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# Teachers' perceptions and curriculum analysis for a zoo education program

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# TEACHER'S PERCEPTIONS AND CURRICULUM ANALYSIS FOR A ZOO EDUCATION PROGRAM

by
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# ABSTRACT

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Study intent investigated teacher's perceptions of a zoo education program and evaluated modules. Study explored program effectiveness by evaluating teacher's motivation to participate, student's engagement, presenter performance, program effectiveness, and teachers met expectations. Study explored if program addressed New Jersey and Pennsylvania standards, North American Association for Environmental Education (NAAEE) guidelines, and a lesson plan format. Research investigated teachers perceptions by questionnaire from strongly disagree to strongly agree. Teacher's perceived presenters performed well, students engaged, and integrating curriculum the motivation to participate. Research to evaluate modules was subjective. Modules addressed Science and Social Studies for New Jersey, Science and Technology, Environment and Ecology for Pennsylvania. Analysis recommended the addition of standards not stated. Program is short-term, does not support skills building and action orientation recommended by the NAAEE guidelines, and assessment and psychomotor objectives as recommended by a lesson plan format.

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# CHAPTER 1

# INTRODUCTION

The North American Association for Environmental Education (NAAEE) defines environmental education as "a process that enables people to acquire knowledge, skills, and positive environmental experiences in order to analyze issues, assess benefits and risks, make informed decisions, and take responsible actions to achieve and sustain environmental quality" (NAAEE, 2004). Environmental education curriculum, according to Hungerford and Volk (1990), develops students to invest in environmental issues. Formal education provides a long-term process for students to engage in this investment. In contrast, nonformal education in the form of a field trip may last from two hours to a full day. Typically, nonformal education targets voluntary participation of students and is located in a recreational setting for a short-term and detached experience (Knapp, 1995, p. 326).

## Problem Statement

*Why is it important to study nonformal education?*

Nonformal education institutions address their curriculum to local, state and national standards for participating schools. Curriculum that addresses to standards provides schools the justification to participate in a nonformal education

program. The long-term goals and objectives for environmental education are at a disadvantage in a nonformal education program, which is short-term and in most cases detached. This study is important because nonformal education programs attempt to address their curricula to formal school curricula and standards. Yet, the long-term goals for environmental education may not be achievable in a nonformal setting. The goals for environmental education emphasize the student's long-term investment of environmental issues and citizenship action. Standards and objectives are short-term achievement goals measured by standardized testing. The goals for environmental education, intentions of nonformal education programs, and the objectives of standards may be complex, which raises the question: How can nonformal education enhance or improve formal education programs? This thesis will investigate the motivation for teachers from formal education programs to participate in a nonformal education program called Zoo School. Are teacher's objectives short-term or long-term?

Teachers have various nonformal education programs that they can select. It is not clear what motivates teachers to attend and participate. What would motivate teachers to select Zoo School as opposed to other programs, or not selecting a program? The Zoo School program encourages schools to participate because they feel that their program addresses the New Jersey Core Curriculum Content Standards (NJCCCS) and Pennsylvania Academic Standards (PAS), and integrates well with formal curriculum.

## Significance of the Study

Nonformal education takes place outside the school or is the result of an out-of-school experience. This may include a field trip to a natural history museum, science and

technology center, summer camp, nature preserve, zoo and garden. A field trip, according to Prather (as cited in Ramey-Gassert, 1997, p.438), "is any journey taken under the auspices of the school for educational purposes." Museum learning, according to Ramey-Gassert, Walberg and Walberg (as cited in Ramey-Gassert, 1997, p.434.), "have many potential advantages: nurturing curiosity, improving motivation and attitudes, engaging the audience through participation and social interaction, and enrichment." One such example is a field trip to the zoo having real live animals as a resource. At the zoo, students can observe animal characteristics, compare species behavior, investigate habitat and life-style adaptations, support and obtain knowledge of conservation, and gain real experience of the diversity of life (Woolard, 1995, p.?). Zoos have developed education programs that address the curriculum of schools.

Nonformal education resources like zoos and museums enhance formal educational programs and provide curriculum enrichment for teachers. The significance of this study is to evaluate if the nonformal Zoo School setting can have an effective experience for students in grades K-12. Can Zoo School provide students the curiosity, improve motivation and attitude, and engage students through participation and social interaction? Can the Zoo School modules provide that diversity?

## Purpose of the Study

The intent of the study is to investigate (a) teacher's perceptions of the Zoo school program and (b) evaluate the Zoo School curriculum. The study examines if Zoo School has an effective program by evaluating teacher's motivation to participate, student's engagement of learning activities, presenter performance, other factors for program

effectiveness, and met expectations for integrating curriculum, supporting the New Jersey Core Curriculum Content Standards (NJCCCS) and Pennsylvania Academic Standards (PAS) or rewarding their students for academic achievement. In addition, the study examines if Zoo School modules address New Jersey and Pennsylvania standards, and the North American Association for Environmental Education (NAAEE) *Guidelines for Excellence* and a lesson plan format. Zoo School may then enhance or improve their curriculum based on the findings and recommendations of the thesis study.

## Research Questions

The intent of the study is to investigate teacher's perceptions of Zoo school and evaluate their curriculum. The study examines if Zoo School has an effective program. The study researches the following questions:

1. To what extent do teachers perceive that module activities engage their students?
2. To what extent do teachers perceive that Zoo School provides their students an effective experience?
3. To what extent do teachers meet their expectations with regard to integrate curriculum?
4. To what extent do teachers meet their expectations with regard to support New Jersey and Pennsylvania academic standards?
5. To what extent do teachers meet their expectations with regard to reward their students for academic achievement?
6. To what extent do the Zoo School modules address New Jersey and Pennsylvania academic standards?

7. To what extent do the Zoo School modules address the North American Association for Environmental Education *Guidelines for Excellence*?
8. To what extent does Zoo School use a lesson plan format?

## Research Hypotheses

The study examines what motivates teachers to participate in Zoo School and teacher's perception of program effectiveness for the students. Five hypotheses address this issue:

(H1): Teachers perceive that Zoo School provides their students with an engaging education program.

(H2): Teachers perceive that Zoo School provides their students with an effective experience.

(H3): Teachers enroll in Zoo School because they believe that these courses are an integral part of instruction.

(H4): Teachers enroll in Zoo School because they perceive these courses support their state academic standards.

(H5): Teachers enroll in Zoo School because they believe that these courses are a reward to their students for academic achievement.

## Limitations

Study limitations exist to the internal validity of a research design. Measuring teacher's perceptions may be subjective. One solution to overcome the subjective nature is to use a Likert evaluation instrument to measure these factors. Limitations for using this type of instrument may have inherent bias and variables that are unpredictable at the time of formulating and implementing the survey. In other words, you really do not know the internal validity of the research design until the survey has been in the field for some time and the results analyzed. For example, if the survey positions every statement in a positive manner, the participant may be inclined to respond with all "strongly agree". Did the participant read the question? Perhaps, some negative statements set in the survey as a test needs consideration. In the case of this study, all of the survey questions are in a positive manner.

A second limitation inherent in the survey instrument is that Zoo School required no more than a one-page questionnaire. This may limit the author's control of the questionnaire. Questions may come up later such as why did we ask this question and did not seek information about this? Why are participants not responding to demographic questions and various perception statements?

## Delimitations

Study delimitations exist to the external validity or generalization of a study. The surveyed population in the Zoo School study relies on volunteer participation selected non-randomly, which may have an inherent non-response bias. Convenience survey results may not represent the target or total population. This is not an inherent weakness

or disclaimer for this study. It would be impossible to design a study that would take into account all teachers in different places and times in which to generalize.

A second delimitation for the study is the process to administer the survey questionnaire to the teacher by the Zoo School presenter at the end of the forty-five minute class presentation. As students are preparing for the zoo field trip or returning to their school, the teacher may lack the appropriate time to complete the questionnaire. In other words, the teacher may race through the responses. Teacher's have the option to complete and send the survey by fax or mail from their school, which may limit survey return rate. The fax machine may also print darker than the markings on the survey. In addition, teacher motivation to participate may not reflect their actual intentions, but that of their school district. Is it their opinion or the school? Would you be willing to admit that you brought your class to Zoo School as a fun reward for academic achievement?

A third delimitation is that the evaluation of the Zoo School modules against the New Jersey and Pennsylvania standards, and the NAAEE *Guidelines for Excellence* and a lesson plan format may be subjective. The question becomes how to evaluate the modules with validity and reliability given the subjective nature. Even with the limitations to evaluate teacher perceptions and modules, the benefits to evaluate outweigh the concerns.

## Assumptions

The literature review suggests in many cases that standards and objectives integrate into curriculum. The intent of this study is to separate academic standards and curriculum integration. In addition, the literature review suggests that the integral part of class instruction, curriculum enrichment and integrating curriculum are defined the same.

## Research Design

The zoo is located in a large metropolitan area in Pennsylvania near New Jersey and Delaware. The Zoo School program provides nonformal education to students in the tri-state area. The data collection instrument implemented is a survey questionnaire. It consists of sixteen questions on a five-point Likert scale ranging from strongly disagree (1) through strongly agree (5). The questionnaire has five areas and examines teacher's perceptions of Zoo School effectiveness: motivation to participate, perception of student engagement, performance of the Zoo School presenter, other factors for program effectiveness, and teachers met expectations. A descriptive analysis for the five areas describes the data in chapter four. Questions 17 and 18 in the survey provide the teacher with an opportunity to write their comments of what they liked most and recommended changes to the program (Appendix A). The Zoo School presenter at the end of the forty-five minute class presentation administers the questionnaire to the schoolteacher as students are preparing for the zoo field trip or returning to their school. Participants have the option to complete and return the questionnaire by fax or mail from their school. In addition, the study evaluates the Zoo school modules to see if they address the New Jersey and Pennsylvania standards, the NAAEE *Guidelines for Excellence* and a lesson plan format.

## Definitions

The definitions for this study are:

| | |
|---|---|
| Affective Domain | Students' feelings, interests, attitudes, appreciation; and focuses on attitudinal, emotional and valuing goals of students (Cruickshank, Jenkins and Metcalf, 2003, p.483) |
| Annenberg Foundation Grant | Funds programs in educational improvement, primarily through principle leadership, professional development and advocacy (edweek, 2002) |
| Assessment | Evaluation of skills and knowledge acquired by learners during a learning experience (NAAEE, 2004) |
| Cognitive Domain | Objectives related to intellectual tasks such as recalling, comprehending, applying, analyzing, synthesizing and evaluating information (Cruickshank, Jenkins and Metcalf, 2003, p.484) |
| Convenience Sample | Group of subjects selected because of availability (McMillan, 2004, p.112) |
| Curriculum Integration | Philosophy of teaching in which content is drawn from several subject areas to focus on a particular topic or theme (McBrien & Brandt, 1997) |
| Educational Objective | Statement of a specific measurable or observable result desired from an activity (NAAEE, 2004) |
| Environmental Education | Process that enables people to acquire knowledge, skills, and positive environmental experiences in order to analyze issues, assess benefits and risks, make informed decisions, and take responsible actions to achieve and sustain environmental quality (NAAEE, 2004) |
| Evaluation | Process design to determine if planned outcomes have been achieved (NAAEE, 2004) |
| Extrinsic Rewards | Rewards for doing a job which are external to the student; stars, red-light green-light, wows, money, grades, tokens, praise or a field trip (Rehmke-Ribary, 2004) |
| Field Test | Trial of educational materials under the conditions and in the locations for which they were developed in order to determine their quality (NAAEE, 2004) |
| Intrinsic Rewards | Rewards for doing a job which are internal to the student; learning is reinforcing in itself; natural energy (Rehmke-Ribary, 2004) |

| | |
|---|---|
| Lesson Plan | Describes specifically what and how something will be learned within a brief period, usually one or a few class hours. (Cruickshank, Jenkins and Metcalf, 2003, p.161) |
| Module | An educational unit which covers a single subject or topic (Merriam-Webster, 2005) |
| Nonformal Education (NFE) | Education about the environment that takes place at non-formal settings such as parks, zoos, nature centers, community centers, youth camps, etc., rather than in a classroom or school. Any organized educational activity about the environment that takes place outside the formal education system (NAAEE, 2004) |
| Perception | Personal interpretation of an object, event, or situation based on previous experience (NAAEE, 2004) |
| Psychomotor Domain | Students' physical abilities and skills and includes handwriting, typing keyboarding, swimming and sculpting as examples (Cruickshank, Jenkins and Metcalf, 2003, p.488) |
| Set Induction | Indicate the need to start the lesson by capturing learner attention and interest (Cruickshank, Jenkins and Metcalf, 2003, p.162) |
| Social learning | Imitation, reproduction or modeling of a behavior and experiencing reinforcement or satisfaction as a consequence (Cruickshank, Jenkins and Metcalf, 2003, p.489) |
| Standard | Clear and specific statement of what a learner should know or should be able to achieve. (NAAEE, 2004) |
| Survey Population | Smaller group obtained to adequately represent the target population (McMillan, 2004, p.107) |
| Target Population | Larger group to whom results can be generalized (McMillan, 2004, p.107) |
| Title 1 | United States Department of Education program to improve the academic achievement of the disadvantaged (edweek, 2002) |

## Organization of the Study

Chapter 1 has provided a brief introduction that defines environmental education by the North American Association for Environmental Education, and the role of nonformal education. We discussed a problem statement, study significance, purpose, research questions, propositions, design, and the study intent, limitations, delimitations and assumptions. Chapter 2 presents a summary of the *Environmental Education Materials: Guidelines for Excellence* by the North American Association for Environmental Education; New Jersey Core Curriculum Standards; Pennsylvania Academic Standards; and a literature review of nonformal education; zoo evolution, studies and education programs; and the Zoo School program. In addition, we discussed curriculum standards, curriculum integration, and extrinsic rewards. Chapter 3 details the research overview, standards and ethics of survey research, research questions, hypotheses, and methodology, which includes the survey population and sample, data collection instrument, and data analysis. Chapter 4 details the research findings of participating teacher's perceptions of the program effectiveness, and an evaluation of the modules to address the New Jersey Core Curriculum Standards, Pennsylvania Academic Standards, and the North American Association for Environmental Education *Guidelines for Excellence,* and a lesson plan format.

