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ABSTRACT

Education is one important role of zoos, but there is relatively little research on the extent to which zoos are serving this role. Traditional methods for collecting and analyzing such information have significant disadvantages in zoo settings and should be supplemented (not replaced) by nonreactive measures. To test this concept, teams of graduate students conducted six different research projects using nonreactive methods to investigate selected behavior of recreational visitors at the Los Angeles Zoo. Brief synopses of each study are provided. These studies focused on: (1) visitor "turning preference" in a zoo; (2) determinants of the holding power of zoo exhibits; (3) sign reading at two zoo exhibits; (4) children's reactions to selected animals in a petting zoo; (5) animal stereotypes; and (6) intergenerational communication. The studies contributed to knowledge of the educational impact of zoos and to development of nonreactive research methods and improved student research abilities while requiring students to work under conditions faced by contract researchers. In addition, the studies provided future students with a more advanced starting point for further research and contributed to zoo-university cooperation. (Discussions of nonreactive research methodology and the course in which the research projects were carried out are included.) (JN)

ISSUES REGARDING NONFORMAL EVALUATION OF NONFORMAL EDUCATION IN ZOOS

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Paper Presented at the Biannual Meeting of the

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Teams of graduate student conducted six different research projects using nonreactive methods to investigate selected behavior of recreational visitors to the Los Angeles Zoo. The studies contributed to knowledge of the educational impact of zoos and to development of nonreactive research methods, improved student research abilities while requiring them to work under conditions faced by contract researchers, provided future students with a more advanced starting point for further research and contributed to zoo-university cooperation.

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Introduction

As we all know, zoos serve conservation, research, leisure and educational roles. The educational role of zoos involves at least four distinct groups: professional zoo personnel, docents, students in formal courses and recreational visitors. Traditional instruments such as tests, questionnaires and interviews may be appropriate in evaluating the effectiveness of programs for the first three groups. For practical and technical reasons these methods are less appropriate for the latter group.

On the practical side, patrons probably think of the zoo primarily in terms of leisure. Many but not all will complete a brief questionnaire or interview if asked. But, long experience has demonstrated the dubious reliability and validity of results based on volunteer rather than random selection. Further, patrons are unlikely to volunteer more than a few minutes of their time, or to expose themselves to embarrassment, placing important limits on the scope and depth of each instrument.

On the technical side, tests are designed to determine the degree to which a relatively homogeneous groups has mastered a known and fixed body of material. A calculus test would be given to students in a calculus class and not to a random group of people walking through a

shopping center. The students can be assumed to have studied trigonometry and algebra, but not Boolean algebra, Bolyaian geometry, propositional calculus or theory of numbers. Consequently, we know what can and cannot be tested.

No such assumptions can be made about recreational zoo visitors, who range from infants in carriers to the elderly, from grammar school dropouts to PhDs, from first-time visitors to frequent and regular ones. Some visitors spend 5 seconds at an enclosure, some 5 minutes. Some read the signs, some don't. Those who don't may not be able to read, may not read the language of the sign, may never read signs, may have read them on prior visits or may know more about the animal than the sign tells.

Another technical problem with questionnaires, interviews and tests stems from their tendency not just to measure behavior, but to change it as well. That is, they are both obtrusive and reactive. For example, respondents in a zoo setting are likely to respond more favorably to an interviewer asking about conservation of endangered species than they would if asked precisely the same questions in a more neutral setting such as a shopping mall, because respondents tend to shade their answers in the direction they think interviewers are looking for.

For reasons such as these, many researchers have become interested in the potential of "nonreactive" or "unobtrusive" measures. The terms are interchangeable, although the former is increasingly preferred. They represent Sherlock Holmes's approach to social science. The most important types are observation, records and physical evidence. The latter usually is divided into erosion and accretion measures.

A classic erosion measure is estimating exhibit popularity in museums by the rate at which the tiles in front of each wear out

(Duncan, 1963). A classic accretion measure is determining from their garbage whether the rich or the poor are more wasteful of food (Rathje, 1979). An example of nonreactive observation is Gearing's (1952) study of subcultural awareness in south Chicago using shoe styles to determine lifestyle. In general, the flashier shoe tended to belong to the more culture-bound individual. Records have been used to determine popularity of specified types of books by the rate at which those with particular call numbers are borrowed from or reshelved by libraries.

