Museum exhibition research

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1. Introduction

Since their appearance in the 17th century, museum[1] exhibitions have had many roles: spectacular displays of the richness of the world (Van Praët, 1996), systematic inventories of life (Delicado, 2010), tour guides through evolution (Bennett, 1995), analogical representations of the real world (Fortin-Debart, 2003), and multi-sensory immersive scenographies (Belaën, 2003). However, the pedagogical role of the exhibition transects its historical variations: the exhibition constitutes the specific means of education and communication that is unique to the museum (Lord, 2002).

Early research into exhibitions and their educational mechanisms took its point of departure in research from school settings, and was devised to gauge the educational effectiveness of exhibits: how well does the exhibit transmit its intended message? The point of such evaluations was to determine the value of the installation with respect to its educational goal; in case the exhibition failed to meet its objective, remedial action could be undertaken (Screven, 1976). This remedial action, however, was described in very general terms:

> Exhibits can often be improved by changing a few artifacts or their juxtapositions, rewriting the text, changing lighting, or adding programmed audio tapes, self-guide booklets, visitor participatory components, and so on (Screven, 1976, p. 275).

Although the rationale for studies such as the above was to improve exhibit and exhibition design capabilities, without a systematic approach to the causal link between scientific content, exhibit medium, and visitor outcome, the lessons that could be learned from such studies and applied to exhibit design were of a very general nature. Indeed, the content aspect seems to be missing from much early exhibition and exhibit research. In 1976, Linn described the questions of interest for exhibit evaluation as "Who is the user audience? What do they do? Why do they come?" and the outcomes of exhibit evaluation as being useful for making

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minor changes to existing exhibits (for example, providing stools so small visitors can see an exhibit) or deciding which (unpopular) exhibits to withdraw to avoid crowding. (Linn, 1976, p. 295). What is the reason for the lack of consideration of the content?

The focus on the visitor is perhaps understandable; after all, the visitor is the *raison d'être* of any museum exhibition (Mortensen, 2010b). Furthermore, the attempt to support successful exhibit interactions regardless of content probably reflects a desire to create broadly applicable guidelines for exhibit design. But while both endeavours: understanding the visitor and creating content-independent design guidelines are reasonable, research tells us that human thinking and problem-solving are always modulated by the content of the task at hand (Schauble et al., 2002). Accordingly, research into exhibition design cannot ignore the specific content that is to be exhibited because we cannot separate the way science is constructed and staged in exhibitions (the exhibit design) or the way it is taken up or understood by visitors (visitor outcomes) from the science content itself (Bosch, Chevallard, & Gascón, 2006).

Yet, for various reasons, much Anglophone research pertaining to exhibitions and exhibits has continued to pose general questions about the visitor and the exhibit medium, ignoring the scientific content (Gilbert & Stocklmayer, 2001; Laherto, 2012; Mortensen, 2010b). A literature review[2] carried out in 2010 yielded 54 research reports published from 1990 to 2010; here, the interaction between visitor, content and exhibit was only considered in 4 instances while themes pertaining to the exhibit, the visitor and the interaction between them were considered in 52 instances (Figure 1).

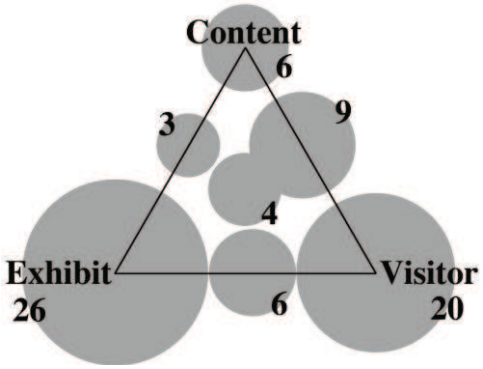


Figure 1. The emphasis of the literature pertaining to exhibition design in the period 1990-2010 (reviewed in Mortensen, 2010a). The area of the grey circles is proportional to the number of instances in which the particular theme or intersection of themes was considered in the reviewed papers.

2. The contribution of didactics

One reason for the persistent attention to the exhibit medium and the visitors may be the strong *curriculum tradition* in the Anglophone countries: a tradition that tends to focus research on questions of issues of teaching styles and teaching methods. However, just as the Anglo-American science education research can enrich and be enriched by the continental European tradition of *didactics* (Fensham, 2002), the Anglo-American research into exhibition design can enrich and be enriched by continental European ideas of *didactic³ design*. In the didactics tradition, the focus is on the specifics of the content to be learned and taught, and how those specifics interact with the teaching medium and the learner. Didactics assumes that science content as it is produced in a research context is not automatically in a form that makes it readily teachable; accordingly, it must be adapted or *transposed* to a form that makes it teachable and learnable (Bosch & Gascón, 2006). The notion of didactic *design* is based on the understanding of teaching/learning situations as something that can be engineered or designed (Artigue, 2008) rather than as naturally occurring phenomena that can only be studied scientifically, from the outside (cf. Schauble & Bartlett, 1997). In the following, I will outline recent developments rooted in the field of didactics that address science exhibition design from a content-engineering perspective.