# CHAPTER 2

# REVIEW OF THE LITERATURE

## The Guidelines for Excellence

### *History of Environmental Education*

The North American Association for Environmental Education (NAAEE) promotes environmental education and supports individuals and groups through teaching, research and service. The NAAEE goals promote the analysis and understanding of environmental issues as the basis for effective education, problem solving, policy-making and management (NAAEE, 2004). The NAAEE published *Environmental Education Materials: Guidelines for Excellence* in 1996. The guidelines are rooted in two important documents of environmental education: the UNESCO-UNEP Belgrade Charter of 1976 and the UNESCO Tbilisi Declaration of 1978 (NAAEE, 2004).

The Belgrade Charter adopted in 1975 by a United Nations conference, provides a goal statement for environmental education. "The goal of environmental education is to develop a world population that is aware of, and concerned about, the environment and it's associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems, and the prevention of new ones" (NAAEE, 2004).

The Tbilisi Declaration adopted in 1977 at an inter-governmental conference, derived from the Belgrade Charter and established three goals. These goals (a) foster clear awareness of, and concern about economic, social, political and ecological

interdependence in urban and rural areas. (b) provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment, and (c) create new patterns of behavior of individuals, groups and society as a whole towards the environment" (NAAEE, 2004). The *Guidelines for Excellence* derived recommendations based on the Belgrade Charter and Tbilisi Declaration.

*Goals for Curriculum Development in Environmental Education*

Table 1. Goals for Curriculum Development in Environmental Education

| | | |
|---|---|---|
| I | Ecological Foundations | Provide sufficient ecological knowledge for ecologically sound decisions with respect to environmental issues |
| II | Conceptual Awareness: Issues and values | Development of conceptual awareness; how individual and collective action influence quality of life and environment; how to resolve by investigation, evaluation, decision-making, citizen action |
| III | Issue Investigation and Evaluation | Development of knowledge and skill to investigate real-world environmental issues and evaluate alternative solutions to resolve issues; values clarified to the issues and alternative solutions |
| IV | Action Skills: Training and Application | Development of skills for positive environmental action to resolve environment-related issues; development of action plans by learners for implementation if desired |
| | Superordinate | Provide skills for environmental knowledgeable, dedicated citizens to work individually and collectively, and to achieve and maintain dynamic equilibrium between quality of life and environment |

(Hungerford, Peyton & Wilke, 1980, p. 89-90)

In 1980, Hungerford, Peyton, Wilke, and the NAAEE *Guidelines for Excellence* Project derived four goals and a super-ordinate goal of curriculum development in environmental education from the Belgrade and Tbilisi Declaration Objectives (as cited in Hungerford, Peyton & Wilke, p.89-90). The first goal level (I) is an ecological foundation for knowledge of environmental issues. The second goal level (II) is the development of conceptual awareness, actions of issues, and solution development. The third goal level (III) is the knowledge and skill to investigate issues, and evaluate

alternative solutions. The fourth goal level (IV) is the training and skills for positive environmental action. The Super-ordinate Goal aids citizens with knowledge and skills to achieve and maintain a quality dynamic equilibrium of life and environment. As shown in Table 1, the Goals of Curriculum Development in Environmental Education are:

*NAAEE Guidelines for Excellence*

The NAAEE *Guidelines for Excellence* is a collection of recommendations to develop and select environmental education materials. The *Guidelines for Excellence* assists developers to produce high quality activity guides and lesson plans, and assist presenters to evaluate environmental education materials. The *Guidelines for Excellence* have six key characteristics: fairness and accuracy; depth; emphasis on skill building; action orientation; instructional soundness; and usability and associated guidelines (NAAEE, 2004). Guideline indicators address each guideline.

For the key characteristic Fairness and Accuracy, environmental education materials are necessary for describing environmental problems, issues and conditions, and reflecting the diversity of perspectives. The *Guidelines for Excellence* have four recommended guidelines for fairness and accuracy of environmental education materials. The four guidelines reflect sound theories and well-documented facts (1.1); should represent balanced perspectives of differing opinions scientific explanations (1.2); encourage students to explore different perspectives and form their own opinions (1.3); and have respect and equity to different cultures, races, genders, social groups and ages (1.4) (NAAEE, 2004).

For the key characteristic Depth, environmental education materials are necessary for environmental awareness, an understanding of environmental concepts and issues,

and an awareness of the feelings, values, attitudes and perceptions of environmental issues. The *Guidelines for Excellence* have four recommended guidelines for the depth of environmental education materials. The four guidelines recognize that environmental perceptions and issues shape feelings, experiences and attitudes (2.1). They use unifying themes and important concepts (2.2); emphasize the social, economic and ecological aspects as part of environmental concepts (2.3); and use a variety of time and place scales to measure the effects on short to long-term conditions, local to global community, and the international community (2.4) (NAAEE, 2004).

For the key characteristic Emphasis on Skills Building, environmental education materials are necessary to build lifelong skills that enable learners to deal with environmental issues. The *Guidelines for Excellence* have three recommended guidelines for lifelong skill building of environmental education materials. The three guidelines challenge students to use and improve critical thinking and creative skills (3.1); teach students to form their own conclusion to resolve the issue based on research and study (3.2); and provide students basic skills to participate and resolve environmental issues (3.3) (NAAEE, 2004).

For the key characteristic Action Orientation, environmental education materials are necessary to promote civic responsibility and encourage students to resolve environmental issues with their knowledge, personal skills and assessments. The *Guidelines for Excellence* have two recommended guidelines for the action orientation of environmental education materials. The two guidelines support students to examine the consequences of their behavior on the environment and evaluate choices to resolve

environmental issues (4.1); and strengthen the student's perception of their ability to influence a situation (4.2) (NAAEE, 2004).

For the key characteristic Instructional Soundness, environmental education materials are necessary to create an effective learning environment. The *Guidelines for Excellence* have eight recommended guidelines for the instructional soundness of environmental education materials. The eight guidelines based on student interest and ability to achieve a conceptual understanding (5.1). They offer a variety of teaching and learning methods (5.2); provide relevance to the student (5.3); provide student's opportunities to learn in different environments outside the classroom (5.4); recognize that environmental education is interdisciplinary (5.5); be appropriate for the target grade level (5.6); should be implemented based on the presenters experience (5.7); and assess the student's progress (5.8) (NAAEE, 2004).

For the key characteristic Usability, environmental education materials are necessary to invite student learning. The *Guidelines for Excellence* have seven recommended guidelines for the usability of environmental education materials. The seven guidelines have clarity to presenters and students (6.1). they are inviting and easy to use (6.2); extend beyond a one use life span (6.3); adaptable to a variety of learning situations (6.4); provide additional support and instruction to presenters (6.5); achieve what they claim to achieve (6.6); and align with national, state or local standards or curriculum (6.7) (NAAEE, 2004). As shown in Tables 2 and 3, the requirements for NAAEE key characteristics and the *Guidelines for Excellence* include environmental materials that should ...

Table 2. NAAEE Six Key Characteristics

| | | |
|---|---|---|
| 1 | Fairness and Accuracy | Be fair & accurate in describing environmental problems, issues and conditions and reflecting diversity of perspectives on them |
| 2 | Depth | Foster awareness of the natural and built environment, an understanding of environmental concepts, conditions and issues, and an awareness of values, attitudes, perceptions at heart of issues |
| 3 | Emphasis on Skills Building | Build lifelong skills that enable learners to address environmental issues |
| 4 | Action Orientation | Promote civic responsibility, encourage learners to use knowledge, personal skills and assessments of problems and issues for problem solving and action |
| 5 | Instructional Soundness | Rely on instructional techniques that create an effective learning environment |
| 6 | Usability | Be clear to educators and learners concerning the overall structure (purpose, direction, and logic of presentation) |

(NAAEE, 2004)

Table 3. NAAEE *Guidelines for Excellence*

| | | |
|---|---|---|
| 1.1 | Factual accuracy | Reflect sound theories and well-documented facts about subjects and issues |
| 1.2 | Balanced presentation of differing viewpoints and theories | Be presented in a balanced way where there are a range of perspectives, differences of opinion or competing scientific explanations |
| 1.3 | Openness to inquiry | Encourage learners to explore different perspectives and form their own opinions |
| 1.4 | Reflection of diversity | Included with respect and equity different cultures, races, genders, social groups, ages |
| 2.1 | Awareness | Acknowledge that feelings, experiences, and attitudes shape environmental perceptions and issues |
| 2.2 | Focus on concepts | Use unifying themes and important concepts rather than presenting a series of facts |
| 2.3 | Concepts in context | Set in a context that includes social, economic and ecological aspects. |
| 2.4 | Attention to different scales | Be explored using a variety of scales as appropriate- short to long time spans, localized to global effects, and local to international community levels |
| 3.1 | Critical and creative thinking | Challenge learners to use and improve critical thinking and creative skills |
| 3.2 | Applying skills to issues | Have students learn to arrive at their own conclusions based on thorough research and study, rather than being taught that a certain course of action is best |

| | | |
|---|---|---|
| 3.3 | Action skills | Gain learners basic skills needed to participate in resolving environmental issues. |
| 4.1 | Sense of personal stake | Help learners to examine the possible consequences of their behaviors on the environment and evaluate choices they can make which may help resolve environmental issues |
| 4.2 | Self-efficacy | Aim to strengthen learners' perception and ability to influence the outcome of a situation |
| 5.1 | Learner-centered instruction | Be based on learner interest and ability to construct knowledge and conceptual understanding when appropriate |
| 5.2 | Different ways of learning | Offer opportunities for different modes of teaching and learning |
| 5.3 | Connections to learners' everyday lives | Present information and ideas relevant to learners |
| 5.4 | Expanded learning environment | Teach students in environments that extend beyond the classroom. |
| 5.5 | Interdisciplinary | Recognize the interdisciplinary nature of environmental education |
| 5.6 | Goals and objectives | Be clearly spelled out |
| 5.7 | Appropriateness for specific learning settings | Have claims about the appropriateness for the targeted grade level(s) and the implementation of the activity consistent with educator experience |
| 5.8 | Assessment | Have a variety of means for assessing learner progress included in the materials |
| 6.1 | Clarity and logic | Be clear to educators and learners concerning the overall structure (purpose, direction, and logic of presentation) |
| 6.2 | Easy to use | Be inviting and easy to use |
| 6.3 | Long-lived | Have a life span that extends beyond one use. |
| 6.4 | Adaptable | Be adaptable to a range of learning situations |
| 6.5 | Accompanied by instruction and support | Be provided to meet educators' needs with additional support and instruction |
| 6.6 | Make sustained claims | Accomplish what they claim to accomplish |
| 6.7 | Fit with national, state or local requirements | Fit within national, state, or local standards or curricula. |

(NAAEE, 2004)

*Lesson Plan Format*

The *Guidelines for Excellence* assists developers to produce high quality lesson plans and assist presenters to evaluate environmental education materials. Lesson plans "describe specifically what and how something will be learned within a brief period,

usually one or a few class hours" (Cruickshank, Jenkins and Metcalf, 2003, p.161). Lesson plans are composed of several parts, detailed and formatted to ensure that an activity will go well. As shown in Table 4, Cruickshank, Jenkins and Metcalf (2003) recommend a lesson plan format divided into six areas: objectives, resources, set induction or introduction, methodology, assessment and closure).

Table 4. Parts of a Lesson Plan

| | | |
|---|---|---|
| 1 | Objectives | Indicates the lesson's objectives |
| | Cognitive Domain | Intellectual tasks: recalling, comprehending, applying, analyzing, synthesizing and evaluating information |
| | Psychomotor Domain | Physical abilities and skills |
| | Affective Domain | Feelings, interests, attitudes, appreciation; and focuses on attitudinal, emotional and valuing goals |
| | Standards | Clear and specific statement of what a learner should know or should be able to achieve |
| 2 | Resources | Denotes resources and materials to be used |
| 3 | Set Induction | Describes how the lesson will be introduced |
| 4 | Methodology | Describes how teaching and learning will take place |
| 5 | Assessment | Makes clear how student learning will be determined |
| 6 | Closure | Provides for lesson ending |

(Cruickshank, Jenkins and Metcalf, 2003, p.161)

Lesson plan objectives should be relevant to the curriculum and promote learning through the cognitive, psychomotor and affective domains (Cruickshank, Jenkins and Metcalf, 2003, p.161). The cognitive domain has objectives related to intellectual tasks such as recalling, comprehending, applying, analyzing, synthesizing and evaluating information (Cruickshank, Jenkins and Metcalf, 2003, p.484). The psychomotor domain has objectives related to the students' physical abilities and skills and includes handwriting, typing keyboarding, swimming and sculpting as examples (Cruickshank, Jenkins and Metcalf, 2003, p.488). The affective domain has objectives related to the

students' feelings, interests, attitudes, and appreciation; and focuses on attitudinal, emotional and valuing goals of students (Cruickshank, Jenkins and Metcalf, 2003, p.483). The objectives should clearly state within each domain what students are able to achieve.

