Editorial: Research on Learning in Informal Contexts: Advancing the Field?

Justin Dillon, Jonathan Osborne

Editorial: Research on Learning in Informal Contexts: Advancing the Field?

Journal:	*International Journal of Science Education*
Manuscript ID:	TSED-2007-0174
Manuscript Type:	Special Issue Research Paper
Keywords:	informal education, science education
Keywords (user):	

Research on Learning in Informal Contexts: Advancing the Field?

Jonathan Osborne
Justin Dillon
Centre for Informal Learning and Schools, Department for Education and Professional Studies, King's College London, Franklin-Wilkins Building, 150 Stamford Street, London SE1 9NH, United Kingdom

Most children between the ages of 5 and 16 only spend 18% of their waking hours in school (Bransford, 2006). Yet, contemporary society sees school as almost the sole site of learning, whereas the reality is that much, if not more, learning takes place in the social and cultural contexts that are offered outside school – the informal contexts which are the focus of the set of papers presented here. It is not that the students do not learn in school – most do – though what proportion gain more than a basic functional literacy is unclear. The cultural capital that schools present to young people, particularly science, is often decontextualised and lacks apparent relevance (Aikenhead, 2005; Osborne, Simon, & Collins, 2003). In contrast, knowledge gained in the context of its use or application has an immediate salience such that it is remembered and its value understood (Lave, 1988). The vast repository of knowledge that is uncovered by simply engaging in conversation with any individual about their life's passion – be it cycling, skiing, architecture, or art – demonstrates that this is so. This is not, however, to devalue the work of schools but rather to make two points about research on learning in informal contexts.

First that much knowledge is acquired outside school. To date, the study of how it is acquired palls into insignificance compared to the volumes of work that have been conducted in the formal field. In formal education we can point to a body of scholarly work which has accumulated over the past century. And, whilst there will always remain some equivocation about the clarity of its findings in the contested ground of educational research, this work does have clear theoretical grounds and implications for practitioners. In the domain of science education alone, there is, for instance, the almost voluminous Handbook of Research on Science Teaching (Abell & Lederman, 2007) and this journal is now on its 29th Volume. Similarly, the *Journal of Research in Science Teaching* is now into its 42nd volume. Some might argue that we still lack a comprehensive understanding of how science is learnt in formal contexts. Nevertheless, this body of research did allow the panel established by the US National Academy of Sciences to look at what is known about good practice in science education from K-8 to produce an authoritative document (Duschl, Schweingruber, & Shouse, 2006) which addresses, and to some extent answers, questions about what research on learning suggests about how science is learned, or how this body of research clarifies how to teach science in K-8 classrooms. In contrast, it would be difficult, if not impossible, to write an authoritative volume of research on the learning of science in informal contexts. Why? Put simply, whereas the study of learning science in such contexts is still in its infancy, the study in formal contexts is well established.

The second point is that if the study of learning science in formal contexts is difficult, the study in informal contexts is doubly so. Formal schooling at least takes place in highly contained spaces; teachers' characteristics and actions can be observed readily and a wide range of empirical data about both students and teachers can be collected

with comparative ease. It is even possible to manipulate some of the variables so that at least quasi-experimental methods can be applied to test or evaluate different treatments. In the informal context, however, even capturing the data is fraught with problems. First there are the problems of working in an environment where the researcher has little or no control. Not only are researchers unable to structure the interaction of the participant with the exhibit or phenomenon of interest, but they also have considerable technical problems in capturing the data. Informal contexts are often noisy, people in such environments are unpredictable and the ethical issues are more complex. The outcome is that whilst the study of learning science in formal contexts has at least reached the foothills of knowledge and understanding, researchers working in informal contexts are still in the plains gazing at the mountain in the far distance.

It is in this context that the US National Science Foundation, in 2001, funded the Center for Informal Learning and Schools (CILS) to create a programme of research, scholarship, and leadership in the area of informal learning and the relationship of informal science institutions and schools. CILS involves a collaboration between the San Francisco Exploratorium (one of the world's first interactive science centre), the University of California Santa Cruz and King's College London.

One of the goals of CILS is to address pressing problems confronting K-12 science education by focusing on key components of the infrastructure that supports science education, particularly through studying science learning in out-of-school settings, including informal science institutions, and building programmatic bridges between out-of-school and school science learning. In tandem with these studies, CILS has sought to build on and strengthen the methods and research base of this domain. This special edition contains a range of papers summarising some of the work that has been conducted by CILS staff and students.

