

INFORMAL LEARNING IN EXPERIENTIAL SETTINGS

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Abstract

This professional development effort had the major goal of assessing informal learning in experiential settings. Twenty elementary teachers from public and private schools participated in an on-site seminar that was university and foundation connected. The activities involved the teachers in experiential learning in science centers, a wildlife refuge, and a zoological sanctuary. A questionnaire reflected the significance of instruction provided by guides, types of exhibits, and the use of informal learning to enhance concept development. The data revealed positive results for using informal learning as an educational complement to classroom instruction.

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Introduction

Personal involvement on the part of the learner provides a motivation that materials cannot provide. Michael S. Brown, Nobel Prize laureate for physiology/medicine, stated that the essence of science is curiosity (National Science Board Commission, 1986). Brown emphasizes the need to instill in learners the curiosity about their everyday world that will lead to exploration. Robert Yager (1982) states that informal learning settings are places where learners are surrounded by reality.

Education needs to be a lifelong, year-round process. Despite the significant role the formal educational system assumes in influencing scientific literacy, society must recognize the limitations of the system (Medrich, Rosen, Rubin & Buckley, 1981). By the time a student completes high school, the student has spent 11,000 hours in the classroom and approximately 65,000 hours outside it (Levine & Levine, 1996). Educators realize that student cognitive frameworks are constructed during in-school and out-of-school experiences (Germann, 1994).

Informal learning is a potentially valuable complement to classroom instruction (Koran & Shafer, 1985). The very nature of the informal setting provides an exploratory context (Yager, 1982). Many exhibits are designed to represent relationships that become virtual reality for the learner as he/she interacts with the exhibit (Koran & Shafer, 1985).

Statistics reveal that annually 160 million people visit science centers, zoos, aquaria, and nature centers (Harris, 1980). This figure represents approximately half of the 300 million museum visits in the United States; clearly people are motivated to experience science in informal settings (Booth, Krockover, & Woods, 1982). Almost half the people attending museums have been found to be students in the intermediate elementary and junior high grades (Laetsch, Diamond, Gottfried, & Rosenfeld, 1980). Out-of-school learning opportunities contribute to cognitive development; these informal settings represent a significant instructional resource (Yager, 1982).

The recommendations from corporate symposia, precollege board commissions, and international seminars reflect the need to use informal learning to advance scientific literacy. The Exxon Education Foundation

Symposium (1984) recommended: a future-oriented science curriculum to promote scientific and technological literacy, and the use of informal settings for learning.

The National Science Board Commission on Precollege Education in Mathematics, Science, and Technology (Coleman & Selby, 1983) recognized the importance of informal learning with special emphasis on field trips. The United Kingdom/United States Seminar (Yager, 1982) recognized that informal settings can serve as educationally appropriate settings for learning; the informal settings cater to all kinds of learners; cross all age ranges; and surround learners with reality (Yager, 1982).

Enhancing the Learning Potential of Informal Settings

As learners move through any informal setting, a critical factor in their learning is whether or not the exhibits capture their attention (Screven, 1974; Novak, 1979). Participatory exhibits have been found to be effective in enhancing learning (Association of Science-Technology Centers, 1987). Learners spend more time observing and asking questions if they have opportunities to manipulate the objects in the exhibits; studies reveal that the students must be prepared for participatory exhibits (Tobias, 1975).

Learners need preliminary information about how to participate in the hands-on manipulatory exhibits and descriptions of appropriate and acceptable behavior (Koran & Shafer, 1985). Researchers have found that teachers can positively influence learning in the informal setting by explaining to students that exhibits are designed to focus attention on important events (Association of Science-Technology Centers, 1987). Teachers need to use probing questions to stimulate forward thinking prior to a visit to a science center and throughout the visit; a follow-up discussion should provide for reflection (Finson & Enochs, 1987).

What is significant for science teachers is that frequently students in informal settings do not have the experience required to guide them in their behavior. Consequently, learners are guided by the behaviors that reflect formal learning settings (Koran, Longino, & Shafer, 1983). Teachers can serve as role models and introduce new behavior patterns for learning in informal settings. Learners need information about how to behave in

participatory settings and assurances that their behavior is appropriate (Koran, Longino, & Shafer, 1983).

The purpose of the project was to provide professional development for teachers of grades K - 6 with content emphasis on environmental science. The field experience component of the program involved the teacher-participants in experiential settings including science centers, a wildlife refuge, and a zoological sanctuary. A questionnaire designed by the author (Koran & Shafer, 1985) was used for data collection for the study. The purpose of the study was to determine the significance of informal learning settings as instructional resources. Analysis of the questionnaire data identified the teacher-participants' attitudes toward instruction by guides and the design of the exhibits and yielded a set of assertions from the open-ended responses.