Resources are the available materials to assist students accomplish the prior objectives. Set induction introduces the lesson, and captures the attention and interest of the learner. The methodology describes how teaching and learning takes place. The assessment describes how learning is determined during the instruction and how to evaluate learning at the end of the lesson. The closure describes the conclusion or finish of the lesson and as a reflection, review or summary of what the student learned, and connection to prior and future learning (Cruickshank, Jenkins and Metcalf, 2003, p.162).

The *Guidelines for Excellence* provides recommendations for selecting, evaluating and producing quality environmental curriculum. Nonformal environmental education staff trained by the NAAEE, use these guidelines. Nonformal environmental education programs have diverse settings and audience, can range from short-term to long-term. We next discuss the objectives of nonformal education, environmental sensitivity and zoo settings.

## Non-Formal Education

Nonformal education (NFE), according to Howe and Disinger (1988), are a variety of "out-of-school" settings that students make use of to gain knowledge of environmental concepts, problems and issues. The most effective settings may include woodlands, zoos, museums, aquaria, arboreta, community areas and environmental centers. Outdoor settings are very effective for encouraging positive environmental

attitudes and values, and teaching awareness of environmental issues (Howe and Disinger, 1988). Nonformal education provides students with motivational benefits. Students that are motivated to learn have choice, challenge, novelty, and cooperation in a nonformal environment where curriculum and school environment are removed (Brophy, (1987); Csikszentmihalyi, (1975); de Charms, (1984); and Stiepek, (1988) (as cited in Emmons, 1997, p.37)).

Environmental sensitivity can develop intense and direct experiences with the natural environment (Hungerford and Volk (1990); McKnight (1990); and Peters-Grant (1986) (as cited in Emmons, 1997, p.37)). Positive attitudes about the natural environment may increase with direct contact to the natural environment (Harvey (1990) and Newhouse (1991) (as cited in Emmons, 1997, p.37)). For example, a Swiss education program, *Nature on the Way*, provided a means to study 4000 children (248 classes) and their everyday life perceptions of plant and animal species.

*Nature on the Way* objectives provided an opportunity for children to experience nature on the way to school, develop awareness to nature, and develop an interest and tolerance to local species. The findings suggested that children in the test group had a higher observable increase to identify and distinguish plant and animal species at the genus and species level in their local environment. In comparison, the control group had a lesser observable increase (Lindemann-Matthies, 2002, p.26). In addition, the teachers involved in the study increased their time spent on the program, felt a personal obligation to engage their students in environmental education, and to solve environmental issues (Lindemann-Matthies, 2002, p.26). Although the program educational objectives

primarily focus on affective learning benefits, cognitive learning benefits were achievable.

The objectives of affective learning benefits are concerned with attitude, emotion and value. Cognitive learning benefits are concerned with the knowledge, comprehension and application, analysis, synthesis and evaluation (Cruickshank, Jenkins and Metcalf, 2003, p.148-49). Presenters are concerned about the affective and cognitive learning benefits of student experiences. The cognitive and affective learning benefits of children influence student's active participation, preparation and "reinforcement of conservation information during a field trip to a zoo, nature center, or museum" (Bitgood, Koran and Marshdoyl (as cited in Gutierrez, 1994, p.19)).

Learning at a zoo may have more affective learning benefits than cognitive learning, yet field trips may not have an advantage over conventional classroom instruction (Koran and Baker (as cited in Gutierrez, 1994, p.19)). For example, a study of animal behavior may have affective learning benefits at museums and zoos in Los Angeles. Animal behavior produced laughter and other positive affective learning benefits with children and may suggest that museums and zoos convey information with enjoyment and entertainment (Birney (as cited in de White and Jacobson, 1994)).

In summary, nonformal education may be very effective for encouraging beneficial affective learning with respect to environmental attitudes and values, teaching awareness of environmental issues and providing students with the benefits of motivation. The NAAEE *Guidelines for Excellence* supports nonformal education because it offers a variety of teaching and learning methods, and provides student's opportunities to learn in different environments outside the classroom. For example, a

zoo setting may provide the student a positive and beneficial affective and cognitive learning environment. We next discuss zoo evolution, studies, and related zoo education programs.

## Zoo Evolution, Studies and Zoo Education Programs

### *Zoo Evolution*

Zoo settings enable students to visit wildlife in an enclosed public location. The evolution of zoos transformed from a taxonomy collection of animals in cages in the nineteenth century, to a twentieth century species exhibit demonstrating wildlife variation. The twenty-first century motivation by ecological themes, emphasize natural environment and conservation (Benbow, 2000). Zoo exhibits have first, second and third generation classification. The first generation exhibits are basic enclosures with little or no enrichment. The second-generation exhibits are close to natural settings with artificially enriched stimuli. In addition, the third generations exhibits display wildlife in their species-natural groups, contain vegetation, and land formations to simulate an animal's natural habitat (Coll, Vyle and Bolstad, 203, p.73).

A model developed by George Rabb (Chicago Zoological Society) demonstrates that zoo evolution is the result of cultural changes between humans and nature (Benbow, 2000). Technological advances have provided us with a wealth of information related to maintaining environmental controls, recreating natural habitats, and researching the conditions and resources suitable for captive wildlife. Zoos in the nineteenth century were more concerned about the display. Technological advances and emphasis on

research and conservation has provided resources for the modern zoos to develop beneficial affective and cognitive learning education programs.

*Zoo Research Studies*

A student's affective and cognitive learning may benefit by teacher preparation, the outside setting and the direct experience of the field trip to the zoo. Teacher preparation may include pre-visit learning activities in the classroom and post-visit reinforcement of zoo program materials. For example, pre-visit learning activities and post-visit reinforcement activities was beneficial in a study of sixth grade students at a zoological garden (Gennaro et al., 1983 (as cited in de White and Jacobson, 1994, p.19)). The study findings suggest that the teacher's approval of instructional materials and their opinions influenced pre-visit activities and post-visit reinforcement. In-house preparation of education materials and teacher training may also benefit a students' affective and cognitive learning potential.

Some suggest that in-house preparation of education materials and training at zoos in developed and developing countries are inadequate. According to Hatley (1990) and Pomerantz (1991), and Strapp and Cox (1974) (as cited in de White and Jacobson, 1994, p.22), implementing an environmental education program at a zoo in Colombia had inadequate in-house preparation and training for teachers. Yet, museums have a reputation as a place to learn. Perhaps, the perception of zoos and museums- "a zoo is a place to take young children for a day out, whilst a museum is a place for learning" (Tunnicliffe, 1996), may have an influence on cultural and educational expectations.

The London Zoo and the London Natural History Museum studied cultural and educational expectations. The study focused on affective and cognitive learning, and

spontaneous comments of primary-aged students. The study suggested that students were more prepared for a museum rather than a zoo visit, yet the management and comments by children were much higher at the zoo. The study also suggests that children under seven primarily visited the zoo and children over seven visited the museum. The cultural and educational expectations for older children at a museum seek and receive information and responded with knowledge source comments. Younger children taken to the zoo, on the other hand, were less prepared and made affective comments and describe animals with human characteristics (Tunnicliffe, 1996).

In summary, studies suggest that pre-learning and post-learning activities are important factors for nonformal zoo education programs. In addition, cultural and educational expectations may have an influence at zoo and museum settings. The museum has the cultural and educational expectation as a place to learn, and the zoo is a place for enjoyment. Yet, a review of internet websites may suggest that there are zoo programs that pride themselves as a place for effective learning. We next summarize the Denver and Houston Zoo education programs.

*The Denver Zoo Program*

The Denver Zoo program has two classes: *Edventure* and *Creature Feature*. The curriculum addresses state and local district standards, and teaches students about life science concepts. The Zoo *Edventure* module is hands-on, inquiry-based, and includes animal demonstrations and bio-facts. The Zoo *Edventure* module addresses student learning while exploring the Denver Zoo. The *Creature Feature* module addresses one animal group and includes animal demonstrations and bio-facts (Denver Zoo, 2000).

*The Houston Zoo Program*

The Houston Zoo program has two classes: *Adventure* and *Eco-tracks*. The *Adventure* module examines interactive learning where students have an opportunity to touch live animals and bio-facts such as animal skins, skulls, and mounts. Students may also participate in educational games and simulated laboratory activities. The *Eco-Tracks* module is a self-guided tour that begins with a 30-minute introductory auditorium presentation by the zoo staff. The group leaders receive a tour binder and box key that has a tour schedule, suggested activities and the background for each animal. The key opens bio-fact boxes at six animal locations that contain furs, skulls, or other items the group leader and students can utilize to work through the activities (Houston Zoo, 2004).

In summary, the Denver and Houston Zoo's have nonformal environmental education modules that provide a place for learning activities with objectives. The Zoo School program that we are investigating also provides learning activities with educational objectives for children. We next discuss the objectives and education grants that support Zoo School.

*Zoo School Program*

The Zoo School program provides free classes for students in grades K-12. The schools are primarily from a large metropolitan school district in Pennsylvania (ZS, 2004b). The main objective of Zoo School is to use the resources and expertise of the zoo staff to provide nonformal education to 17,000 undeserved and at-risk youth. The program involves more than 500 pre K-12 students, with an emphasis on elementary and middle school students in grades K-8 (ZS, 2004b).

The United States Department of Education grant and Annenberg Foundation grant fund Zoo School. The design for the two grants includes field trip and educational programs to public schools that meet the Title 1 of the U.S. Department of Education requirements. The U.S. Department of Education and Annenberg Foundation grants will support program development, implementation, evaluation, and student fees and admissions (ZS, 2004b).

*The U.S. Department of Education Grant*

The U.S. Department of Education (DOE) "provides financial assistance through State educational agencies to local educational agencies and public schools with high percentage of underprivileged children to help ensure that all students meet challenging state academic content and student academic achievement standards" (DOE, 2002). The *Title1* program implemented by the U.S. Department of Education, improve the academic achievement of economically disadvantaged students.

"Local educational agencies target the *Title I* funds they receive to public schools with the highest percentages of children from low-income families. Unless a participating school is operating a school-wide program, the school must focus Title I services on children who are failing, or most at risk of failing, to meet state academic standards. Schools that enroll at least 40 percent of students from underprivileged families are eligible to use Title I funds for school-wide programs that serve all children in the school" (DOE, 2002).

*The Annenberg Foundation Grant*

The Annenberg Foundation provides financial support for projects within the areas of education, culture, arts and community and civic life. It provides financial

support to programs likely to produce positive change. The national Challenge Grant for Public School Reform is a $500 million matching grants program of 18 locally designed projects. The Annenberg Foundation and its predecessor organizations provided support for a 20-year partnership in educational programs with the Corporation for Public Broadcasting (Annenberg Foundation, 2004).

Other major grants have supported the Metropolitan Museum of Art, National Gallery of Art, Los Angeles County Museum of Art, and Academy of Music in Philadelphia, Metropolitan Opera, and the Music Center of Los Angeles County. In addition, recent grants have supported design and construction projects that include the Capitol Visitor Center in Washington, DC, the Liberty Bell Pavilion and the National Constitution Center in Philadelphia, and The British Museum in London (Annenberg Foundation, 2004).

The Annenberg Foundation financially supports organizations defined as a public charity and tax exempt under Section 501(c) (3) of the Internal Revenue Code (Annenberg Foundation, 2004). Zoo School defined as a public charity, has established educational objectives that address the Annenberg grant and the U.S. Department of Education grant.

*Zoo School Program Objectives*

Zoo School has educational and operational objectives that address the financial support of the Department of Education grant and Annenberg Foundation grant. The educational and operational goals and objectives of Zoo School allow seventeen thousand students from the metropolitan school district to attend. Five hundred K-12 classes benefit from curriculum enrichment and field trip opportunities. The program represents

the metropolitan school district composition and assists approximately seventy-eight percent low-income students, which consist of sixty-five percent African Americans, fifteen percent white, fourteen percent Hispanic, five percent Asian, and two-tenths percent Native American. One thousand seven hundred teachers, aids and chaperones are aware of Zoo School resources, and participate in the classes; and students will describe in their own words what they learned through Zoo School (ZS, 2004b).

Zoo School science and environmental education classes are forty-five minutes and address wildlife, conservation and the environment. The classes address local school district curriculum, and meet New Jersey and Pennsylvania standards scope and sequence. In addition, Zoo School follows the Benchmarks for Science Literacy and the National Science Education Standards (ZS, 2004b). The NAAEE *Guidelines for Excellence* recommends addressing environmental education programs to national, state or local standards or curricula. We next discuss issues of curriculum standards, standardized testing, curriculum standards movement, Science Literacy and the National Science Education Standards.

## Curriculum Standards

Curriculum standards are educational objectives that outline what students should know and be able to perform at various grade levels. The curriculum standards movement has a two-decade history of developing accountability measures, initially starting with mathematics and science at the national level and eventually trickled to the state and local level. The history of the national standards reform movement is diverse, complex, and not discussed in this study. In 2001, the *No Child Left Behind Act* strengthened student

accountabilities and measuring achievement with more comprehensive statewide testing of students. The next section summarizes Science Literacy and the National Science Education Standards, and discusses the *No Child Left Behind Act*, standardized testing and accountability, and issues of curriculum standards.

*National Science Education Standards and Science Literacy*

The National Science Education Standards (NSES) are achievement goals for members of the science education community. The National Research Council produced and published the NSES in 1995-96. Twenty-two scientific, science education societies, and 18,000 individuals formulated the NSES in four years (NSTA, 2004).