The papers begin with Deborah Siegel, Jennifer Esterly, Maureen Callanan and Ramser Wright's study of the conversations about science in Mexican-descent families which adds to the body of empirical research about how parents interact with their children. One of its findings confounds those of earlier work which suggest that the style of interaction between parent and child varied with the level of parental schooling. Thus, whilst in one sense, it undermines any emerging theoretical perspectives, in another it adds to the richness of our picture, pushing the scholarly community to ask harder questions and construct better theories to explain the observed effects. Can the difference be accounted for by the extent of the parental schooling which has socialised them into the 'school-like' ways that are considered to be pedagogic? What this paper also shows is that researchers working in informal contexts often have to use considerable methodological ingenuity in order to further our understanding. Here the work compares the behaviours observed in a set home task activity with those in the more naturalistic context of a museum. One surprising finding emerging from this work is the similarity of the talk with that that which might be observed in a formal context demonstrating, if nothing else, that such experiences afford significant learning opportunities. Another is that, contrary to the work probably most strongly framed by Bernstein (1990), parents from differing social backgrounds are equally capable of helping their children to learn.

Jane Lehr, Ellen McCallie, Sarah Davies, Brandiff Caron, Benjamin Gammon and Sally Duensing approach the mountain from a very different direction – that of the public engagement with science. Their focus is on the role and value of dialogue events. They begin by asking and performing a very specific and necessary function of academic scholarship, asking what is of value in this context. And, in so doing, challenging contemporary orthodoxies. The paper offers instead a variety of ways in which these dialogue events might be examined and valued and, as a corollary, asks us to consider what it is that counts as success. For, only if there is any consensus about the goals of this, or any other educational activity, can we begin to answer the question of whether dialogue, or any other event, can be considered effective. Indeed they go further to argue that such events are both reciprocal and mutual and we can and should ask not just what the public learns but what the scientists, experts and others involved learn.

One of the central concerns of the Center for Informal Learning and Schools has been to develop the relationship that exists between the two contexts. In short, given that informal science institutions (ISIs) are an important part of any nation's cultural capital, how can they be more effectively used for educational purposes? One area that has been developed in science centres and museums is in the provision of professional development for teachers. Michelle Phillips**,** Doreen Finkelstein and Saundra Wever Frerichs seek to provide us with baseline data about the extent of this involvement. Based on a survey of over 475 ISIs in the USA, they present data which shows the wide range of institutional involvement, and examines the extent to which ISIs might be following research-based models of good practice. Whilst the findings are in one sense positive, they raise issues about the focus of this body of work and its potential to affect practice. Additionally, they explore what the context of the ISI uniquely affords for continuous professional development that other environments do not?

The contemporary world has transformed the means by which we communicate and engage with each other. The Internet gives us access not only to a vast repository of information but to new ways of engaging with our peers and new ways of representing ourselves. Introducing the concept of 'digital fluency', Sherry Hsi reviews the affordances of contemporary technology for learning and the methods by which the outcomes and effects of such experiences might be explored. Explicit in her review is the recognition that such forms of social engagement are both powerfully motivating and intense learning experiences. Perhaps more implicit is an acknowledgement that these new technologies, and the forms of learning they promote, represent significant challenges to the way learning is conceptualised within formal science education. Her central case, however, is for the need for more extensive study of such environments as these are the context in which many young people are learning. Such studies are essential to reduce the gap between the form of learning in both contexts.

Recently research in informal contexts has been dominated by a socio-cultural perspective (Leinhardt, Crowley, & Knutson, 2002) which has tended to focus on the discourse of participants (e.g. Crowley et al. (2001). Robin Meisner, Dirk vom Lehn, Christian Heath, Alex Burch, Ben Gammon and Molly Reisman, building on the methodological and theoretical traditions of Goffman, examine how exhibits become contexts in which the meaning of the exhibit is mediated by a

process of performance. Using detailed video observations of participants at the new Energy gallery in the London Science Museum, they show how participants actions at an exhibit help to construct a shared meaning and how the exhibits themselves are used in that process of mediation. Their work is therefore important in adding to our understanding of the repertoire of ways in which individuals can construct new meanings from their experience in informal contexts.

