# Chapter 7: Individual Differences in Learning in Informal Settings

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## Abstract

One characteristic of museums and zoological parks is the diversity of their visitors. Typically, visitors will consist of a range of ages, both sexes and a range of background and experience. Add to these variables the probability that visitors will be more or less verbal, learn better from visual or aural presentations, be more or less inhibited or aggressive when confronted with a hands-on situation, be more or less attentive, have more or less conceptual or factual knowledge about the exhibits, have well developed memory skills or none at all, and will differ in their ability to function inductively and we see the critical role of "individual differences." Individual differences may be compensatory or facilitative. If an aptitude is well developed, such as visual learning skills, the aptitude can facilitate learning from an exhibit. A well-developed aptitude can also function to develop or assist in developing another aptitude. Defined, an aptitude is any characteristic of a person (cognitive, affective or psychomotor) that functions to either facilitate learning or interfere with it. Research on individual differences usually involves testing for aptitudes, the administration of a variety of treatments designed to achieve a specific outcome, and measuring the outcome in relation to the aptitude. The objective of this research is to address the question, "For whom is a presentation of this type most effective in achieving the specified outcome." This chapter describes a model presented in recent publications, elaborates on variables involved in the model, and suggests potential research areas for exploration.

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Existing research and evaluation has focused on some variables in each of the categories noted in Figure 1. For instance, in the Visitor Processing Activities area, much of the early research has considered attention (Screven, 1974; Dierking, 1984; Falk, 1985; Koran, 1984,

1986, 1988). One major reason that attention has been a popular variable for exploration is the relative ease of ascertaining and measuring whether or not visitors are paying attention. Researchers can observe a visitor standing before an exhibit and time the period the visitor spends in front of the exhibit. Similarly, researchers can observe visitors confronted with different types of exhibits and do studies comparing attention to different exhibits. In the Falk and Dierking studies, individuals and families were tracked and their attention to exhibits, self, others and attention within families were quantified. The inference in these studies is that if an individual remains in the vicinity of an exhibit and attention is paid to objects or events occurring in the exhibit, learning will result. As we all know, this inferential leap does not account for individual differences such as prerequisite knowledge or the inevitable variability in coding, memory, and retrieval skills. Consequently, the model in Figure 1 was first proposed to suggest that there are many aptitudes, processing methods, exhibit variations and outcome variations that could fruitfully be studied beyond attention. Further, it may be possible to design simulation exhibits for study and to conduct research under conditions where individual differences, processing methods, exhibit types and outcomes can be studied simultaneously. One experimental design approach to the simultaneous study of these four variables in museums and zoos has been described in Koran et al (1984). This design is commonly employed in an area of research called aptitude-treatment interaction research. Figure 2 supplies the range of variables that might be studied in controlled experimental settings in museums, zoos, nature centers and even schools, and suggests aptitudes, treatments and criterion variables that might be manipulated.

Two variables that will be focused on in this paper are the amount of mental energy (AIME, Saloman, 1983) expended by visitors and the degree to which visitors can be influenced by the manipulation of their perceptions. Saloman (1983) describes AIME as the number of non-automatic mental elaborations applied to a unit of material. By non-automatic mental elaborations, he means that when things are considered "easy," mental elaborations are automatic and the processing is often shallow. Conversely, when the number of non-automatic mental elaborations is high, the task is perceived "difficult." In his research, Saloman found that television is perceived as "easy" while text or print is considered difficult by students. He refers to PDC as the "perceived demand characteristics" of a unit of material, or the amount of mental energy necessary to process such materials. AIME is measured by self-report methods as well as written measures during which learners generate inferences. The AIME correlates .67 with the number of generated

inferences. In short, learning depends on the differential ways in which sources of information are perceived. These perceptions influence the amount of mental effort expended in the learning process. Deeper processing is reported to be related to improved long term memory of text material, recall of conceptual information and transfer to new material. As Saloman points out, motivation is the driving force, but for learning to actually take place, some specific mental activity needs to take place.

The implications of the above research are that it is neither practical nor cost efficient to consider changing different exhibits. Instead, the processing or orienting instructions provided for the learner can be varied to fit various subgroups. Among these variations can be adjuncts such as behavioral objectives, advance organizers, questions or perspectives (Screven, 1974). The AIME research is particularly relevant here because visitors can be influenced by written or visual materials to perceive learning from museum or zoo exhibits as being easy or hard, educational or entertaining, thus influencing the effectiveness of a given exhibit. In short, perceptions are varied rather than exhibits to facilitate acquisition, storage and retrieval of information.

