert & Priest, 1997) the product of learning is the main focus. It is conceivable that the professional background and motivations of researchers play an important role in determining the focus on learning, however, Falk and Dierking (1997, p. 216) have pointed out that learning is neither a process nor a product, but a combination of the two.

In more recent times, references to constructivist views of learning appeared more frequently in the science museum literature (Borun, Massey & Lutter, 1993; Feher, 1990; Hein, 1995; Lucas et al., 1986). A common factor of such references is the recognition of the importance of visitors' prior knowledge, their alternative conceptions, and the individual nature of the construction of meaning from experiences encountered in the museum. The importance of social interactions is recognised to varying degrees. Some researchers have adopted a social construction of knowledge framework for research in science museums (Falk & Dierking 1997; Gilbert & Priest, 1997; Schauble et al., 1997). To do so, they needed to make clear what they meant by "learning." For example, Falk and Dierking (1997, p. 216) asserted that:

> "Learning is the process of applying prior knowledge and experience to new experiences; this effort is normally played out within a physical context and is mediated in the actions of other individuals. In addition, learning always involves some element of emotion and feeling."

This definition highlights the process of learning in the physical, social and personal contexts of the learner. Gilbert and Priest (1997) view learning "as the development and use of mental models by individuals" (p. 751). In this

definition of learning, it is the products of learning in the form of mental models, which are highlighted. According to Gilbert and Priest (1997, p. 750), a mental model is "an internal representation of an object, states of affairs, or a sequence of events or processes, of how the world is, and of physiological and everyday social actions." Both definitions are applicable to learning in formal and informal, in-school and out-of-school contexts and, despite the different emphases, may be considered to be complementary and consistent with Ausubel's (Ausubel, Novak & Hanesian, 1978) theory of meaningful learning.

Ausubel's theory of meaningful learning has influenced some research of learning associated with field trips to museums and other out-of-school locations (Anderson, 1999; Balling, Falk & Aronson, 1995; Dierking, 1991; Dierking & Falk, 1994; Falk & Dierking, 1997; Orion, 1993) perhaps because it relates so specifically to the individual's role in making meaning as discrete "bits" of information are added to cognitive structures. Valsiner and Leung (1994, p. 211) describe the knowledge construction process, a synonym for learning, in terms of a transformation of the knowledge structure of an individual. According to Valsiner and Leung, the process is constrained, but not determined by the relationship between the environment and the individual. Their description of the structure of knowledge and transformations between individuals' knowledge states, although framed in Piagetian terms, is highly reminiscent of Ausubel's theory. More recently, Chinn and Brewer (1998) have referred to "snapshots" of what people know at different times, implying the existence of "states of knowledge" and pointed out that researchers "infer that knowledge change is triggered by events involving *new data*, *new conceptions*, *reflection* and *social pressures*." (p. 101, emphasis in original). They claim that "there are few if any comprehensive theories of knowledge acquisition at present. Rather, most current theories are fragments of theories that address one, two or three of the issues" (p. 110).

One theoretical approach that might fill this void is described by its proponents as a "human constructivist" perspective on learning (Mintzes & Wandersee, 1998; Mintzes, Wandersee, & Novak, 1997). The human constructivist view of learning recognises that individuals' present conceptions are products of diverse personal experiences, observations of objects and events, culture, language, and teachers' explanations. Such conceptions are not necessarily consistent with academic knowledge structures. Furthermore, Mintzes et al. (1997) make the important point that "common instructional practices, including those of good teachers and textbooks, are a major source of misunderstanding" (p. 413). This is also true of learning in science museums (Anderson, 1999; Lucas, 1999).

Human constructivism recognises that learning can be at times gradual and assimilative, and at other times rapid and transformative. The former condition implies an incremental change in the individual's conceptual understanding.

The latter condition implies a substantial restructuring of the individual's knowledge. In the words of Mintzes et al. (1997):

> *"conceptual change requires a restructuring of the knowledge framework, and this in turn results from the making and breaking of connections between concepts and sometimes the replacement or substitution of one concept with another"* (p. 415, emphasis in original).

In relation to learning in museums and similar locations, the human constructivist view of learning has potential to guide research and to assist in the interpretation of research data because it recognises the individual's prior knowledge and active personal involvement in knowledge construction, for example during a museum visit. Human constructivism also acknowledges the role played by individuals' present knowledge states, for example as they exit a museum, in determining "the nature and quality of subsequent learning" (Mintzes & Wandersee, 1998, p. 52).