Such measures are not a new idea: among the early instances in the research literature are a series of studies in museums by Melton in the 1930s. Webb, et. al. (1981) collected and classified numerous examples in the first comprehensive treatments of the subject. They argued that nonreactive measures could be useful in supplementing more traditional methods, and that nonreactive measures might also permit social scientists to study questions difficult to address with traditional methods.

NONREACTIVE RESEARCH ON THE EDUCATIONAL ROLE OF ZOOS

The scarcity of systematic research on the educational impact of zoos, the inappropriateness of traditional instruments for conducting such research, and both the challenge and potential of nonreactive measures provide an obvious challenge. To meet it, arrangements were made for a research methods class to meet Saturdays at the Los Angeles Zoo. Six teams of three graduate students each conducted research projects within time limits imposed by the length of the class. The class was designed to simulate the conditions under which applied or contract researchers often work in the United States. This insured conditions strange to most academic researchers and seldom addressed in

textbooks on conducting research but which students in an "applied" behavioral science graduate program needed to understand.

Each team had 10 weeks to design, formally propose, gain acceptance for, complete and present results. Specific tasks were required each week and the final deadline was real, fixed and distressingly eminent for students who for the most part had read but not done any research. This simulated contract research, in which the client closely monitors progress and need not pay for a report not completed on time.

Working on a research team involves depending on others and it involves discussion and compromise and frustrations not encountered in working alone. But, research is seldom done any longer by individual investigators, and learning to work on a team is a necessity seldom discussed in textbooks and better experienced than read.

All teams had to investigate some aspect of learning in zoos. Although this was defined to include both cognitive and affective learning, teams had to use nonreactive research methods and to insure that they maintained some relationship with traditional social science, they had to make comparisons across time, groups or conditions. Imposing such restrictions also simulated the real world of contract or applied researchers, who lack the freedom to investigate problems that interest them but must instead tackle problems of interest to clients, often using methods prescribed by them.

No team was permitted to begin data collection until a formal proposal had been submitted and had been approved by the instructor and the Zoo's Director of Research. This served the obvious purpose of providing a mechanism for protecting the interests of the Zoo and the rights of its patrons. But, it also simulated the process of submitting a proposal to a funding agency and so served an instructional purpose as

well. Although proposals had to follow a prescribed format, not knowing quite what was and was not acceptable to the reviewers simulated the ambiguity and anxiety applied researchers must learn to face in the competitive world of grants and contracts.

Two copies of the final report were required, one for the instructor and one for the Los Angeles Zoo. Although the papers could not be expected to reach the standards expected of a masters thesis, reports were required to follow the format required for theses. This put students on notice that higher standards than customary for term papers would be demanded. It prepared them to write a thesis in future. It provided a simple means of standardizing the appearance of the reports from all six teams.

Each team had to present a summary of their research at the last class meeting. Zoo staff and students in the prerequisite research courses were invited to attend. Although only two of each actually appeared, the likelihood of an audience that had not participated meant that the students had to be prepared to explain their rationale, data collection and results to people who did not share their assumptions but who did have specialized knowledge about the methods and substance of their work. This audience, published abstracts, enforced time limits on presentation length, and the instructor serving as moderator gave the presentation most of the trappings of a formal academic conference.

Six Student Research Projects

Those interested in a summary of the actual findings are referred to the paper I will be presenting next week at the meeting of the American Association of Zoological Park and Aquarium Administrators (Churchman, 1984). My purpose today is not to present the results of

the projects, but to discuss issues pertaining to the conduct of evaluative research in zoos. Still, it is useful to provide you with brief synopses of each.