Program Description

Participant Criteria

Teams of participants were selected according to the following criteria: (a) elementary teacher in either a rural public or private school (b) interest in inquiry-based science instruction, and (c) a personal commitment to share acquired knowledge and strategies with peers during in-service. Twenty participants from eight schools were selected. The teaching experience of the selected teachers ranged from one to twenty-five years. Two schools were represented by a single teacher, and the remaining schools by teams of two or more teachers, respectively.

Design of Program

Conducted in September, 1995, the project (partially funded with an Eisenhower Mathematics and Science grant) "Habitats and Their Conservation" provided twenty elementary teachers opportunities to learn about environmental science in informal settings. The experiential opportunities enabled the teachers to experience firsthand the interconnectedness of science, technology, and society. Participation in an on-site seminar in Florida was provided by the Earth Shuttle Foundation, the University of Mobile staff, and the Alabama Commission on Higher Education. Figure 1 shows the daily schedule for the program's activities

in the informal settings. The experiential opportunities focused on habitats for endangered and injured species, a nature expedition through a wildlife refuge, and activities behind-the-scenes in the Experimental Prototype Community of Tomorrow (EPCOT Center). All experiences emphasized strategies for the conservation of the environment. The educational objectives of the three-day informal learning experience were correlated with the *Alabama Course of Study: Science* (1996).

The K-12 science program for Alabama is an inquiry-based program that allows for observation, discovery, prediction, problem-solving, theory usage, appreciation of the natural world, and a fascination with the scientific quest. Effective science instruction is not possible without an emphasis on laboratory exploration. The science laboratory should be thought as any place where scientific inquiry is occurring, whether that is a classroom, hallway, playground, science museum, amusement park, or beach (*Alabama course of study: Science*, p.7).

Four different experiential settings were used in this program. The first experiential setting introduced the teacher-participants to Discovery Island, an 11-acre zoological sanctuary for injured and endangered species from many countries of the world. The teacher-participants were afforded opportunities to handle the island inhabitants, visit behind-the-scenes medical facilities, walk among the Galapagos tortoises, and tour one of the world's largest aviaries. From this exploratory experience, the teacher-participants perceived the philosophy of Discovery Island, which is respect for land and life.

The second habitat viewed was Sea World's awareness program for injured and endangered marine animals. The highly structured program began with a multi-media presentation featuring scientists and researchers. Following that presentation, the teacher-participants observed firsthand the personal care that manatees receive in the Manatee Rehabilitation Center. At the tidepool, the teacher-participants were given opportunities to engage in a hands-on encounter with the tidepool marine life. Other activities included feeding and touching dolphins and viewing polar bears in a simulated natural setting.

The nature expedition focused on the Merritt Island Wildlife Refuge. Wildlife experts guided the teacher-participants through nature awareness

activities, on a hike through a subtropical forest, and on an airboat ride through undeveloped wetlands. The wildlife viewed included bald eagles, blue heron, and alligators. Resource and instructional materials were distributed following the awareness activities.

The next experience focused on the science-oriented pavilions in EPCOT Center. Before entering the pavilions, the Earth Shuttle educational instructors briefed the teacher-participants. The science concepts presented in the exhibits were discussed; the educational instructors used a wide variety of manipulatives and probing questions to teach the concepts.

The Land Pavilion. The riverboat cruise through four geographical regions and working greenhouses offered teachers an in-depth view of future food crops, innovative agricultural techniques, and pest management. Hydroponics, trickle irrigation, space agriculture, aquaculture, minimum tillage, genetic engineering, and integrated pest management (IPM) were viewed. The exhibits promoted the partnership between science and technology for improving agriculture. The teacher-participants received classroom instructional materials including hydroponic experiments and an extensive bibliography of resources.

The Living Seas. The simulated journey to the bottom of the sea, Sea Base Alpha, afforded the teacher-participants with a clear overview of the mariculture laboratory. The teachers tested their manual dexterity in an atmospheric diving suit, interacted with computer centers, and interviewed a researcher at the mariculture laboratory.

Finally, a reflection workshop afforded the teacher-participants with an opportunity to evaluate the exploratory activities. The resource and instructional materials were correlated with the activities; teacher-participants outlined the types of lesson plans that could be developed using their firsthand experiences. The teams of teachers discussed future inservice presentations demonstrating their firsthand experiences, instructional materials, and resources.