Our view of learning is consistent with human constructivism. We regard learning emergent from an individual's experiences in a museum as a process which is continuous, dynamic and transforming though subsequent experiences beyond the museum setting, and the products of learning to be subject to transformation long after the individual has left the museum.

The Museum Experience

Our understanding of the nature of learning associated with a visit to a museum leads us to reiterate several propositions about such learning.

- A visitor's prior knowledge, culture, attitudes, and beliefs influence significantly how that person will experience and interpret exhibits, events and social interactions within the museum.
- The physical nature of the exhibits and the museum context in which they are presented affect the type and duration of visitors' interactions with exhibits in a museum, and there is a wide range of such interactions by visitors.
- Visitors to museums are frequently members of small groups of people linked by family, social, or educational affiliations. In such circumstances, the nature of visitors' interactions with exhibits, and in particular their interpretation of the exhibits will be mediated in substantial and largely unpredictable fashion by social factors operating within the group.
- New knowledge and understanding resulting from a visit to a museum constitute a foundation for further learning as the individual interprets subsequent events and experiences by reference to the museum experience.

In relation to the last of these propositions, the subsequent events and experiences may derive from sources such as conversations, television programs, movies, reading, travel and, in the case of school students, planned or incidental classroom activities. The potential for extending or enhancing students' learning from visits to museums by planned school-based post visit activities has not been recognised and exploited by teachers (Anderson, 1999; Bitgood, 1989).

We turn now to a discussion of principles for developing such post visit activities (PVAs) that are consistent with our view of learning. The principles outlined were influential in the development of the PVAs used in Anderson's (1999) study of elementary students' learning about electricity and magnetism associated with a visit to an interactive science museum and subsequent post visit activities in the classroom.

Principles for the Development of PVAs

A post-visit activity is a classroom-based activity or exercise specifically designed to enhance learning about a particular topic or phenomenon experienced by students during a visit to a museum or similar informal learning environment. In practice, there are many forms that a PVA may take, and there are many perspectives from which a teacher might develop a PVA (Anderson, 1998). A PVA may be as simple as a classroom-based discussion or as elaborate as an extended research project. Our view is that PVAs have the potential to be highly influential and powerful knowledge building strategies when they recognise the idiosyncratic nature of the learning outcomes for individual students as a result of their museum experiences and enable students to consolidate and enhance their knowledge and understanding in appropriate ways. By "appropriate" we mean consistent with the human constructivist view of learning discussed previously.

Principle 1

Post-visit activities should be built upon students' experiences during their visit to the museum and their pre-existing knowledge, understandings, and related learning experiences so as to consolidate and/or extend their understanding of the themes portrayed in the galleries and their classroom-based curriculum.

It is reasonable to assume that students' understandings of at least some of the information and principles portrayed by the exhibits will be developed in varying degrees as a result of their museum experiences, but the extent of such transformations is difficult for teachers to predict. Nevertheless, the types and extent of knowledge development can be determined in part after museum experiences through a variety of means, such as in-gallery interviews, focus groups, surveys, and similar techniques (Falk & Dierking, 1992; Guba & Lincoln, 1989; Rennie & McClafferty, 1996). With experience, teachers may

build a personal awareness of the range and probability of learning outcomes for students whom they have taken to visit a local museum.

Teachers might also gain such insights in a more naturalistic manner during classroom-based debriefing sessions immediately following class visits to the museum. For example, identifying and discussing interesting or puzzling exhibits, or experiences which students found to be memorable is likely to provide the teacher with indications of what students know and understand about the museum exhibits. Such teacher-facilitated actions constitute PVAs which can promote ongoing knowledge construction and reconstruction. In addition, when teachers and museum educators have a sense of what their students actually learn during the museum visit, which frequently is a limited and/or distorted version of the learning outcomes intended by the exhibit designers, they can begin to develop PVAs which capitalise on the students' learning in appropriate ways.

Principle 2

Post-visit activities should be designed in the light of contextual constraints of implementation time, preparation time, availability of resources, and the educational contexts in which students and teachers operate within and beyond the formal school environment.