1. P. Ricci, G. Sova and J. Squires. Visitor Turning Preference in a Zoo.

Melton (1935) established that museum visitors tend to turn right regardless of exhibit design. But, the Los Angeles Zoo is built in a canyon, so that turns are not just right or left, but also up, down or level. Twenty-seven 45-minute observation periods were conducted at three t-shaped intersections, covering all directions equally, by researchers who simply sat at one of the many convenient benches looking as much like visitors taking a break as their clipboards allowed. Only two people, one a zoo staffer who knew about the project, gave them more than a passing glance. Results suggest that choice of direction is influenced more by terrain grade, by time of day and by the interaction of the two than by the right-turn bias suggested by Melton. This insures more traffic early in the day and perhaps in total for certain exhibits (e.g., aquatics, Australia) than for others (e.g., flight cage, South America).

2. M. Bowman, M. Hamamura and C. Stockton-Payne. Determinants of the Holding Power of Zoo Exhibits.

Linn (1981) reported learning is positively correlated with time spent at museum exhibits; Loomis (1974) and Clowes and Wolff (1981) both reported that time spent at an exhibit is itself influenced by group size, and Wolf and Tymitz (1978) reported that time spent at an exhibit is influenced by time of day. Therefore, this team counted the number of people in each group and timed how long each group spent in 9 different exhibit areas. of 1440 groups observed, groups of 2-3 predominated. No differences were detected but any that exist would

have been obscured by the team's rounding all basic data to the nearest minute.

3. L. Buck, M. Drulias and C. Norris. Sign Reading at Two Zoo Exhibits.

Study of sign reading has a well-established tradition in zoo research. The Los Angeles Zoo was in the final stages of replacing all signs with new ones that are state of the art as to material, placement and content, and include outstanding pictures of each animal by Julie Nagata, the zoo's own artist, and vital in a zoo dedicated to mixed exhibits where possible. The tiger and ruffed lemur exhibits were selected for study. The proportion of visitors to each who read signs, and the time they took to do so, was determined, this time to the second. Data was collected in such a way that any differences in sign reading between exhibits, sex of visitors and sex could be assessed, but the requisite t-tests and chi-squares were not completed by the students. This was disappointing, but another part of the study was successfully completed and is interesting. Twenty-nine of the new exhibit signs were subjected to a computer analysis of reading level, an astoundingly simple process I recommend to all. Results for complete signs ranged from grade 5 to college sophomore, with some sections as low as grade 4 and as high as college graduate.

4. J. Frank, L. Zimbelman and G. Thomas. Childrens' Reactions to Selected Animals in a Petting Zoo.

Education is not strictly a matter of acquiring facts, but also of developing attitudes. Many zoos have a contact area where children are provided the opportunity to pet and feed animals. By direct observation of 1005 children, this team determined that goats were more popular than ducks and ducks more popular than sheep; that goats drew the greatest amount of positive responses, ducks the greatest amount of neutral

response and sheep the greatest number of negative response, each of these categories having been operationally defined prior to commencement of data collection. Girls demonstrated more negative reactions than boys, but this category comprised both aggression toward and fear of animals.

5. B. Berman, D. Earnest and D. Silver. Animal Stereotypes.

Animals dominate the earliest tales children hear and may influence lifelong attitudes toward them. Characters in such tales are cast in absolutes: for example, and despite exceptions, elephants often are strong and intelligent, wolves often are ferocious and villainous and bears often are gentle, clumsy and clownlike. Data was collected by eavesdropping limited to the first two, presumably the most spontaneous, remarks made by randomly selected visitors as they approached the African elephant, timber wolf and sloth bear exhibits. Elephants evoked almost no negative comments, and children often identified them as Dumbo or Babar rather than as elephants. In contrast, wolves evoked almost no positive comments, children making remarks such as "There's the Big Bad Wolf," while adults often showed concern lest the animals swim the moat, in which case they feared being eaten "in a bite." Bears evoked few negative comments, and people appeared surprised at such effective looking claws, as if they did not fit the image held of the animals. That is, the team found evidence of differential response to animals apparently rooted in children's literature which persisted into adulthood.