The NSES has six areas of science education: science teaching; professional development for teachers of science; assessment in science education; science content; science education programs; and science education systems (NSTA, 2004). The NSES has eight categories: unifying concepts and processes in science; science as inquiry; physical science; life science; earth and space science; science and technology; science in personal and social perspectives; and history and nature of science (NSES, 1996). The NSES has four principles: science is for all students; learning science is an active process; school science reflects the intellectual and cultural traditions that characterize the practice of contemporary science; and improving science education is part of systemic education reform (NSES, 1996).

The goals and objectives of NSES education reform may differ from the reality or truth in the classroom. The National Academy of Sciences claims that there is still a lot of emphasis on formulas and definitions in today's science class. The NSES education

reform suggests that student's first do the experiment, determine conclusions from their findings, and in the end learn the accepted theory (Dahir, 1995, p.22).

The NSES defines scientific literacy as "the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity" (NSES, 1996). In addition, the NSES adds that "scientific literacy means that a person" has the ability to ask, find, or determine answers to questions derived from curiosity about everyday experiences. The ability to describe, explains, and predicts natural phenomena, read with understanding articles about science in the popular press. The ability to identify scientific issues underlying national and local decisions, express positions that are scientifically and technologically informed, evaluate the quality of scientific information by its source and the methods used to generate it, and pose and evaluate arguments based on evidence and apply conclusions from such arguments appropriately (NAP, 1996, p.22).

*No Child Left Behind Act*

The *No Child Left Behind Act* (NCLB), signed into law on January 8, 2002 as an education reform plan by George W. Bush. The *No Child Left Behind Act* addresses four principles: stronger accountability for results; expanded flexibility and local control; expanded options for parents; and emphasis on teaching methods proven to work (ED.GOV, 2004).

The National Governors Association (NGA) has developed resources to assist state Governors implement The *No Child Left Behind Act.* States provide public school choice and supplemental services for students in failing schools as early as fall 2002. States integrate scientifically based reaching research into comprehensive reading

instruction for young children. States set and monitor adequate yearly progress, based on baseline 2001-02 data, issue annual report cards on school performance and statewide test results by 2002-03, implement annual, standards-based assessments in reading and math for grades 3-8 by 2005-06, and assure that all classes taught by a qualified teacher by 2005-06 (NGA, 2004).

Measuring student achievement through statewide testing and with stronger accountability requirements required by the *No Child Left behind Act* means to diagnose, label and sort students. The history of measurement may have racial, ethnic and social biasness, and assessment misrepresentation. According to Neisworth and Bagnato (2004, p.198), misrepresenting children through testing that mismeasures them, denies children beneficial expectations and opportunities. We next discuss the affects of standardized testing and accountability.

*Standardized Testing and Accountability*

Schools are accountable for their students' knowledge and skills established by curriculum standards, measure student achievement with standardized tests, have goals to raise standardized test scores, and rank themselves based on the test results. Accountability measures have narrowed curriculum to raising math and reading scores (von Zastrow and Janc (as cited in Keller and Bichelmeyer, 2004, p.17)). Teachers are under pressure to meet accountability targets set by the standards. According to a recent Rose and Gallup poll (as cited in Keller and Bichelmeyer, 2004, p.21), fifty-six percent of Americans would favor firing teachers in schools that fail to show progress towards meeting curriculum standards. The pressure of teachers to meet accountability goals may be their approach between traditional and progressive modes of instruction.

The traditional instruction approach increases students' achievement on standardized tests through drill and memorization of information. The progressive approach increases students' achievement on standardized tests through critical and higher-order thinking process skills, and problem solving. One would think that the later is preferred over the former. It is common to hear "schools which cast off all pretense of progressive pedagogy in the weeks and days prior to the administration of these standardized 'measures of learning' as classroom upon classroom is led in test preparation sessions" (Keller and Bichelmeyer, 2004, p.20). Standardized tests are criticized for emphasizing low-level basic skills and cultural, racial and gender bias (Isaac and Michael (1997); Linn (1991); and Wiggins (1998) (as cited in Cruickshank, Jenkins and Metcalf, 2003, p.282)). According to Popham, standardized tests may be misused or their results misinterpreted (Cruickshank, Jenkins and Metcalf, 2003, p.282).

*Curriculum Standards Issues*

When do teachers have time to teach when they have to meet accountability targets set by curriculum standards? How do teachers cover a broad body of knowledge with time being so critical? Initially intended for education reform and the academic standards movement were mathematics and science. Social studies have been included to develop student's skills for functioning in a democratic society (Berson, Ouzts and Walsh, 1999, p.85). For example, as a result of the America 2000 education initiative, geography was included as a core subject to develop a geographically literate society. Consequently, this resulted in the National Geography Standards. Other disciplines such as language arts, health and physical education and technology (see tables 3 and 4) for example have had similar implementation of their own standards and outcomes. How do

you expect elementary and middle grade teacher's address standards in so many diverse disciplines?

Standards written in the early 1990s lacked distinction in student expectations and curriculum goal. In some cases, the statement does not describe student knowledge, skill or something learned. For example, early childhood curriculum standards may read, "Students will be exposed to a variety of art, music, literature and drama. For example, the teacher will read a variety of literature to the children, such as poetry, nonfiction, fairy tales, nursery rhymes, and quality fiction" (Kendall, 2003, p.66).

Most curriculum standards assume that the student has affective and cognitive learning skills. Cognitive skills such as processing information, according to the Illinois Department of Education (as cited in Keller and Bichelmeyer, 2004, p.20), "such as writing, problem solving, teamwork, communicating and making connections are important skills that cut across content standards." Yet, integrating content with performance standards has resulted in a number of problems. According to Kendall (2003), separating content from performance gives a clearer picture of expectations. Childhood development studies and standards documents have a common problem of vague language. Standards must have precise and clear language, and avoid phrases such as "begins to or develops" (Kendall, 2003, p.67).

In summary, based on the literature reviewed, we did not find work that empirically supports or refutes the assertion that academic standards increase student achievement based on standardized testing. Furthermore, the national standards movement encouraged state and local education departments to formulate their own standards established from national standards. The NAAEE *Guidelines for Excellence*

recommends addressing environmental education programs to national, state or local standards or curricula. The Zoo School program has addressed their modules to New Jersey and Pennsylvania academic standards. We next discuss and summarize the New Jersey Core Curriculum and Pennsylvania Academic Standards

## New Jersey Core Curriculum Content Standards

The New Jersey States Department of Education (NJDOE) adopted the New Jersey Core Curriculum Content Standards (NJCCCS) in 1996 and revised it in 2002-04. The curriculum standards describe what students should know and be able to achieve at completion of a thirteen-year (K-12) public education. The standards are revised every five years, provide local school districts with benchmarks for student achievement in nine content areas and were influenced by national standards, research-based practice, student needs, and developed by committees of teachers, administrators, parents, students, and representatives from higher education, business, and community. The New Jersey Constitution in 1875 guaranteed a "thorough and efficient education" (NJDOE, 2004).

New Jersey provides local school districts with associated strands and cumulative progress indicators for student achievement in nine content areas. As shown in Table 5, the New Jersey Core Curriculum Content Standards and adopted publication dates are:

Table 5. New Jersey Core Curriculum Content Standard Areas

| | | |
|---|---|---|
| 1.0 | Visual and performing Arts | April 2004 |
| 2.0 | Comprehensive Health and Physical Education | April 2004 |
| 3.0 | Language Arts Literacy | April 2004 |
| 4.0 | Mathematics | July 2002 |
| 5.0 | Science | July 2002 |
| 6.0 | Social Studies | October 2004 |
| 7.0 | World Languages | April 2004 |
| 8.0 | Technological Literacy | April 2004 |
| 9.0 | Career Education and Consumer, Family, and Life Skills | April 2004 |

(NJDOE, 2002-04)

The areas of Science and Social Studies have ten and six standards, respectively. As shown in Table 6, the New Jersey Core Curriculum Content Standards for Science and Social Studies are:

Table 6. New Jersey Core Curriculum Content Standards for Science and Social Studies

| Science | | Social studies | |
|---|---|---|---|
| 5.1 | Scientific Process | 6.1 | Social Studies Skills |
| 5.2 | Science and Society | 6.2 | Civics |
| 5.3 | Mathematical Applications | 6.3 | World History |
| 5.4 | Nature and Process of Technology | 6.4 | United States/New Jersey History |
| 5.5 | Life Science | 6.5 | Economics |
| 5.6 | Physical Science- Chemistry | 6.6 | Geography |
| 5.7 | Physical Science- Physics | 6.7 | World in Spatial Terms (1996) |
| 5.8 | Earth Science | 6.8 | Human Systems (1996) |
| 5.9 | Astronomy and Space Science | 6.9 | Environment and Society (1996) |
| 5.10 | Environmental Science | | |

(NJDOE, 2002-04)

New Jersey addresses ten standards for Science with associated strands and cumulative progress indicators (Table 5). As an example, we briefly describe the standards for Science and descriptions for Mathematical Applications (5.3), Characteristics of Life (5.5) and Environmental Studies (5.10):

"Science should be taught at all levels with awareness of its connection to other subjects and the needs of society. While these standards do not suggest a specific curriculum design or sequence of courses, they assume that the relationship of the various disciplines of science to each other, and of science to the overall learning experience, will be strongly emphasized. The standards also reflect the needs of the students and teachers of New Jersey; indeed, incorporating New Jersey's unique natural resources in the teaching of science should be a primary goal of school districts as they move towards implementation" (NJDOE, 2002-04).

| | | |
|---|---|---|
| 5.3 | Mathematical Applications | "All students will integrate mathematics as a tool for problem-solving in science, and as a means of expressing and/or modeling scientific theories" (NJDOE, 2002-04). |
| 5.5 | Characteristics of Life | "All students will gain an understanding of the structure, characteristics, and basic needs of organisms and will investigate the diversity of life" (NJDOE, 2002-04). |
| 5.8 | Earth Science | "All students will gain an understanding of the structure, dynamics, and geophysical systems of the earth" (NJDOE, 2002-04). |
| 5.10 | Environmental Studies | "All students will develop an understanding of the environment as a system of interdependent components affected by human activity and natural phenomena" (NJDOE, 2002-04). |

New Jersey has adopted six standards for Social Studies with associated strands and cumulative progress indicators (see Table 6). As an example, we briefly describe the standards for Social Studies and descriptions for Geography (6.6):

"Social studies education is to provide students with the knowledge, skills and attitudes they need to be active, informed, responsible citizens and contributing members of their communities. The standards define social studies as the four disciplines of history, geography, civics, and economics. The teaching of social studies should include interdisciplinary connections among these areas. Social studies instruction can be based on one or more of these core disciplines or on a combination of these in the problem-solving or inquiry mode. This is frequently the basis of social studies activities in the classroom" (NJDOE, 2002-04).

| | | |
|---|---|---|
| 6.6 | Geography | "All students will apply knowledge of spatial relationships and other geographic skills to understand human behavior in relation to the physical and cultural environment" (NJDOE, 2002-04). |

## Pennsylvania Academic Standards

The Pennsylvania State Board if Education (PDE) adopted the Pennsylvania Academic Standards (PAS) established by executive order of the Governor's Advisory Commission on Academic Standards on September 30, 1996. The purpose of the executive order was to recommend to Governor Ridge, "a rigorous set of standards, the achievement of which demonstrates the attainment of high levels of student competency in core academic subjects (PDE, 2001)." The Commission had the responsibility to "obtain and consider ideas and proposals regarding academic standards from citizens throughout the Commonwealth, particularly parents and community and business leaders" (PDE, 2001).

The commission submitted recommendations to achieve the executive order such as standards must be measurable. Students need to be able to make the connection between learning expectations in school and success in life. Standards must clearly express intentions. Performance levels associated with standards describe how well a student is achieving relative to the standard. Pennsylvania strives for a performance-based system of assessments that is based on the standards that are adopted by the

Commonwealth; four performance levels, which define novice, partially proficient, proficient, and advanced; and an expected level of achievement as proficient. A student whose performance on a standards-based assessment is proficient has demonstrated knowledge of the standard being tested (PDE, 2001).

Pennsylvania provides local school districts with associated strands and cumulative progress indicators for student achievement in thirteen content areas. Standards 12 and 13 are under revision and review. As shown in Table 7, the Pennsylvania Academic Standards and final publication dates are:

Table 7. Pennsylvania Academic Standard Areas

| | | |
|---|---|---|
| 1.0 | Reading, Writing Speaking and Listening | May 15, 2002 |
| 2.0 | Mathematics | May 15, 2002 |
| 3.0 | Science and Technology | January 5, 2002 |
| 4.0 | Environment and Ecology | January 5, 2002 |
| 5.0 | Civics and Government | January 11, 2003 |
| 6.0 | Economics | January 11, 2003 |
| 7.0 | Geography | January 11, 2003 |
| 8.0 | History | January 11, 2003 |
| 9.0 | Arts and Humanities | January 11, 2003 |
| 10.0 | Health, Safety and Physical Education | January 11, 2003 |
| 11.0 | Family and Consumer Sciences | January 11, 2003 |
| 12.0 | World Languages | May 16, 2002: Revised Draft |
| 13.0 | Career Education and Work | May 16, 2002: Reviewed |

(PDE, 2002-03)

The areas of Science and Technology, and Environment and Ecology have eight and nine standards, respectively. As shown in Table 8, the Pennsylvania Academic Standards for Science and Technology, and Environment and Ecology are:

Table 8. Pennsylvania Academic Standards for Science and Technology, and Environment and Ecology

| Science and Technology Standards | | Environment and Ecology Standards | |
|---|---|---|---|
| 3.1 | Unifying Themes | 4.1 | Watersheds and Wetlands |
| 3.2 | Inquiry and Design | 4.2 | Renewable, Nonrenewable Resources |
| 3.3 | Biological Sciences | 4.3 | Environmental Health |
| 3.4 | Physical Science- Chemistry and Physics | 4.4 | Agriculture and Society |
| 3.5 | Earth Sciences | 4.5 | Integrated Pest Management |
| 3.6 | Technology Education | 4.6 | Ecosystems and their Interactions |
| 3.7 | Technological Devices | 4.7 | Threatened, Endangered, Extinct Species |
| 3.8 | Science, Technology, Human Endeavors | 4.8 | Humans and the Environment |
| (PDE, 2002-03) | | 4.9 | Environmental Laws and Regulations |

Pennsylvania addresses eight standards for Science and technology with associated strands and cumulative progress indicators. As an example, we briefly describe the standards for Science, Technology, and descriptions for Unifying Themes (3.1) and Biological Sciences (3.3):

"Science includes the search for understanding the natural world and facts, principles, theories and laws that have been verified by the scientific community and are used to explain and predict natural phenomena and events. Acquiring scientific knowledge involves constructing hypotheses using observation and knowledge in the content area in order to formulate useful questions that provoke scientific inquiry. As a result of repeated, rigorous testing over time and applying multiple perspectives to a problem, consistent information emerges. A theory describes this verifiable event or phenomena. Theories are powerful elements in science and are used to predict other events. As theories lose their ability to predict, they are modified, expanded or generalized or incorporated into a broader theory" (PDE, 2002-03).