Evaluation of Informal Learning Experiences

Data Collection and Analysis

Data collected for the study included teacher-participant responses to the informal learning questionnaire designed by the author (Koran &

Shafer, 1985) (see Figure 2). The questionnaire included fourteen items, organized into two categories. The first category included seven semantic-differential items. The items asked about the participants' attitudes toward instruction provided by the guides and toward the types of exhibits. The significance of prequestions and postdiscussions by educational guides, thematic and participatory exhibits, media presentations, and pamphlets were assessed on a scale from very important to not important. Means were calculated for each item on the questionnaire.

The second category included seven open-ended response items that were directed at the experiences encountered by each teacher-participant. The short-answer responses pertained to the use of informal learning as an educational complement to classroom instruction. Assertions about informal settings as instructional resources were constructed from these responses.

Findings

Results from the first section of the questionnaire (Table 1) reveal that the teacher-participants perceive prequestioning by educational guides as a positive effect on learner attentiveness. Prequestioning provided by the guides focus the learner's attention on the concepts that are to be learned in the exhibit. The responses to the item, "The reading of instructional materials such as pamphlets before visiting complex exhibits provide learners with major ideas that they can incorporate into the concepts learned" were positive. The data indicate that the teachers believe that the prereading strategy enhances learning in informal settings. The teacher-participants rated informal learning in out-of-school settings as a potentially valuable adjunct to classroom instruction. Responses such as "seeing how science is applied in daily life" and "getting behind-the-scenes information on the exhibits made the tours more valuable" support informal learning settings as a valuable complement to classroom instruction.

The data in Table 2 show that the teacher-participants strongly agree that participatory exhibits promote attentiveness and retention of experiences. The teacher-participants rated thematic exhibits as very important. More than half of the teacher-participants preferred media

presentations over standard-case exhibits. The results show that the design of the exhibits is a major factor in enhancing learning in informal settings.

Analysis of the data from the second section of the questionnaire yielded a set of assertions pertaining to the informal learning experiences.

Assertion 1: Educational guides can positively affect learning in informal settings. The teacher-participants openly expressed the importance of educational guides in informal settings.

The guides really contributed to the learning experiences. Their knowledge about the subject areas helped me to understand the exhibits.

The guides were invaluable because they helped us to focus on key points and things to look for along the way.

Many teachers responded that the guides made the experience successful.

Knowledge, pacing, and the extent of material covered play a part in the success of the experience.

Very. They were knowledgeable, and it helps to have someone there with the answers to all the questions that come up. They also gave good preview talks so we knew what to expect and look for.

The guides open up a series of thoughts and ideas in how to use these experiences as a part of our curriculum.

Assertion 2: Firsthand experiences make concepts more understandable and meaningful. A majority of teacher-participants expressed that practical firsthand experiences promote concept development and appreciation of nature.

It is always more effective to study wildlife in its natural setting.

Real-life experiences help learners see the everyday effects-uses of 'school subjects' like math and science. They help create dreamers.

Getting behind-the-scenes at EPCOT helped me understand innovativeness with agriculture, pest management, and genetic engineering.

The experience at the Manatee Rehabilitation Center raised my awareness of the personal care given to injured marine animals.

The field experience was educational in the sense of being in an actual swamp and sighting the habitats of the area's animals. Many teachers' responses revealed that identifying plants and animals that live along the wetlands provided a true appreciation of the lands and the importance of preservation, rather than polluting and destroying them by carelessness.

Assertion 3: Free choice and participatory design may enhance learning. In this study, it was found that the teacher-participants' responses reflect the importance of learning through freedom of choice in informal settings. This response supports this notion: *"Being able to spend more time at an exhibit of my choice boosted my attitude toward learning about that exhibit."*

The participatory design of the exhibits seems to promote attentiveness and retention. The teacher-participants voluntarily chose to participate in the on-site seminar in Florida. The author observed the teacher-participants actively engaged in the participatory exhibits at EPCOT and in the field experiences at the wildlife refuge and zoological sanctuaries. One response exemplifies the consensus of the teacher-participants, *"I'm glad that I came on the trip. The on-site seminar was educational and fascinating!"*

Assertion 4: Informal learning settings can be educational resources for classroom instruction. Many of the teacher-participants expressed that the informal learning experiences gave them valuable knowledge to use in developing their science lesson plans. A number of the comments about the informal learning settings recognized the benefits of learning in informal settings such as science centers, museums, and wildlife refuges.

The entire tour of EPCOT was a very educational experience for me. I was impressed with the hands-on activities and audiovisual aids. The technology was fascinating. Touring with other teachers provided for ideas to be shared.