6. J. Daniels, N. O'Brien, R. Saria. Intergenerational Communication.

Gerontological theory can benefit from an increased understanding of communication between the elderly and the young. One setting in which such interactions can readily be observed is the zoo. Eight

groups of senior citizens accompanied by children were followed to record nonverbal behavior and communication of seniors with accompanying children both at and between exhibits. Lacking sophisticated recording equipment this required standing close enough to overhear without being detected for a full hour, a feat successfully accomplished by a system of rotating the observer from a "pool" of researchers following from a distance. The route taken by each group was mapped and annotated. At the end of one hour six of the eight groups reached the same point within 50 yards, and the seventh was following the same route but much more slowly.

Content analysis using a multiple rater system led the team to suggest a typology of interactions. Five of the eight groups were judged to be instructive though the interactions were sometimes two-way and sometimes only one-day (adult to child). These groups provided a demonstration of the combined recreational and educational nature of zoo visits. Six of the groups, including all judged to be instructive, were judged to be affectionate, while the remaining two were classified as authoritative, noninstructive and noninteractive. Most intergenerational communication was between senior females and children, and they also set the pace for the group, while senior males remained detached both emotionally and physically, a finding consistent with Neugarten's (1973) study that suggest women become more dominant and men become more passive as they age.

Simplicity

The projects were simple, perhaps disappointingly so to many here. There were three reasons for this. Two are practical: first, no funding was available, which limited the number of hours that working students could put into each project and eliminated any special equipment. Second, all projects had to be completed in 10 weeks. Third, my goal was a simple project well-done rather than an elaborate one poorly done, even if the goal was not always achieved.

But, the simplicity of the individual projects is deceptive, as potentially they are akin to the pieces of a jigsaw puzzle. Cross-analysis of the projects has the potential for improved understanding of how people utilize the zoo. Consider, for example, how the route maps of the intergenerational study group and the right-left turn data can be used to develop a comprehensive picture of the general route followed by visitors. Or, how the data on group size and time at exhibits can be combined with sign reading information to develop a more accurate idea of cognitive learning. Two projects both investigated children's attitudes toward animals from quite different perspectives. To facilitate such analyses, teams were asked to collect data where possible during the same morning, midday and afternoon hours. Unfortunately, this idea proved premature and will have to await replication of the studies to correct the mistakes made the first time around.

Learning from Mistakes

Having mentioned mistakes, it is worth noting some of them. The two teams that were required to rewrite their proposals ran out of time

before completing appropriate statistical tests, and the team that was timed people to the minute instead of the second (much to my surprise when I heard the report--a detail of supervision that escaped me) did not have data accurate enough to warrant statistical testing. The second team probably should have selected more varied exhibits than they did to enhance variance in their data; similarly, the third team almost certainly would have improved their study by selecting signs on the basis of their reading level.

Although we all talk about learning from our mistakes, most of us would prefer not to make them. But trying to design error-free research often results in limiting work to trivial problems, problems for which the answer is already known, an incredibly low level of output, or all of these problems. The mistakes are easily corrected during replication and some were not even recognized until data collection or even analysis began. Such improvements were one reason for conducting the studies in the first place. Happily, no serious mistakes, such as a member of one of our teams being reported to zoo security by a visitor fearful of child molesters (a matter much in the news while the research was being conducted), took place.

Ethics of Nonreactive Research

The techniques described are unobtrusive and nonreactive compared with traditional research techniques such as questionnaires and interviews. But, are they ethical? Individuals will vary widely on what is and is not ethical in research, and obviously no research would be possible if everyone's principles had to be observed by every researcher. A more practicable and legalistic approach has evolved that rests primarily on two principles.

The first principle is whether the knowledge gained outweighs the risk to subjects. On one side of this seesaw is the sparse literature on the educational role and impact of zoos, suggesting that almost any systematic research will add to our knowledge. On the other is the risk of physical or psychological harm to subjects, which because the methods are unobtrusive and cannot be traced back to a specific individual are at least legally non-existent. The balance clearly favors continued conduct of research of the type being described.

