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FOREWORD

Learning Science from Experiences in Informal Contexts: The Next Generation of Research

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Introduction

Changes have occurred in the ways science educators and researchers view the learning that occurs in, and emerges from, experiences in informal contexts such as museums, science centres, botanic gardens, and aquarium[1]. Prior to the 1980s, there was a search for evidence and a wide spread lack of acceptance that "real learning" occurred in such contexts. Rather, "real learning" was the seen as the sole domain of the classroom and teacher. There are several reasons for this view. First, prior to the 1980s there was not a body of systematic research on informal learning comparable to the body of research on school-based learning. Second, many of the studies conducted in informal contexts merely or considered how learning was effected by differential interventions (such as a change in exhibit format), rather than defining the nature of such learning. The studies characteristically used multiple choice tests and comparative research designs to demonstrate statistically significant effects, rather than the more qualitative measures of learning employed in investigations today. Third, studies of that time naturally adopted perspectives on learning different from those broadly held today. In many of the studies prior to the 1990s, researchers saw learning as the acquisition of facts and information, rather than the gradual, incremental, and assimilative growth in knowledge interpreted in the light of prior knowledge and understanding, that typifies contemporary constructivist views of learning.

Contemporary Research Developments in the Investigation of Museum-based Learning

At the beginning of the nineties, Feher (1990) observed that "the study of learning in science museums is a field in its infancy" (p. 35). In the years following there has been considerable growth and development in this field of research. Changes in accepted paradigms and definitions of learning have resulted in studies that point to the considerable richness of learning that have the potential to emerge from

[1] Museums, science centres, botanic gardens, and aquariums are commonly referred to as museum settings.

experiences in informal settings. By the middle of the 1990s there was widespread acceptance of the cognitive, affective and social value of experiences in museums and similar institutions (Rennie & McClafferty, 1996), and Falk and Dierking (1992) had drawn attention to the physical, social and personal contexts in which learning occurs. Others argued that students enjoyed visits to museums tremendously and that the resulting increased interest and enjoyment of science activities constitute extremely valuable learning outcomes that persist over time (Ayres & Melear, 1998; Ramey-Gassert, Walberg, & Walberg, 1994; Rennie, 1994; Wolins, Jensen & Ulzheimer, 1992). In the later 1990s several researchers (e.g. Anderson, 1999; Falk & Dierking 1997; Gilbert & Priest, 1997; Schauble Leinhardt, & Martin, 1997) embraced constructivist and sociocultural views of learning for detailed investigations of the processes of knowledge development from students' experiences in informal settings. Key to the their epistemological positions were the views that learning is dynamic in nature, and that prior knowledge is not only a strong influence on the learning that occurs in informal settings, but that these experiences dynamically influence subsequent knowledge development beyond the informal setting. This subsequent knowledge development may be realised for the learner in the hours, days, months, even years following the experience.

Views of Learning Appropriate to Today's Research Agendas

Contemporary visitor studies tend not to differentiate between "formal" and "informal" varieties of learning, instead pointing out that the difference is the learning context. In the past, distinctions were made between formal and informal learning suggesting, for example, that the learning that occurred in a school was different from the learning that occurred in a museum. 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)[2]. Like Dierking, we contend that because learning is dynamic in nature, it is false to assume that "real learning" is the providential domain of any one experience, be it derived from a museum setting or a classroom. Rather, the multiplicity of daily life experiences - watching television, surfing the Internet, having conversations, going to science class, or visiting a museum - are the substance from which we continually construct and reconstruct our knowledge and make our own

[2] A continued debate on this issue is taking place in the publication 'Informal Learning Review.' In particular, see Dierking et al, 2002.

meaning of the world around us. We also believe that experiences in informal settings, like museums and science centers, have the potential to produce rich knowledge and understandings if visitors are able to draw connections with their own prior knowledge and are able to see connections with subsequent life experiences, in the classroom or in any other experiential aspect of life. Thus it behooves the teacher to help students to see and connect with museum experiences though adequate pre-visit preparation, and even more importantly, to creatively embed the experiences into the classroom curriculum following the visit.

Future Directions for Research in the "Informal Learning" Field

"Informal learning" research has evolved considerably over the last two decades. It has progressed from studies that simply demonstrate that learning occurs in informal settings to studies that explore the nature of the making meaning and the developing knowledge states of museum visitors. In surveying the literature in the field, it is evident that there are still many worthy questions to ask, and, indeed, many areas of research that are worthy of pursuit in this field. Researchers Hofstein and Rosenfeld (1996) make an 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). Indeed, research that follows people through their daily lives shows that people's learning experiences across "formal" and "informal" environments can be seamless (Ellenbogen, 2002). Increasingly, science museums and like institutions are taking on educational roles to shape the public's understanding of science (e.g. Durant, 1996; Lewenstein, 2001) and therefore their scientific literacy. From our stand point, and that of a number of our colleagues, the level of research issues that typify the field is still evolving.

Despite the considerable progress museums and like institutions have made in the ways they develop and implement education programs for school groups, and despite teachers' appreciations of the educational value of field trip visits to museum settings, there is much evidence to suggest that the experiences students have are under-realised in terms of their true learning potential. Absent from the research to date are studies that focus on the potential for such out-of-school experiences to help students become aware of their own learning processes. This is despite the fact that a number of studies of student learning in formal classroom environments provide

strong evidence that when students are assisted to become aware of their own learning processes (metacognition), they gain much richer understandings of the content of their learning and also become better more empowered learners (Baird, 1986; Thomas, 1999; Thomas & McRobbie, 2001). Understanding such processes would facilitate another level in the evolution of educational research in informal settings. Filling this knowledge void would help school teachers and museum staff to design more educational effective curriculum that are able to realise the greater learning potential of students' field-trip experiences. In addition, it would help students to develop richer cognitive understandings of the topics portrayed in museum-based settings and help them become more empowered life-long learners.

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