"Technology education involves a broad spectrum of knowledge and activities. Effective technology education combines knowledge of content, process and skills to provide students with a holistic approach to learning. Technology education offers unique opportunities to apply numerous academic concepts through practical, hands-on applications. Instructional technology, on the other hand, deals specifically with use of computers and different software to solve problems and communicate effectively. Knowledge of content, process and skills should be used together to effectively engage students and promote a complete understanding of the sciences, related technologies and their interrelationship. The relationship between science and technology is one where science builds principles or theories and technology provides the practical application of those principles or theories" (PDE, 2002-03).

| | | |
|---|---|---|
| 3.1 | Unifying Themes | "Science and technology provide big ideas that integrate with significant concepts. There are only a few fundamental concepts and processes that form the framework upon which science and technology knowledge are organized - motion and forces, energy, structure of matter, change over time and machine. Themes create the context through which the content of the disciplines can be taught and are emphasized in each standard" (PDE, 2002-03). |
| 3.3 | Biological Sciences | "Concerns living things, their appearance, different types of life, the scope of their similarities and differences, where they live and how they live. Living things are made of the same components as all other matter, involve the same kinds of transformations of energy and move using the same basic kinds of forces as described in chemistry and physics standards. Through the study of the diversity of life, students learn to understand how life has changed over a long period of time. This great variety of life forms continues to change even today as genetic instructions within cells are passed from generation to generation, yet the amazing integrity of most species remains" (PDE, 2002-03). |

Pennsylvania developed nine standards for Environment and Ecology with associated strands and cumulative progress indicators. The standards for Environment and Ecology address standard headings, grade levels, and cumulative strands and progress indicators. Environment and Ecology does not have existing stated descriptions in the standards, as in Science and Technology. For example, we briefly describe standards for Environment and ecology derived through the associated strands and

cumulative progress indicators Watersheds and Wetland (4.1), 4.2 Renewable and Nonrenewable Resources (4.2), Environmental Health (4.3), Integrated Pest Management (4.5), Ecosystems and Interactions (4.6), Adaptations and Endangered Species (4.7), and Humans and the Environment (4.8).

"Environment and Ecology is a very engaging academic area that captivates students' innate interests in their surroundings of the natural and built environment. The skills and knowledge that are addressed in this area of study will serve as tools for student participation in a democratic world of constantly evolving issues and concerns. As they achieve these standards, students will become aware of the role they play in the community in reaching decisions related to the environment. The study of Environment and Ecology will allow students to be active participants and problem solvers in real issues that affect them, their homes, schools and communities" (PDE, 2002-03).

| | | |
|---|---|---|
| 4.1 | Watersheds and Wetlands | Students learn water environment types, origin to outflow stream changes, stream order, moving and still water differences, watershed role and cycle role, landforms, vegetation, amount and speed of water relationships, U.S. watersheds relationships, living organism types in aquatic environments and effects in water environments, physical stream characteristics, watershed parameters, wetland plants, animals, characteristics, multiple functions, and wetland ecosystems (PDE, 2002-03). |
| 4.2 | Renewable and Nonrenewable Resources | Students learn the needs of people, raw materials come from natural resources, renewable and nonrenewable resources supply energy and materials, natural resources products and uses, renewable and nonrenewable resources availability, natural resources limited life spans and distribution, man-made systems impact to manage and distribute natural resources, recycling and waste management alternatives, and solid waste management practices (PDE, 2002-03). |
| 4.3 | Environmental Health | Students learn that plants, animals and humans are dependent on air and water, environmental health issues, how human actions affect environmental health, interdependent elements of natural systems, biological diversity as an indicator of a healthy environment; and need for a healthy environment (PDE, 2002-03). |
| 4.5 | Integrated Pest Management | Students learn the types, benefits and harmful effects of pests, classifications of different regions, integrated pest management systems, pest control, affects on the environment, health benefits and risks, global practices, need, uses, effects and historical significance (PDE, 2002-03). |
| 4.6 | Ecosystems and Interactions | Students learn the dependence and survival of living things on nonliving things in the environment, energy flow, matter from organism to organism, biotic and abiotic components, interdependence, cycles affect and influence, change over time, and human action and natural changes (PDE, 2002-03). |
| 4.7 | Threatened, Endangered and Extinct Species | Students learn differences in living things, biodiversity and stability of plants and animals, species adaptation to their environment, biodiversity and ability to survive, natural and human caused extinction, natural or human actions for extinction, specialization; and relation of threatened, endangered or extinct species to human and natural systems (PDE, 2002-03). |
| 4.8 | Humans and the Environment | Students learn biological requirements of humans, civilization development and environment, society's needs, technology and natural resources sustainability, environmental conditions and peoples lives, sustainability, natural resources uses and sustainability, human activities and the environment, importance of maintaining natural resources, concept of supply and demand affects the environment, and international implications of environmental occurrences (PDE, 2002-03). |

In comparison, the New Jersey and Pennsylvania standards have many differences and similarities. One similarity is that the standards are interdisciplinary in character. New Jersey and Pennsylvania standards have adopted curriculum integration into their standards. For example, the Pennsylvania Academic Standards have combined the disciplines of science and technology. Pennsylvania has addressed the relevance and relationship between science and technology, where science is based on principles or theories, and technology provides and supports the practical application of those principles or theories (PDE, 2001).

The NAAEE *Guidelines for Excellence* recommends using unifying themes and important concepts, and social, economic and ecological aspects as a part of environmental concepts. Standards promote the grouping of subject disciplines and express this as curriculum integration. We next discuss the objectives, attributes and limitations of curriculum integration.

## Curriculum Integration

What is curriculum integration? Curriculum integration has several main objectives. The main objectives provide the grouping of subject disciplines to eliminate separate entities and supporting one curriculum. Other objectives include reflecting and understanding of how we think about world, and ourselves and thinking about the purposes of schools, curricula sources and knowledge use (James and Adams, 1998, p.3). According to Humphreys, Post and Ellis (as cited in James and Adams, 1998, p.3) curriculum integration is concerned with the sharing of content, developing problem

solving and hypothesis processes, calculating and questioning skills, communicating and pattern concepts; and the affective goals of motivation and self-concept.

Curriculum integration as described above provides a framework to apply knowledge from several disciplines with a process to solve real-life situations. Integrating curriculum may encourage students to experience themselves and world by their learning. Curriculum may engage students to search, obtain, and apply knowledge with full meaning, and help students view knowledge as real life issues and apply academic strengths, provide opportunities for school and personal achievement, and allow depth and multiple perspectives. "Hands-on" or "natural and down-to-earth learning" provide conditions for teaching diverse information with meaning. Teachers and school administrators economize time and money by integrating curriculum (Beane (1995), Alleman (1993), and McDonald and Czermiak (1994) (as cited in James and Adams, 1998, p.4)).

The objective of integrating curriculum is to offer students a series of courses so that instructors may work together and demonstrate that courses can interact and overlap effectively. For example, students learn that ninth-grade biology, tenth-grade chemistry, and eleventh-grade physics overlap, interact and integrate (Dahir, 1995, p.23). The National Academy of Science Standards, according to Dahir (1995), suggests teaching high school student's biology, chemistry and physics as one course in the ninth through eleventh grade. Yet, there are issues to resolve even with the beneficial attributes of integrating curriculum.

As described above, curriculum integration may provide many beneficial attributes. The reality is that teachers may not see the time spent to integrate curriculum

something that current schools can offer. For example, efforts to integrate technology may not be a realistic in today's schools. According to Keller and Bichelmeyer (2004, p.22), the time spent learning to use technology may not be a realistic goal in our school's present conditions.

Another issue with curriculum integration is that educational resources on curriculum integration are limited. For example, the National Council of Teachers of Mathematics (NCTM) has core standards that support curriculum integration. Yet, we connect mathematics to science and rarely connect mathematics to other disciplines. According to James and Adams (1998, p.3), integrating mathematics and nutrition is a "natural partnership." However, James and Adams (1998) further suggest that the education resources to integrate mathematic and nutrition are limited, unavailable and not applicable. Seventy-five percent of teachers that taught foods and nutrition adapt existing materials with their own education resources (James and Adams, 1998, p.3).

In summary, academic standards and curriculum integration are very much interconnected and important in the educational reforms of the late 1980s to the present. Issues still exist between the benefits of integrating curriculum and the current realities in schools today. The New Jersey and Pennsylvania standards have adopted curriculum integration into their academic standards. As an example described above, the Pennsylvania Academic Standards integrate the disciplines of science and technology.

The NAAEE *Guidelines for Excellence* recommends providing student's opportunities to learn in different environments outside the classroom. The intrinsic motivations to challenge students to use and improve critical thinking and creative skills; teach students to form their own conclusion to resolve issues based on research and study

and provide student's basic skills to participate and resolve environmental issues at times may not be effective in a public school classroom. Sometimes, extrinsic rewards provide a management technique to add excitement and enhance a pro-social learning behavior.

## Extrinsic Rewards

Extrinsic rewards used in a classroom to maintain a learning environment, provide added interest and excitement to classroom routines and enhance pro-social learning behavior. Social learning is the imitation, reproduction or modeling of a behavior and experiencing reinforcement or satisfaction as a consequence (Cruickshank, Jenkins and Metcalf, 2003, p.489) External to the student, extrinsic rewards or reinforcement may come in the form of stars, red-light green-light, "wows", money, grades, tokens, praise or a field trip (Ribary, 2004). According to Ryan and Deci (1996) (as cited in Ribary, 2004), extrinsic rewards are task-contingent. Behavior rewarded strengthened and more likely repeated, and conversely behavior not rewarded eventually diminishes (Cruickshank, Jenkins and Metcalf, 2003, p.399). Extrinsic rewards may be the most effective means of encouraging pro-social behavior (Goetz, Alexander and Ash (as cited in Cruickshank, Jenkins and Metcalf, 2003, p.399)).

Psychologists Edward Thorndike and B.F. Skinner emphasized the importance of rewards (or reinforcement) in their behavioral learning theories (Omrod, 2004, p.49). B.F. Skinner differentiated reinforcement and reward. A reinforcement is defined by its effect on behavior whether it has pleasant or unpleasant affects. A reward implies that the affected behavior is pleasant (Omrod, p.52, 2004). Operant conditioning is learning facilitated through reinforcement and a learner receives an award for correct or

appropriate behavior (Cruickshank, Jenkins and Metcalf p.77, 2003). The use of reinforcement has presently shifted from inhibiting misbehavior to rewarding positive academic performance (Brophy, Evertson and Harris (as cited in Cruickshank, Jenkins and Metcalf, 2003, p.77)). The literature review suggests that rewards and reinforcement have similarities and differences, and for the purpose of this study are equal.

There are three important conditions necessary for operant conditioning to occur. The reinforcement must follow the response, follow immediately and be contingent on the response (Omrod, 2004, p.53). Unfortunately, teachers are required to multi-task in the classroom and pro-social behavior may go unrewarded or unnoticed. More importantly, schools delay reinforcement, which may have a negative impact on younger children. In addition, the teacher sometimes reinforces undesirable behavior unintentionally. Teachers who monitor and acknowledge desirable behavior reinforce the behavior importance. The literature review suggests that extrinsic rewards and reinforcement may have a negative or positive impact to the student.

*Positive Impact*

Extrinsic rewards can bring out a desirable behavior. Should we implement a rewards system to motivate student learning and increase academic achievement? According to Slavin (as cited in Graves, 1991, p.78), rewards are effective in cooperative group learning strategies based on the individual achievement of each student. This strategy guarantees high achieving students will assist low achieving students to complete the assignment and not share answers. A rewards system in cooperative group learning strategies allows students to ask for assistance suitable to group pressures. Graves (1991) suggested that cooperative group learning is pleasure and a reward in itself. "The social

rewards of working cooperatively probably enhance intrinsic motivation and are among the great advantages of using cooperative learning strategies" (Graves, 1991).

Students are self-motivated to do most of their assignments, but extrinsic group rewards may help unmotivated students when assignments are routine (Slavin (as cited in Graves, 1991, p.78)). Extrinsic rewards work well for school programs that are ineffective, have chaotic conditions and high student populations.