Conclusion

Analysis of the questionnaire data indicate that the experiential activities are potentially valuable instructional resources. In this study teachers had positive attitudes toward informal learning settings including science centers, wildlife refuges, and zoological sanctuaries. These teachers support the use of educational guides, participatory exhibits, media presentations, and pamphlets.

Studies have shown that informal learning is effective (Association of Science - Technology Centers, 1987) because learning is through free choice and participation is voluntary. The third assertion in this study, Free choice and participatory design may enhance learning, supports this research.

Several previous studies and commission reports concur with these teachers' beliefs and emphasize the use of informal settings for learning (The Exxon Educational Foundation Symposium, 1984; Coleman & Selby, 1983; Yager, 1982; Medrich, et.al., 1981). Don Moses, Editor of *Smithsonian* (Medrich, Rosen, Rubin, & Buckley, 1981) stated:

If I were to make my generalization from my own experience, it would be that time spent out in the field - is apt to generate more excitement than classroom work alone.

Further research that examines informal learning settings as educational resources should be continued. Such research could investigate the use of guides, the types of exhibits including thematic and participatory, and varied informal settings such as science centers, museums, wildlife refuges, and zoological sanctuaries.

Figure 1. Schedule of Events in Experiential Settings

<u>Friday</u>	<u>Activities</u>
Morning	Discovery Island. An 11- Acre Zoological Sanctuary Tour. Visit Behind-the-Scene's Medical Facilities. Tour One of the World's Largest Aviaries.
Afternoon	Merritt Island Wildlife Refuge.

Nature Awareness Activities by a Guide.
A Hike Through a Subtropical Forest.
Airboat Ride Through Undeveloped Wetlands.

Saturday

Activities

Morning

The Land Pavilion at EPCOT.
Riverboat Cruise Through Working Greenhouses.
Behind-the-Scene's Tour of Innovative
Agricultural Techniques and Pest Management.
Viewed Hydroponics and Trickle Irrigation.
Space Agriculture and Aquaculture.

Afternoon

The Living Seas Pavilion at EPCOT.
Simulated Journey to Sea Base Alpha.
Tested Manual Dexterity.
Mariculture Laboratory Tour.
Interviewed a Researcher.

Sunday

Activities

Morning

Sea World.
Media Presentation on Sea World.
Hands-On Encounter with Tidepool Marine Life.
Manatee Rehabilitation Center Tour.
Viewed Polar Bears in a Simulated Setting.

Afternoon

Reflective Workshop
Interactive Session to Evaluate the Exploratory Activities.
Lesson Plan Discussions and Exchange of Ideas.

Figure 2. Questionnaire on Firsthand Experiences in Informal Settings

I. Directions: Please respond to the following statements by marking the scantron according to the following ratings.

A = Strongly Agree/Very Important

B = Agree/Important

C = Somewhat Agree/Somewhat Important

D = Do Not Agree/Not Important

1. Exhibits designed around a theme promote more conceptualization of the big ideas.
2. Participatory exhibits promote attentiveness and retention of experiences.
3. Pre-questions by educational guides have the effect of focusing learner attention on the concepts to be learned in the exhibit.
4. After a walk-through of an exhibit, a guide's questions to prompt the learners to reflect in order to recall general and specific information significantly affect learning.
5. Media presentations are preferred over standard-case exhibits.
6. The reading of instructional materials such as pamphlets before visiting complex exhibits provides learners with major ideas that they can later incorporate into the concepts learned.
7. Informal learning in out-of-school settings is a potentially valuable adjunct to classroom instruction.

II. Please complete the open-ended questions.

1. In what ways did you like the tour of the pavilions in EPCOT?
2. What was beneficial about the Merritt Island field experience?
3. In what ways was the field experience with the airboat ride in the undeveloped wetlands educational?
4. In what ways would you find these experiences beneficial for students?
5. How important were the guides? Please elaborate.
6. What was the best experience during these three days in informal settings?
7. How could I, as project director, improve upon this program?

Table 1
Participant Attitudes Toward Instruction by Guides
(n = 18)

Response Questions	Mean *	SD
Pre-questions by guides effective	3.72	0.461
Immediate follow-up questions effective	3.50	0.786
Informal settings valuable adjunct	3.72	0.575

* Maximum possible score is 4.

Table 2***Participant Attitudes Toward Types of Exhibits (n=18)***

Response Questions	Mean *	SD
Thematic exhibit design	3.67	0.485
Participatory exhibit promotes attentiveness	3.94	0.236
Media presentations preferred	3.28	0.958
Pamphlets important	3.33	0.594

* Maximum possible score is 4.

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