It is the sociocultural perspective which sees discourse as the tool of tools – the means by which meaning is mediated and by which understanding is constructed. Ohlsson (1996), for instance, has argued that all higher order epistemic learning is dependent on seven discourse acts which he suggest are describing, explaining, predicting, arguing, critiquing, explicating and defining. If so, then promoting conversations at exhibits is in effect promoting learning. The question is 'How?' By making simple modifications to exhibit labeling, Jill Hohenstein and Lynn Tran explore what the effects are of additional questions, asking to what extent these are generative of learning behaviours. Their work is simple but rigorously and systematically conducted and, like all good research, raises as many questions as it answers. What it shows, nevertheless, is that it is possible to manipulate the labeling of exhibits to generate more productive learning discourse. However, the three exhibits which are the focus of their study all have different effects, suggesting that there are no simple answers to producing discursively generative labels. Nevertheless, the work does show specific examples of how it is possible to manipulate exhibits to enhance the quality of dialogue engendered.

Finally, the work of Doris Ash, Rhiannon Crain, Carol Brandt, Molly Loomis, Mele Wheaton and Christine Bennett raises important methodological issues. Whilst, the sociocultural turn in educational research has led to an emphasis on discourse, it has raised two problems. One is simply the technical problem of capturing discourse in an environment where the subjects of interest move wherever they please. More fundamentally is the complexity of dealing with everyday conversations whose structure is more fluid and less transparent. In response, Ash and her co-workers have developed an innovative tool (Tool for Observing Biological Time over Time – TOTBOT) which attempts to capture the many aspects of conversations engendered by visits to a marine life centre. Their article explores, with a refreshingly frank honesty, the challenges posed by applying such a coding scheme to the kind of discursive data captured in such informal contexts. Their tool enables quantitative representations of the nature of the visitors' discourse – representations which are easily assimilated by an audience. Yet, as they point out, that process of data reduction fails to capture some of the complexity and nuances embedded in such conversations. Their tool does represent a methodological advancement and it is only through such work and reflective examination of methods that the field will be able to sift out those approaches that are more functionally effective.

All research endeavour in education consists of taking a long-term view. Research in education is a slow and cumulative process. Answers to such questions as 'what do children learn from a visit to a museum?' will never be easily obtained. Rather, what the field has done, and to which this volume is a contribution, is slowly develop both our knowledge and the tools with which we may use to answer such questions.

Gradually, we begin to map out the landscape and, in so doing, move us nearer the foothills of a better and more informed understanding of the learning of science in informal contexts.

Finally, we would like to acknowledge the team of reviewers who have helped us to put this special edition together. Our thanks go to Lynn Dierking, John Gilbert, Marcus Grace, Doris Jorde, Jim Kisiel, Terry McClafferty, Jan Packer, Leonie Rennie**,** Sue Stocklmayer, Martin Storksdiek, Elke Sumfleth and Manuela Welzel.

References

Abell, S., & Lederman, N. G. (Eds.) (2007). *Handbook of Research in Science Education*. Mahwah, New Jersey: Lawrence Erlbaum.

Aikenhead, G. (2005). *Science Education for Everyday Life: Evidence Based Practice*. New York: Teachers College Press.

Bernstein, B. (1990). *The Structuring of Pedagogic Discourse: Volume IV, Class Codes and Control*. London: Routledge.

Bransford, J. D. (2006). *Toward a 21st Century Learning Theory:Some Emerging Thoughts.* Paper presented at the Annual Conference of the National Association for Research in Science Teaching, San Francisco, CA.

Crowley, K., Callanan, M. A., Jipson, J. L., Galco, J., Topping, K., & Jeff, S. (2001). Shared scientific thinking in everyday parent-child activity. *Science Education, 85*(6), 712-773.

Duschl, R., Schweingruber, H., & Shouse, A. (2006). *Taking Science to School: Learning and Teaching in Grades K-8*. Washington DC: National Research Council.

Lave, J. (1988). *Cognition in Practice: mind, mathematics and culture in everyday life*. Cambridge: Cambridge University Press:.

Leinhardt, G., Crowley, K., & Knutson, K. (Eds.). (2002). *Supporting Science Learning in Museums*. Mahwah, New Jersey: Lawrence Erlbaum Associates, Inc.

Ohlsson, S. (1996). Learning to do and learning to understand? A lesson and a challenge for cognitive modelling. In P. Reimann & H. Spada (Eds.), *Learning in Humans and Machines* (pp. 37-62). Oxford: Elsevier.

Osborne, J. F., Simon, S., & Collins, S. (2003). Attitudes towards Science: A Review of the literature and its implications. *International Journal of Science Education, 25*(9), 1049–1079.