3. Theories and models for exhibition design

3.1 Didactic Transposition and exhibition design

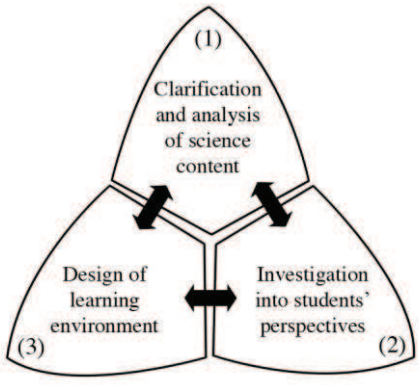
The notion of didactic transposition originated in the field of sociology (Verret, 1975), but has since been adopted in mathematics education (Chevallard, 1991) and biology education (Clément, 2007) as a way to understand how knowledge produced in the research context of the disciplines was transformed by various actors into *didactic objects* in the educational context of these disciplines. Since the mid-nineties, the notion of didactic transposition has been used in a growing number of studies on exhibition development (Marandino & Mortensen, 2010). At first the notion was used simply as an acknowledgement of the knowledge transformation that took place in museums (Allard, Larouche, Lefebvre, Meunier, & Vadeboncoeur, 1996). Gradually, the notion gained more complexity, including

considerations of socio-cultural and institutional contexts (Marandino, 2001; Simonneaux & Jacobi, 1997), the semiotics of the objects to be exhibited (Asensio & Pol, 1999; Gouvêa de Sousa et al., 2002), and the notion of an epistemological reference model (Mortensen, 2010b). Along with its increasing complexity, the notion of didactic transposition also changed from being purely descriptive to being more normative. With the appearance of the epistemological reference model, the central didactic questions begin to change from the descriptive "where does the knowledge come from?" to the more normative "what is the goal of teaching that particular object of knowledge? What connection does it have to the scientific object of knowledge to which it refers?".

3.2 Educational Reconstruction and exhibition design

Going beyond descriptive models, Laherto (2012) created a normative model of exhibition development based on the notion of *educational reconstruction*. Educational reconstruction is rooted in didactics, taking its point of departure in considerations of science content, learners' characteristics, and the creation of a learning environment (Figure 2). In order to adapt the model of educational reconstruction to the informal learning context, Laherto enriches it with the model of *personal awareness of science and technology* or PAST (Stocklmayer & Gilbert, 2002) which regards learners as individuals with unique attitudes, needs, interests, and experiences.

Figure 2. The model of educational reconstruction (adapted from Duit, Gropengiesser, & Kattmann, 2005). According to this model, the content to be taught is analysed and clarified; there is an investigation into learners' perspectives, and the teacher or designer creates the learning environment. These investigations are carried out recursively; i.e. the results of one investigation can influence the results of another; thus, the process must be continually carried out until all elements co-exist without tension.



Laherto sees the developed model of exhibition development as a way to create educationally sound exhibitions as well as a way to bring museum research and practice closer together. It is a research based model which requires the user to engage in research

activities; thus using the model can both inform the exhibition development process and contribute to the educational research literature. However, constraints on time and resources may preclude museums from engaging in research activities to the extent that they can produce publishable papers; it is up to these professionals to proportion the educational research activities to other important considerations in the development practice (Laherto, 2012).

3.3 The Anthropological Theory of the Didactic and exhibition design

In the last example given here, Achiam (née Mortensen) published a series of papers that studied the design (Mortensen, 2010b) and implementation (Mortensen, 2011) of a science exhibit, and synthesised a model of exhibit engineering on the basis of this analysis (Achiam, 2012). The framework used in this work is the Anthropological Theory of Didactics or ATD (Chevallard, 1999, 2007) that is based on the notion of didactic transposition mentioned in the preceding. ATD goes beyond didactic transposition by conceiving of human activity in *praxeologies*: units that include the practical and cognitive activities that result from our interactions with the world (Chevallard, 2007). This, what is transposed in the creation of teaching activities or educational environments is no longer just knowledge, but should be thought of as praxeologies: sets of content-related tasks, actions and reflections. In this perspective, a science exhibit can be seen as an embodiment of a praxeology: certain content-related tasks that museum visitors can perceive, act and reflect upon (Mortensen, 2011).