A similar line of research was carried out by Anderson et al (1977). This research, called perspectives research, showed that one could alter what was learned and remembered from text by giving different learners different perspectives. Rather than influencing the learner's perception of a task as "easy" or "difficult," in this research treatments are designed to influence perspectives. In one study, subjects were given a passage to read concerning a house. Group 1 was told to read it from the perspective of a burglar, Group 2 from the perspective of a home buyer. As a result, the burglar perspective lead to attention, coding and memory of the locations of the silver, T.V., VCR and other expensive, marketable items. The home buyer perspective led to the attention, coding and memory of details such as the size of the house, traffic patterns, size of the kitchen, location of the closets, etc. These results were interpreted to mean that schema brought into play by the perspective instructions selectively enhanced encoding when operative during attempts at recall. Perspective influenced which elements were learned, recalled and retained more efficiently.

In museums, zoos and other informal settings, written and visual or audio stimuli can provide a unique perspective for exhibits of different types. It is possible that differences in perspectives could alter what visitors learn and remember from different exhibits. As in the AIME research, these perspectives can be varied without changing the nature of

the exhibit. Different perspectives can be designed and tested for different age groups and exhibit types thereby influencing processing activities beyond attentional behavior for a wide range of outcomes.

Finally, research in informal settings has frequently focused on cognitive outcomes. It may be that affective outcomes such as interest, motivation, and increased curiosity are being affected by different types of exhibits or exhibit adjuncts, but since they have not been measured as outcome variables in existing research, data is lacking on these variables. One recommendation emerging from both Figures 1 and 2 is that we need to broaden our perception regarding what kinds of exhibits result in what kinds of outcomes for what kinds of people, and how we can simply and inexpensively influence exhibits and outcomes. The research team at the University of Florida is convinced that preliminary studies of AIME and perspectives that have been done in contexts other than informal settings could lead to exciting studies and useful findings in the future in informal settings.

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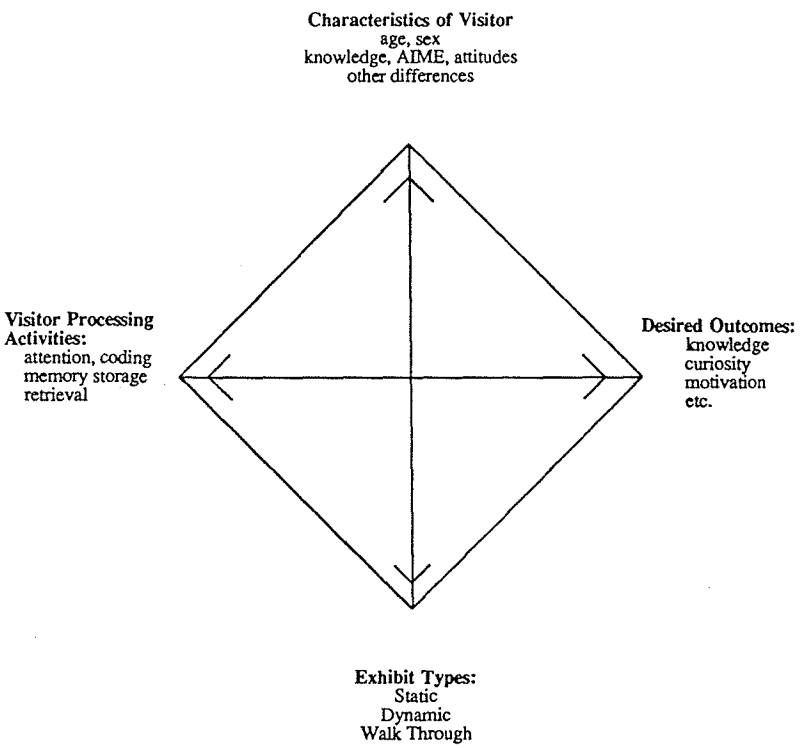
Figure 1

A FRAMEWORK FOR EXPLORING MUSEUM EDUCATION RESEARCH



## Figure 2

## Model Variables

1. Characteristics of Visitors
   a. age/sex
   b. entering knowledge
   c. curiosity
   d. inductiveness
   e. associative memory
   f. verbal fluency
   g. abstract reasoning
   h. cognitive styles
   i. AIME (amount of invested mental energy)

2. Visitor Processing Activities
   a. attention-type, duration
   b. coding strategies
   c. search procedures
   d. metacognition
   e. memory strategies
   f. orienting activities
   g. visitor perceptions

3. Desired Outcomes
   a. factual knowledge
   b. conceptual knowledge
   c. process knowledge
   d. curiosity
   e. heuristics of the above
   f. attitude change

4. Exhibits
   a. static case exhibits
   b. walk through exhibits
   c. dynamic hands-on exhibits
   d. variations of the above