*Negative Impact*

Extrinsic rewards can bring forth a temporary fulfillment in a desired behavior. Should we implement a rewards system to motivate student learning and to increase academic achievement? Studies suggest that when students expect a reward for successfully completing an assignment, they do not perform as well as students who are not rewarded (Kohn, 1995, p.8). Could the love of learning or the intrinsic (internal) motivation to learn be more powerful? Research studies suggest that extrinsic rewards weaken intrinsic motivation (Kohn (as cited in Graves, 1991, p.77)). "The fact is that extrinsic motivators do not alter the attitudes that underlie our behaviors. They do not create an enduring commitment to a set of values or to learning; they merely, and temporarily, change what we do" (Kohn (as cited in Rehmke-Ribary, 2004)). Yet, Graves (1991) suggests that research studies in extrinsic rewards vary and have a variety of interpretations and conclusions.

Students perceive extrinsic rewards as behavior control or manipulation. Extrinsic rewards are not beneficial in the long-term when students perceive them as a bribes or limits to their freedom (Deci et al; Hennessey; Lepper and Hodell; Ryan, Mims and Koestner; and Spaulding (as cited in Omrod, 2004, p.458)). Hennessey and Stipek (as

cited in Omrod, 2004, p.458) feel extrinsic rewards may communicate the message that an assignment is not worth doing for its own sake. The teacher is controlling his or her students by tempting them with external factors that do not even relate to the task itself. An extrinsic reward is a way of doing things to children, rather than working with them (kohn (as cited in Rehmke-Ribary, 2004)).

According to Schaps and Lewis (1991), extrinsic rewards are not necessary to motivate student engagement and perseverance. Students' higher-order achievement and overall development may require three conditions: challenging and interesting learning that builds on students natural efforts; curriculum focused on social, ethical and cognitive development; and a student belonging and contributing to their environment (Schaps and Lewis, 1991, p.81). Extrinsic rewards disregard a students' ability to think and reason on their own. It does not allow a student the chance to develop self-determination or independent thinking (Rehmke-Ribary, 2004).

## Summary

In summary, standards, curriculum integration and extrinsic rewards may be the incentive for teachers to participate in the nonformal Zoo School program. Chapter 2 presented a summary of the North American Association for Environmental Education *Guidelines for Excellence*; the New Jersey Core Curriculum Content Standards and Pennsylvania Academic Standards; and a literature review of nonformal education; zoo evolution, studies and the Denver and Houston zoo education programs; the Zoo School education program and objectives; and curriculum standards, curriculum integration, and extrinsic rewards. Chapter 3 details the research methodology used in the study and the

standards and ethics of survey research. Chapter 4 details the research findings of participating teacher's perceptions of the program effectiveness, and an evaluation of the Zoo School modules to the New Jersey Core Curriculum Content Standards and Pennsylvania Academic Standards, and the North American Association for Environmental Education *Guidelines for excellence,* and a lesson plan format.

# CHAPTER 3

# RESEARCH METHOD

## Research Overview

The intent of the study is to investigate (a) teacher's perceptions of the Zoo school program and (b) evaluate Zoo School modules. The study examines if Zoo School has an effective program by evaluating teacher's motivation to participate, student's engagement of learning activities, presenter performance, other factors for program effectiveness, and met expectations for integrating curriculum, supporting the New Jersey Core Curriculum Content Standards (NJCCCS) and Pennsylvania Academic Standards (PAS), or rewarding their students for academic achievement. In addition, the study examines if the Zoo School modules address the New Jersey and Pennsylvania standards, and the North American Association for Environmental Education (NAAEE) *Guidelines for Excellence* and a lesson plan format.

## Standards of Survey Research

### *Survey Research*

Survey research is a means for researchers to select a sample of participants, administer a standardized questionnaire, and collect data from a population. Two types of educational investigation are quantitative and qualitative research. Quantitative research has four characteristics: number data collection and statistical relationships,

conceptualize with variability and reliability, hypothetical with statistical significance, and have goals to test theory, establish facts, show relationships and statistically describe the data collected. Qualitative research has three characteristics: associated with field research, case study, and interpretation; conceptualize with meaning, understanding, social construction and context; and have goals to develop understanding, describe ideas and natural behavior (McMillan, 2004, p.10).

*Quantitative Research Design*

The research design refers to the study methodology. Two types of research design used in quantitative investigation are non-experimental and experimental. Non-experimental research describes and uncovers relationships between two or more variables, and classified as descriptive, comparative, correlative and casual comparative. Descriptive research provides simple information on the frequency of the study subject. Comparative research examines the differences between groups for a variable. Correlative research studies relationships with two or more variables. Casual comparative research describes past relationships and current responses, and draw casual relationships between them (McMillan, 2004, p.9).

Non-experimental quantitative research is a method of collecting data, and allows the researcher to select participants, collect information and analyze data to answer research questions. The participants selected from a large population, may allow inferences about the population from a smaller sample, or the whole population is included in the survey. Surveys may describe the incidence, frequency and distribution of the population and other demographics (McMillan, 2004, p.194). Non-experimental quantitative research has characteristics of versatility, efficiency and generalization.

Surveys can address a wide range of problems or research questions directed at attitudes, perspectives and beliefs of the participant by a written or interview process. Written surveys are less expensive than phone or personal interviews with a large number of participants. Survey research from a population sample can derive accurate generalized conclusions about a larger population (McMillan, 2004, p.195).

In designing a survey questionnaire for non-experimental research, survey design should have a defined purpose and objectives, needed resources and target population identified, and an appropriate survey method with words carefully chosen that are clear, understandable and unbiased questions. A survey has a well-designed format with minimum 10-point typeface and sufficient spacing to separate sections, and clear directions to return the completed survey. In addition, a survey has a brief professional letter of transmittal that describes researcher credibility and research benefits, and two pilot-tested drafts with a sample of 15-20 participants (McMillan, 2004, p.195-196).

*Characteristics of Sampling*

The sample is the participants and described by the type of sampling method and participant characteristics. The target population or universe is the larger group of participants, objects or events. The survey population or sampling frame is a less generalized description of the target population (McMillan, 2004, p.106-108). The sample size should be large enough to represent the target population, which determines the research credibility.

The research credibility determines the validity of the research design and research method. The validity is the appropriateness of the research method used to derive the results generated by the method (McMillan, 2004, p.136). Internal validity

addresses issues that relate to accuracy such as a non-biased data collection and accurately interpreting the data findings. External validity addresses the issue of generalizing results to the target population and relating inferences to the study findings.

Research reliability is the extent, measure and type of sampling error inherent in the research method and design (McMillan, 2004, p.141). A sampling error exists between the sample and target population. Sources of measurement error may exist from the survey design and administration such as changed directions and scoring, and misunderstood directions and wording. Measurement error may exist by the participant such as anxiety, illness motivation, attitude and reading ability (McMillan, 2004, p.141). One type of sampling error is sampling bias, influenced by the researcher in the form of misleading results, incomplete information and data misinterpretation (McMillan, 2004, p.118-121).

Sampling bias occurs when the validity does not represent the target population intended to represent. Volunteered participation of a surveyed population may skew the results by non-response bias. If more than 20% of the participants did not respond, it may be necessary to check for systematic non-response bias in the data collection instrument or survey implementation process. If the return rate is less than 60%, the researcher may need to compare non-participant to participant responses (McMillan, 2004, p.119). "Often the percentage of the sample returning the questionnaire will be 50 to 60% or even lower" (McMillan, 2004, p.116).

*Quantitative Sampling Methods*

Probability and non-probability quantitative sampling are methods to represent participants in a large target population. A probability sample is the random selection of

participants from a larger population that will adequately represent the target population. Probability sampling generalized by four types is simple random, systematic, stratified, and cluster. Simple random sampling has the probability that every member of the population has an equal and independent chance of selection. Systematic sampling selects participants from a list that begins randomly and afterwards a predetermined sequence of selection. Stratified sampling is a modified simple or systematic sampling that divides the population into homogenous subgroups. Cluster sampling is the random selection of naturally occurring groups and the selection of participants from those groups (McMillan, 2004, p.107-110).

A non-probability sample does not randomly select participants from a larger target population. Non-probability sampling generalized by three types is convenience, quota and purposeful. A convenience sample selects participants by availability and understands relationships rather than generalized conclusions. A quota sample is a non-random selection of participants that effectively represents the target population. A purposeful sample is the selection of participants that are informative of the topic and used in quantitative and qualitative research (McMillan, 2004, p.107-110).

*Quantitative Sampling Procedures*

Quantitative sampling procedures include the type of sampling method and participants sampled in the study. Participants have demographic characteristics and the population has definition. The sampling method, such as simple random and stratified, is clearly described and the survey questionnaire return rate indicated and analyzed if a significant portion (less than 60%) of the survey population participates. The selected participants are free of bias, have an adequate number of participants that accurately

represent the population, and are appropriate for the problem investigated. Participants selected for qualitative studies have knowledge of the topic and informative experience (McMillan, 2004, p.121).

*Research Survey Instruments*

The data collection instrument may be in the form of a questionnaire, observation, and interview. Evaluation is also a procedure to collect information. "Evaluation research is directed toward making decisions about the effectiveness or desirability of a program" (McMillan, 2004, p.13).Evaluation is a procedure for collecting and using information. An example of evaluation can be a comparison of performance with a standard or guideline, or the judgment and interpretation of a process (McMillan, 2004, p.124-125).

The survey questionnaire contains statements or questions used to obtain perceptions, attitudes, beliefs, values and perspectives. An attitude questionnaire indicates a degree of preference with a favorable to unfavorable response that reflects likes and dislikes. Questionnaires typically have scales, checklist or ranked items. A scale is a series of gradations from a positive to negative description followed by a statement or question. The Likert scale is the most widely used and the participant responds with agreement or disagreement with the statement (McMillan, 2004, p.157-159).

Observational data collection describes behavior and can take place in a natural setting or a controlled setting such as a classroom. Quantitative observations rely on data to summarize the observations. Qualitative observations have less control and allow the observer to make judgments about the content recorded. Laboratory observation is highly controlled and the researcher records specific behaviors identified by the study. The

observed participant may give bias responses. The participant may respond or give answers the researcher may want (McMillan, 2004, p.164-165).

The researcher and participant orally conduct interview data collection. The intent of the interview is to allow greater depth and richness of information otherwise not offered by questionnaire and observation data collection. Interviews achieve a higher return rate, sometimes 90 or 95% volunteering for an interview. The expense, time consumption, and smaller sample size are disadvantages of the interview method (McMillan, 2004, p.165).

There are three types of interview questions: structured, semi structured and unstructured. The structured question gives the participant a selection of choices. The semi structure question is open-ended, specific in intent and the most common. The unstructured question is open-ended, broad, subjective and the most difficult to conduct. A leading question encourages the participant to respond in a particular way, which can bias the results (McMillan, 2004, p.165).

## Ethics of Survey Research

### *Responsibilities to Participants*

The Council of American Survey Research Organizations (CASRO) developed a Code of Standards and Ethics for Survey Research Organizations. The Code describes the responsibilities of a survey research organization to respondents, clients and outside contractors and in reporting study results (CASRO, 2004). The CASRO Code of Standards and Ethics for Survey Research Organizations apply to the Zoo School study.

CASRO (2004) has identified four fundamental ethical principles for survey participants: willingness to participate in survey research; appropriately informed about the survey's intentions, and how their personal information and survey responses are used and protected; sufficiently satisfied with their survey participation and experience; and willingness to participate again in survey research. Teacher's are the livelihood of the Zoo School survey research and their confidentially is protected from disclosure to third parties. The Zoo School study does not discuss the collected identifiable data by the participant, and disclose identifiable information of the participant. Collected survey questionnaire data used by Zoo School have legitimate internal research purposes.

*Privacy and the Avoidance of Harassment*

The privacy of the survey participant has protection from unnecessary and unwanted personal harassment. The survey questionnaire is voluntary and asks for the cooperation of the participant. The top of the survey questionnaire asks the participant to take a few minutes to complete the survey. Zoo School values the participants' feedback and relies on their insights, comments and suggestions to improve the Zoo School programs. Zoo School respects the right of participants that refuse the survey, or terminate a survey in progress, and is responsible to minimize any discomfort to the survey participant (CASRO, 2004).

The end of the survey asks the participant if Zoo School may contact them for further discussion of the program. Zoo School has made every effort to ensure that the participant understands the purpose of the contact and that it is voluntary. The survey representative is required to provide prompt and honest identification of their affiliation with Zoo School, answer the participant questions in a non-deceptive manner, and ensure

that the participant insights, comments and suggestions have use to improve Zoo School programs. Zoo School respects the right of participants that refuse an interview or terminate an interview in progress. Zoo School has arranged interviews that are convenient to the volunteer participant and represent a reasonable and necessary length of the interview. Zoo School is responsible to minimize discomfort to the participant and interviewer, even though sensitive material will not be part of the interview. Zoo School may notify the participant the intent to use electronic equipment (taping, recording, photographing) during the interview process (CASRO, 2004). Zoo School does not have intentions to use electronic equipment.

## Study and Survey Permission

*Study Permission: Zoo School*

The thesis study has sponsorship by a large metropolitan zoo in the tri-state area of New Jersey, Pennsylvania and Delaware. The thesis study is partial requirements of a Master's thesis in Environmental Education and Conservation at Rowan University at Glassboro, New Jersey. The zoo is granting the author permission to survey teachers participating in Zoo School. The Management of Zoo School wrote a letter of interest supporting the research on Zoo School programs (Appendix B).