The content-oriented model for exhibit engineering presented by Achiam (2012) uses praxeology in two ways: as a template for exhibit design, taking its point of departure in the original scientist's praxeology that created the science content in question; and as a means to prospectively model the intended interactions of the visitor with the exhibit. It argues for the use of the *didactic process* as a way of executing or embodying the intended visitor's praxeology in a physical exhibit (Figure 3).

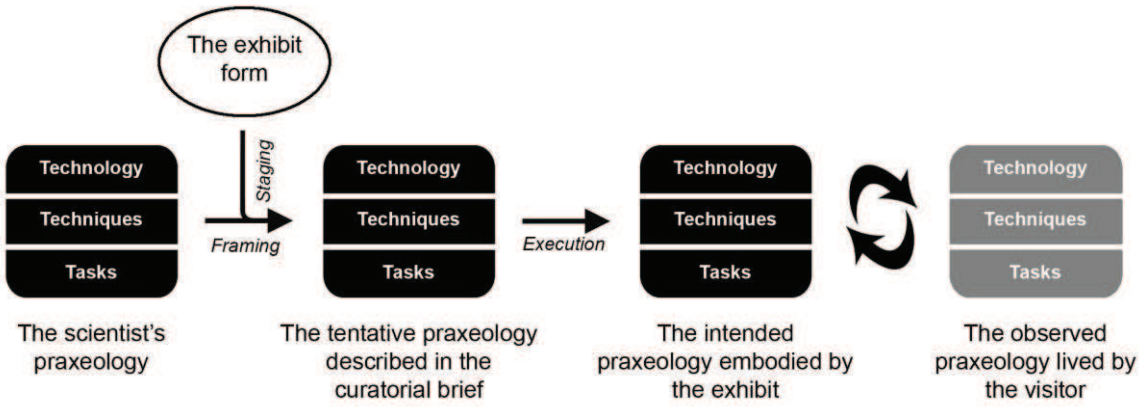


Figure 3. The model of exhibit engineering presented by Achiam (2012). Praxeology, a general model of human activity, is the focal point of the model.

Just as in the model of exhibition development created by Laherto (2012), significant research activity is required in order to use the model. Achiam describes the target audience for the model of exhibit engineering as the museum education research community, including researchers in academia as well as the growing group of professionals who work in the research departments of museums. These professionals typically conduct and report research as well as implementing it in collaboration with the museum's exhibition department and are therefore ideally positioned as mediators between theory and practice (Achiam, 2012).

4. Final remarks

The appearance in the Anglophone literature of exhibition design frameworks and models that are rooted in the continental European tradition of didactics has several implications. First, the use of the notion of didactic transposition is an indication that science content is beginning to come into focus in the museum research community alongside considerations of the learner and the medium. Second, the appearance of normative models that attempt to not only describe how exhibitions come into being, but also to set guidelines for how exhibitions *should* come into being, is a shift towards thinking of exhibitions as the result of a deliberate engineering process. In other words, the 'stubborn streak' described below by Falk and Dierking is being replaced by a more constructive paradigm.

> There still seems to be a stubborn streak running through our profession that treats museum exhibitry and programming as a mysterious art, entirely dependent on the

> instincts and skills of the exhibitor and programmer, rather than being built on a common body of knowledge (Falk & Dierking, 2000, p. ix)

Third, the models presented here represent ways of operationalizing the rather general and abstract principles of the constructivist learning paradigm. Constructivism holds that humans learn by constructing new cognitive, affective, or procedural capabilities on the basis of their already-existing capabilities. The notion of PAST places the focus on visitors' existing knowledge in the exhibition development procedure while the notion of praxeology describes in great detail how the intended learning process can take place as well as what the requirements for the process are. Accordingly, the didactics-based models of exhibition design outlined here may be thought of as intermediate frameworks in the sense of Ruthven, Laborde, Leach, and Tiberghien (2009): theories that can mediate between grand theory such as constructivism and the process of design.

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[1] The term *museum* is used here to describe institutions that have as their primary objective the informal dissemination of science, nature, and technology, e.g. science centres, natural history museums, aquaria, zoos, botanical gardens, etc.

[2] The literature search was based on the search engine Google Scholar using the key phrases science exhibition design and science exhibit design, with and without quotation marks, which yielded 54 research reports published from 1990 to 2010 in international, peer-reviewed, Anglophone journals (Mortensen, 2010a).

[3] The term *didactic* in English has come to mean lecturing or moralising; here it is used in its original sense to describe something that is *instructive* or *designed to disseminate*.