A class visit to a museum can be considered to be an extension of the formal school experience and is frequently planned accordingly, despite the informal setting and free choice environment of the museum. In like manner, classroom-based post visit activities can be considered to be an extension of the informal museum visit, and the potential benefits of so doing have been identified (Bitgood, 1991; Griffin, 1998; Griffin & Symington, 1997). We argue that, from a teacher's point of view, there are definite benefits for designing PVAs that are closely linked to the formal school curriculum. Linking the experiences to the curriculum provides the advantage of an established relevant context to which the students' experiences in the museum and subsequently in the classroom can be related meaningfully (Anderson, 1998; Bitgood, 1989; Griffin, 1998; Wolins, Jensen, & Ulzheimer, 1992.

In a typical school context, teachers are constrained by time and resources, and perhaps their own knowledge, when seeking to develop and facilitate educationally effective PVAs (Griffin, 1998). However, many activities commonly incorporated in the classroom are suitable for modification as PVAs, it being the appropriateness of the link with students' experiences in the museum rather than the specific nature of the PVA that is crucial. For example, carefully prepared work sheets with fairly specific instructions for students to

follow might be quite an appropriate format for PVAs, provided that completion of the work sheets presents opportunities for students to draw upon their personal experiences at the museum in order to enhance their learning, either individually or in concert with others.

Principle 3

Post-visit activities should be related to students' museum experiences and to the broader school-based or other curriculum connected to those museum experiences.

It has been suggested that PVAs should be seen as supporting experiences which help develop students' knowledge and understandings in the light of the wider school, curriculum, and life experiences (Bitgood, 1989, 1991; Griffin, 1998; Javlekar, 1989; Lucas, 2000; Stoneberg, 1981; Wolins et al., 1992). .From a teacher's perspective, PVAs should be developed from the basis of student knowledge which has resulted from the museum experiences, but contextualised within the wider curriculum.

In practice, the third principle requires a teacher to plan a class visit to a museum well in advance of the actual event, and to seek to incorporate as many aspects as possible into the regular curriculum. It also requires the teacher to visit the museum well in advance of the class visit to identify exhibition themes and key exhibits, and to assess their potential for supporting student learning in relation to the broad school curriculum. Part of the process of achieving this is to deconstruct the concepts the designers of the exhibits attempted to convey. Having done so, the teacher will be in a position to organise appropriate pre-visit activities for the students, to anticipate a range of likely student learning outcomes from the museum visit, and to prepare a range of appropriate PVAs.

Principle 4

Post-visit activities should be designed so that they encourage the teacher to respond flexibly to students' emerging and developing understandings and to avoid the PVAs being simply prescriptive in their approach.

Teachers should be sensitive to students' knowledge and understanding so they can direct the PVA in a manner which will provide optimal assistance to students in the construction and reconstruction of their knowledge and understanding. This requires teachers to be both willing and able to adopt a flexible approach to avoid PVAs being simply the completion of mundane tasks set by the teacher. A teacher who is able to respond to a student's knowledge and understanding prior to and during the implementation of the PVA will be likely to provide experiences which are influential in promoting further construction of knowledge and understanding.

Discussion

In this paper we have outlined a view of learning which we regard as being empowering of students' museum experiences beyond the confines of the museum. Further, we presented four principles for the development of PVAs which support and enact this empowerment of students' learning in ways which we regard as being enjoyable, fruitful, and meaningful for students' subsequent learning in school and community contexts. Several practical implications for teachers loom large in the consideration of these principles consistent with the human constructivist view of learning.

Overarching the principles for PVA development is the notion that it vital that PVAs be designed with reference to students' experiences in the museum and to their prior knowledge and understanding. Accordingly, teachers need to attempt to understand their students' knowledge in the domain of the museum exhibition prior to, and emergent during the visit in order to develop effective PVAs.

Because we understand learning to be highly individualistic in nature, we believe that no two visitors will have the same prior knowledge or learning experiences in the museum. Thus it behoves teachers to listen to, and actively seek to explore students' accounts of their responses to the museum and its exhibits. In doing so, teachers will be able to capitalise on the key experiences and unresolved questions of their students in ways that support the wider school-based curriculum. We also believe that is it important for teachers not to be "prescriptive" in their approach to the design and development of PVAs, because what a teacher perceives to be of importance, interest, and relevance may not be congruent with students' interests and needs.

We encourage PVA development that is not only founded on students' prior knowledge and experiences in the museum, but also flexible and divergent in nature. There is immense value in designing PVAs which provide multiple links to a broad spectrum of the school curriculum. In keeping with the human constructivist view of learning, museum visits supported appropriately by such PVAs have the potential to enhance students' learning by providing many opportunities for students to establish links between the museum visit and their school-based experiences, and, indeed to their everyday lives.

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