*Survey Permission: Zoo School*

The thesis author and Zoo School management developed and designed The Zoo School survey questionnaire. The survey questionnaire received permission by the zoo's Department of Education and Conservation committee on October 5, 2004, and began implementation on October 20, 2004. The exact wording of the survey questions is in

Appendix A. Surveys will continue to be collected throughout the 2004-05 school terms. The zoo's Department of Education and Conservation wrote a letter of permission by giving permission to implement the survey (see Appendix C).

*Survey Permission: Institutional Review Board*

The Institutional Review Board (IRB) of Rowan University requires an application of approval from students conducting research related to their Master's thesis with human subjects. "The Rowan University IRB defines research as a systematic investigation design to develop or contribute to general knowledge" (Rowan University IRB, 2004). Federal regulations (45 CFR 46) permit the exemption of some types of research from a full IRB review.

The Zoo School survey questionnaire implemented is *Category 1* research and exempt from a full review. *Category 1* research is "conducted in a established or commonly accepted educational settings, involving normal educational practices, such as: research on regular and special education instructional strategies; or research on the effectiveness of, or the comparison among, instructional techniques, curricula, or classroom management methods" (Rowan University, IRB, 2004).

The thesis author submitted the IRB Human Research Review Application on November 30, 2004. The IRB approved the application on December 3, 2004. In addition, the thesis author received an application approval letter from the IRB on December 20, 2004 (see Appendix D).

*Human Participant Protections Education*

It is a federal requirement for principal investigators responsible for the design and conduct of a research protocol that involves human subjects to complete training in

*Human Participant Protections Education*. Rowan University maintains Federal Wide Assurance (FWA) with the Office of Human Resource Protection (OHRP), and the U.S. Department of Health and Human Services. The FWA "includes a requirement for all research staff working with human participants to receive training in ethical guidelines and regulations" (Rowan University, IRB, 2004).

The author completed the training in ethical guidelines and regulations on the OHRP website at http://www.hhs.gov/ohrp/. OHRP issued a completion certificate on October 5, 2004 (see Appendix E). The author submitted the OHRP completion certificate and IRB Human Research Review Application to Rowan University IRB on November 30, 2004.

## Research Questions

The intent of the study is to investigate teacher's perceptions of Zoo school and evaluate their modules. The study examines if Zoo School has an effective program. The study researches the following questions:

1. To what extent do teachers perceive that module activities engage their students?
2. To what extent do teachers perceive that Zoo School provides their students an effective experience?
3. To what extent do teachers meet their expectations with regard to integrate curriculum?
4. To what extent do teachers meet their expectations with regard to support New Jersey and Pennsylvania education standards?

5. To what extent do teachers meet their expectations with regard to reward their students for academic achievement?
6. To what extent do the Zoo School modules address New Jersey and Pennsylvania academic standards?
7. To what extent do the Zoo School modules address the North American Association for Environmental Education *Guidelines for Excellence*?
8. To what extent does Zoo School use a lesson plan format?

## Research Hypotheses

The study examines what motivates teachers to participate in Zoo School and teacher's perception of program effectiveness for the students. Five hypotheses address this issue:

(H1): Teachers perceive that Zoo School provides their students with an engaging education program.

(H2): Teachers perceive that Zoo School provides their students with an effective experience.

(H3): Teachers enroll in Zoo School because they believe that these courses are an integral part of instruction.

(H4): Teachers enroll in Zoo School because they perceive these courses support their state academic standards.

(H5): Teachers enroll in Zoo School because they believe that these courses are a reward to their students for academic achievement.

## Research Method

The sampling method for the first part of the study is quantitative survey research. The first five research questions investigate teacher's perception of Zoo School effectiveness. Five hypotheses address the issue of what motivates teachers to participate and their perception of program effectiveness for the students. The survey research design is an interest or attitude questionnaire using Likert items. The primary intention of the questionnaire is to collect quantitative data investigating teachers' perceptions of Zoo School effectiveness.

The research method for the second part of the study is a comparative analysis of the existing Zoo School modules. Three research questions intend to study if the Zoo School modules address New Jersey and Pennsylvania standards, and the NAAEE *Guidelines for Excellence* and a generalized lesson plan format. The primary intention is to evaluate the existing Zoo School modules effectiveness.

## Validity of Research Questions and Survey

Five research questions use a non-experimental quantitative research design investigating teachers' perceptions. "The goal of basic research is to understand and explain, to provide broad generalizations about how phenomena are related" (McMillan, 2004, p.13). The study intent is to extend the knowledge base and address specific research questions of teachers' perceptions of Zoo School. The research questions follow a quantitative research design, data collection instrument, and conclude with data analysis and interpretations, and a set of conclusions based on the survey questionnaire findings.

Three research questions are a comparative curriculum analysis and evaluation of the existing Zoo School modules. The study intends to evaluate module effectiveness. "Evaluation research is directed toward making decisions about the effectiveness or desirability of a program" (McMillan, 2004, p.13). The research questions evaluate the existing modules relevance to the New Jersey and Pennsylvania standards, and the NAAEE *Guidelines for Excellence* and a lesson plan format.

## Survey Population

The participants in the Zoo School study were primary and secondary education teachers from Pennsylvania, New Jersey and Delaware. Participants were male and female adult teachers with an unknown and unidentified socio-economic status. Schools that participated either paid or had free enrollment. Schools enrolled free meet the *Title 1* of the U.S. Department of Education requirements, and have support by the U.S. Department of Education grant and Annenberg Foundation grant. The zoo is located in a large metropolitan area in Pennsylvania, near New Jersey and Delaware.

## Survey Sample

### *Sampling Method*

The survey population consists of volunteer teacher participants. The sampling method is a non-probability and non-random convenience survey that utilizes volunteer participation. According to McMillan (2004, p.116), volunteer participants differ from non-volunteer participants. Volunteer participants "tend to be better educated, higher socio-economically, more intelligent, more in need of social approval, more sociable,

more unconventional, less authoritarian, and less conforming than non-volunteers" (McMillan, 2004, p.116).

*Sample Validity*

There are potential weaknesses for using volunteer participants. "When conducting a survey the investigator typically sends questionnaires to a sample of individuals and tabulates the responses of those who return them. Often the percentage of the sample returning the questionnaire will be 50 to 60% or even lower" (McMillan, 2004, p.116). The Zoo School survey sample results may not represent the target population participating in the program.

*Representative Sample*

In the case of the Zoo School study, five hundred K-12 classes are benefiting from curriculum enrichment and field trip opportunities. From September 2004 through March 2005, Zoo School received two hundred and sixteen returned survey questionnaires from a target population of four hundred seventy-four. The return rate was nearly forty-six percent. The sampled population represents volunteer participants from the Zoo School program.

## Data Collection Instrument

*The Survey Instrument*

The data collection instrument for this study was generally an attitude questionnaire that indicates a degree of preference with disagree to agree response. The survey questionnaire consists of three parts. Part 1 provide entry for general demographic

information such as the date, program title, zoo presenter, public school, grade level (s), and the school zip code (Appendix A).

Part 2 lists sixteen statements divided in five areas and explored teacher's perceptions. These areas are motivation to participate, perception of student engagement, performance of the presenter and level of teacher's met expectations. The questionnaire Likert scale ranges from strongly disagree through strongly agree: The values are strongly disagree (1), disagree (2), neither (3), agree (4), and strongly agree (5). The survey questions provided data to evaluate if teachers perceived Zoo School to be effective.

Part 3 provided the teacher an opportunity to express of what they liked most about Zoo School and additional comments to recommend changes to the program. A pilot survey questionnaire conducted prior to data collection suggested the need for minor revisions. The Zoo School survey questions were:

1 I believe the zoo program should be an integral part of instruction for my class
2 It is essential for the zoo program to meet state education standards
3 I plan a trip to the zoo as a fun reward for my students' hard work
4 The zoo program provided an exciting experience for my students
5 My students actively participated in the zoo program
6 My students were captivated by the zoo program
7 The zoo educator was informative
8 The zoo educator was entertaining
9 The zoo educator involved my students in the lesson
10 The zoo program's printed materials are effective learning tools
11 The zoo program is appropriate for my students' grade level
12 The zoo program provided a valuable learning experience for my students
13 I am interested in returning to the Philadelphia Zoo for future programs
How well did the zoo program meet your expectations
14 ...for integration into your curriculum?
15 ...for meeting state education standards?
16 ...as a fun reward for your students' hard work?
17 What did you like most about this program?
18 What do you recommend that we change in the program (e.g.; content, format, timing, logistics, etc.)?

The Zoo School presenter distributed the survey to the teacher at the beginning of the forty-five minute class presentation. At the end of the presentation, students either prepared for the zoo field trip or returned to their school. The participant had the option to complete the survey in the classroom at Zoo School or send the survey questionnaire by fax or mail from their own school.

*Lesson Plan Evaluation*

The study intention was to evaluate if Zoo School modules address the New Jersey and Pennsylvania standards, NAAEE *Guidelines for Excellence*, and follow a lesson plan format. Zoo School has thirteen active modules in which eleven are complete. The analysis explored whether the Zoo School modules address the New Jersey and Pennsylvania standards, NAAEE *Guidelines for Excellence*, and a lesson plan format. Zoo School provided modules for the evaluation. Abbreviations and appropriate grade levels of the Zoo School modules are:

| | | | | | |
|---|---|---|---|---|---|
| FA | Five Alive | PK – 2 | RR | Reptile Rage | 3 – 12 |
| WC | Wild colors | PK – 2 | CB | Creepy, Buggy, Scaly, Slimy | 3 – 12 |
| WA | What Am I? | PK – 2 | GG | Going, Going, Gone | 6 – 12 |
| PH | Primates at Home | K – 6 | PW | Primate Watch | 6 – 12 |
| HH | Habitat Hotel | 2 – 5 | GJ | Genetic Jumble | 9 – 12 |
| AA | Animal Antics | 3 – 8 | SO | Saving Giant Otters | 9 – 12 |
| LL | Links of Life | 3 – 8 | | | |

The evaluation of the Zoo School modules addresses New Jersey and Pennsylvania standards. For New Jersey, local school districts have associated strands and cumulative progress indicators for student achievement in nine content areas:

| | | | |
|---|---|---|---|
| 1.0 | Visual and performing Arts | 6.0 | Social Studies |
| 2.0 | Comprehensive Health and Physical Education | 7.0 | World Languages |
| 3.0 | Language Arts Literacy | 8.0 | Technological Literacy |
| 4.0 | Mathematics | 9.0 | Career Education and Consumer, Family, and Life Skills |
| 5.0 | Science | | |

Zoo School has stated area standards that address the New Jersey Core Curriculum Content Standards in their modules (Table 11). As shown in Table 9, the stated area standards addressed by Zoo School are marked with an X.

Table 9. Stated Addressed Standards to the New Jersey Core Curriculum Content Standards

| | X= stated addressed standards | FA (PK-2) | WC (PK-2) | WI (PK-2) | PH (K-6) | HH (2-5) | AA (3-8) | LL (3-8) | RR (3-12) | CB (3-12) | GG (6-12) | PW (6-12) | GJ (9-12) | SO (9-12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Health, Physical Education | | | | | | | | | | | | | |
| 2.1 | Wellness | | X | | | X | | | | | | | X | |
| | Language Arts Literacy | | | | | | | | | | | | | |
| 3.1 | Reading | | X | | | X | | | | X | | | X | |
| 3.2 | Writing | | | | | | | | | | | | | X |
| 3.3 | Speaking and Inquiry | | X | | X | | | | | | | X | | X |
| 3.4 | Listening | | X | | | | | | | | | X | | X |
| | Mathematics | | | | | | | | | | | | | |
| 4.2 | Geometry and Measurement | | X | | | | X | | X | | | X | | |
| 4.4 | Data Analysis, Probability | | X | | | | | X | | | X | X | | |
| 4.5 | Mathematical Processes | | | | | | | | | | | | X | |
| | Science | | | | | | | | | | | | | |
| 5.1 | Scientific Processes | | | | | | | | | | | | | X |
| 5.3 | Mathematical Applications | X | X | | X | | X | | X | | X | X | | X |
| 5.5 | Characteristics of Life | X | X | | X | X | X | | X | X | X | X | X | |
| 5.6 | Chemistry | X | | | | | | | | | | | | |
| 5.8 | Earth Science | | | | | X | | | | | | | | X |
| 5.10 | Environmental Studies | X | | | X | | X | | X | X | X | X | | X |
| | Social Studies | | | | | | | | | | | | | |
| 6.7 | World in Spatial Terms | | | | | X | | | X | | X | X | | X |
| 6.8 | Human Systems | | | | | X | | | X | | X | X | | X |
| 6.9 | Environment and Society | | | | | | | | | | | | | |

(*Zoo School*, 2004)

For Pennsylvania, local school districts have associated strands and cumulative progress indicators for student achievement in thirteen academic areas:

1.0 Reading, Writing Speaking and Listening
2.0 Mathematics
3.0 Science and Technology
4.0 Environment and Ecology
5.0 Civics and Government
6.0 Economics
7.0 Geography
8.0 History
9.0 Arts and Humanities
10.0 Health, Safety and Physical Education
11.0 Family and Consumer Sciences
12.0 World Languages
13.0 Career Education and Work

Zoo School has stated area standards that address the Pennsylvania Academic Standards in their modules. As shown in Table 10, the stated area standards addressed by Zoo School are marked with an X.