The second principle sometimes required for conducting research on human subjects is informed consent. In the United States it emerged in reaction to a few of notorious experiments and gradually evolved to strike a better risk/benefit balance. This evolution has led to the principle that informed consent is required only when the risk to subjects exceeds "the hazards of normal everyday life." Specifically, whenever data is collected in a public setting, with no manipulation of their behavior, informed consent is not required. This is an important exception, without which research such as described in this paper would not be possible.

Independent Review

As noted above, two reviewers had to be independently satisfied before any data could be collected. I do not know the criteria that the Zoo's Research Director considered, although the impact of data collection on zoo patrons and and adherence to good research principles clearly were among them. She approved two projects, suggested modification to two, and required a complete rewrite of two, feeling in one of the latter cases that data collection would not be sufficiently unobtrusive.

I approved one, required modifications to three, and required a complete rewrite of the same two proposals, though I was less concerned with the unobtrusiveness of the data collection. In one case, where the weaknesses could be corrected in the final report, the teams were permitted to begin data collection on schedule in Week 5. But, in the cases where sampling, instrumentation and data analysis were poorly developed, data collection was not permitted until these obviously major problems had been eliminated. The important point, perhaps, is that the students understood the weaknesses of their own work, worked hard to correct them, and blamed themselves and not the reviewers for the shortcomings of their original designs. I am convinced that one reason for this is that students were told not simply that their work was poor, but given highly specific information on what was wrong with all proposals (not just their own) and suggestions on how to correct them that ran 26 pages and approximately 6500 words.

Cumulative Results

The studies described above have been designed from the start to facilitate continual improvement in both methdological and substantive knowledge. When the course is offered again, the students will be expected to make use of the work done by the first six teams. Obviously, they can take advantage of what we did right, and can correct the mistakes we made and recognized. Rather than review the same literature again as the first teams, that literature has has been abstracted and filed electronically for their use. But, future groups will be expected to add to the collection of abstracts in the electronic filing system. To increase the likelihood that this happens, the two prerequisite courses have been modified to make use of initial results.

Course Structure

The increasingly higher standards are an effort to realize the potential of the course itself. The university currently is and I hope remains on the quarter system, each class meeting 3.67 hours per week for 10 weeks. We met Saturdays, the only day feasible for a university serving working students, from 10:00 when the zoo opens till at least 1:40. Students received an 11-page syllabus, 9 of which pertained to and included detailed instructions and forms related to the proposals each team was required to submit. The first hour often involved discussion of topics such as sampling methods appropriate to the use of unobtrusive measures in the zoo or considerations in oral presentation of results of research. The work to be completed each week suggests just how tight the schedule was:

Week	Activities
1	Tour of Zoo, introduction to course, formation of teams and selection of team projects. Initiate literature review.
2	Final project selection and development of research methodology.
3	Draft proposal due. Field test of sampling plan and instrumentation
4	Final proposal due.
	(External review of proposals between classes)
5	Successful teams begin data collection; unsuccessful teams begin revisions.
6	Data collection continues
7	Data collection continues
8	Data collection continues for teams that had to revise their proposals. Data analysis begins for all others.
9	Draft final reports due.
10	Final reports due. Zoo staff and docents invited to give a formal atmosphere to oral presentation of reports.

Summary

Education is one important role of our zoos, but there is relatively little research on the extent to which zoos are serving this role. Traditional methods for collecting and analyzing such information have significant disadvantages in zoo settings and should be supplemented--not replaced--by nonreactive measures. To test this concept, six research projects were carried out by teams of 3 graduate students each at the Los Angeles Zoo. The projects were designed to achieve six interrelated purposes:

1. To make substantive--if not spectacular--contributions to understanding the educational impact of zoos on recreational visitors.

2. To make substantive--if not landmark--contributions to social science methodology by further development of nonreactive or unobtrusive research methods.

3. To improve the research skills of students by requiring they design and carry out their own research.

4. To subject students to some of the harsh realities of applied research seldom addressed or encountered in academic programs, including teamwork, deadline pressure, and having to satisfy external reviewers before carrying out their research.

5. To provide future students with a more advanced starting point for their own research.

6. To create a cooperative relationship between the university and the zoo.

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