Table 10. Stated Addressed Standards to the Pennsylvania Academic Standards

| | X= stated addressed standards | FA (PK-2) | WC (PK-2) | WA (PK-2) | PH (K-6) | HH (2-5) | AA (3-8) | LL (3-8) | RR (3-12) | CB (3-12) | GG (6-12) | PW (6-12) | GJ (9-12) | SO (9-12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Science and Technology | | | | | | | | | | | | | |
| 3.1 | Unifying Themes of Science | X | | X | | | | | | | | X | X | |
| 3.2 | Inquiry and Design | | X | | | | | | | | | X | | X |
| 3.3 | Biological Sciences | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 3.7 | Technological Devices | | | | | | | | | | | X | | X |
| 3.8 | Science, Technology, Human | | | | X | | | | | | | | | |
| | Environment and Ecology | | | | | | | | | | | | | |
| 4.1 | Wetland and Watersheds | | | X | | X | | | | | X | | | X |
| 4.2 | Renewable and Nonrenewable | | | | | X | | X | | | | | | |
| 4.3 | Environmental Health | | | | X | X | | X | X | X | X | | | X |
| 4.5 | Integrated Pest Management | | | | | | | X | | X | X | | | |
| 4.6 | Ecosystems and Interactions | | | | X | X | X | | X | | X | | X | X |
| 4.7 | Adaptations, Endangered Sp. | | X | X | | | X | X | X | | X | | X | X |
| 4.8 | Humans and the Environment | | | | X | | | | | | | | X | |
| 4.9 | Environmental Laws | | | | | | | | | | | | | X |
| | Geography | | | | | | | | | | | | | |
| 7.1 | Basic Geographic Literacy | | | | | X | | | | | | | | X |
| | Health, Safety, Physical Ed. | | | | | | | | | | | | | |
| 10.2 | Healthful Living | | | | | | | | | | X | | | |
| | Family, Consumer Sciences | | | | | | | | | | | | | |
| 11.1 | Financial and Resource Mgmt. | | | | | X | | X | | | X | | | X |
| 11.2 | Family, Work and Community | | | | | X | | | | | X | | | |
| 11.3 | Food Science and Nutrition | X | | | | | | X | | | | | | |

(*Zoo School*, 2004)

The evaluation of the Zoo School modules addresses the six key characteristics for the NAAEE *Guidelines for Excellence*. The *Guidelines for Excellence* is a collection of recommendations to develop and select environmental education materials. The *Guidelines for Excellence* goals assist developers to produce high quality activity guides and lesson plans, and assist presenters to evaluate environmental education materials. The *Guidelines for Excellence* have six key characteristics: fairness and accuracy; depth;

emphasis on skill building; action orientation; instructional soundness; and usability (NAAEE, 2004).

The evaluation of the Zoo School curricula addresses a lesson plan format as recommended by Cruickshank, Jenkins and Metcalf (2003). A lesson plan format has six areas: objectives, resources, set induction, methodology, assessment and closure. The Zoo School modules have sections for main points and rational; standards; materials and equipment; introduction; transitions; activities; and closing.

## Data Analysis

### *Statistical Tools*

The data analysis for the survey questionnaire utilized Statistical Package for Social Sciences (SPSS) and Excel Microsoft software. A descriptive research approach provides information on the distribution and frequencies of participant attitude. A descriptive analysis for mean, standard deviation and frequency measure the questionnaire statements.

### *Descriptive Analysis*

There are five areas of teacher's perceptions. These areas are Type A, B, C, D and E. Type A is the teacher motivation to participate and includes questions one through three. Type B is student engagement and includes questions four through six. Type C is the presenter effectiveness and includes questions seven through nine. Type D is other factors for program effectiveness and includes questions ten through thirteen. Moreover, Type E is how well the program met teacher expectations and includes question fourteen through sixteen. Frequency values for strongly agreed, agreed, disagreed, and strongly

disagreed, described the survey results. The participant had the opportunity to comment on what they liked about the program and recommended changes for the program.

*Module Evaluation*

An evaluation of the Zoo School modules addresses the New Jersey and Pennsylvania standards, the NAAEE *Guidelines for Excellence,* and a lesson plan format. The evaluated modules address the objective statements, warm-up exercises, activities, transitions and closing statements. The module evaluation addresses the areas of Science and Social Studies for New Jersey, and Science and Technology, and Environment and Ecology for Pennsylvania.

## Summary

Chapter 3 details the research overview, standards and ethics of survey research, research questions, hypotheses, and methodology that includes the survey population and sample, data collection instrument, and data analysis. A survey questionnaire investigated if teacher's influence to participate in Zoo School is by their perceived expectations that the program integrates well in their curriculum, meet required state curriculum standards, or provided a reward to their students for academic achievement. Teacher's perception for their motivation to participate, student engagement, presenter performance, other factors for program effectiveness, and teacher's met expectations were evaluated and labeled as Type A, B, C, D and E.

Zoo School modules obtained evaluated if they address the New Jersey Core Curriculum Content Standards, Pennsylvania Academic Standards, and North American Association for Environmental Education *Guidelines for Excellence*, and a lesson plan

format. Chapter four details the research findings of participating teacher's perceptions of the program effectiveness, and an evaluation of the curriculum to the New Jersey Core Curriculum Content Standard, Pennsylvania Academic Standards, and the North American Association for Environmental Education *Guidelines for Excellence,* and a lesson plan format.

# CHAPTER 4

# FINDINGS

## Research Overview

The intent of the study was to investigate (a) teacher's perceptions of the Zoo school program and (b) evaluate Zoo School modules. The study examined if Zoo School has an effective program by evaluating teacher's motivation to participate, student's engagement of learning activities, presenter performance, other factors for program effectiveness, and met expectations for integrating curriculum, supporting the New Jersey Core Curriculum Content Standards (NJCCCS) and Pennsylvania Academic Standards (PAS), or rewarding their students for academic achievement. In addition, the study examined if the Zoo School curriculum addresses the New Jersey and Pennsylvania standards, and the North American Association for Environmental Education (NAAEE) *Guidelines for Excellence* and a lesson plan format.

## Survey Analysis

### *Descriptive Analysis*

Zoo School received two hundred and sixteen returned survey questionnaires from a target population of four hundred seventy-four. The return rate was nearly forty-six percent. For the surveys returned, eighty-nine percent were from Pennsylvania, six

percent from New Jersey, one percent from Delaware, and five percent of the surveys were missing demographic data.

For the type of program, Sixty-nine percent were in the free Zoo School program-schools that qualified for the *Title 1* U.S. Department of Education program to improve the academic achievement of the disadvantaged. Eleven percent was from the paid Zoo School program, eighteen percent from the Zoo on Wheels Zoo School program, and three percent were missing data on the program type. *Title 1* schools that were not able to pay the cost of a bus received the Zoo on Wheels, Zoo School program option. For the participants that have or have not attended a zoo education program in the past, fifty-nine percent of the total participants have attended, twenty-nine percent have not attended and twelve percent of the surveys had missing data.

Table 11. Demographic Frequency Values

| State | Surveys | % | Type of Program | Surveys | % |
|---|---|---|---|---|---|
| Pennsylvania | 190 | 88.0 | Free Zoo School | 148 | 68.5 |
| New Jersey | 12 | 5.5 | Paid Zoo School | 23 | 10.6 |
| Delaware | 3 | 1.4 | Zoo on Wheels Zoo School | 39 | 18.1 |
| Unknown | 11 | 5.1 | Missing Data | 6 | 2.8 |
| **Irregular Data** | **Surveys** | **%** | **Prior Attendance in a Program** | **Surveys** | **%** |
| Missing Likert Data (>3) | 6 | 2.8 | Yes | 128 | 59.3 |
| All Strongly Agree | 27 | 12.5 | No | 63 | 29.2 |
| Missing Data (Q10) | 34 | 39.5 | Missing Data | 25 | 11.5 |
| Total Missing Questions | 86 | 2.5 | Surveys Returned (474 total) | 216 | 45.6 |

For the Likert questions, surveys had missing data or marked with all "strongly agreed" values. Over two percent of the Likert questions had missing data. Almost three percent of the surveys had over three missing Likert values per survey. Nearly thirteen percent of the total surveys were valued at "strongly agreed" for all Likert questions. The effectiveness of printed materials as an effective learning tool (Q10) had nearly forty

percent of the total missing Likert data (see Table 11). Tables developed by SPSS for descriptive statistics, missing data and frequency values (Appendix F).

*Teacher's motivation to participate.*

Survey Question 1: I believe the zoo program should be an integral part of instruction for my class. For teacher's perception forty-seven percent strongly agreed, forty-one percent agreed, ten percent neither agreed nor disagreed, and two percent disagreed that the zoo program should be an integral part of instruction for the class (see Figure 1).

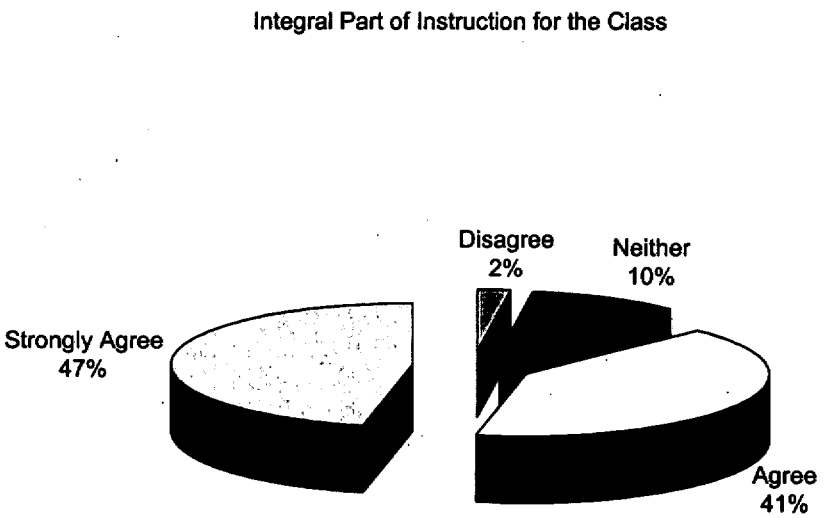


Figure 1. Perception that Zoo School should be an integral part of class instruction

Survey Question 2: It is essential for the zoo program to meet state education standards. For teacher's perception forty percent strongly agreed, Forty-one percent agreed, thirteen percent neither agreed nor disagreed, five percent disagreed, and less than one percent strongly disagreed that it is essential for the zoo program to meet state education standards. One percent had missing data (see Figure 2).

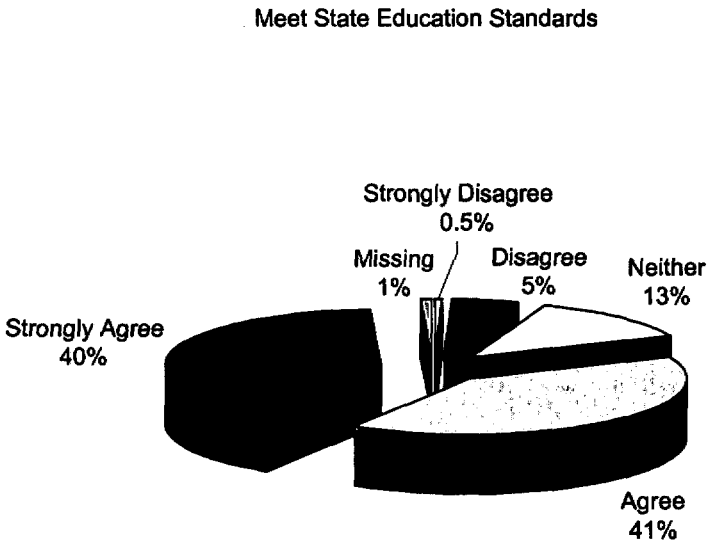


Figure 2. Perception that it is essential for Zoo School to meet state education standards

Survey Question 3: I plan a trip to the zoo as a fun reward for my students' hard work. For teacher's perception twenty-five percent strongly agreed, thirty-six percent agreed, twenty-six percent neither agreed nor disagreed, eight percent disagreed, and four percent strongly disagreed for planning a trip to the zoo as a fun reward for academic achievement. One percent had missing data (see Figure 3).

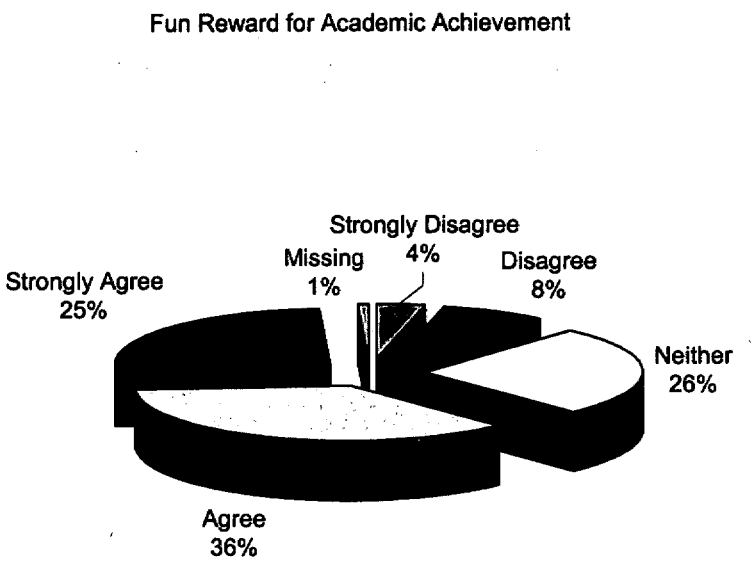


Figure 3. Perception that a trip to the zoo is a fun reward for students' hard work

*Student engagement.*

Survey Question 4: The zoo program provided an exciting experience for my students. For teacher's perception sixty-nine percent strongly agreed, twenty-eight percent agreed, more than one percent neither agreed nor disagreed that the zoo program provided an exciting experience for students. Two percent had missing (see Figure 4).

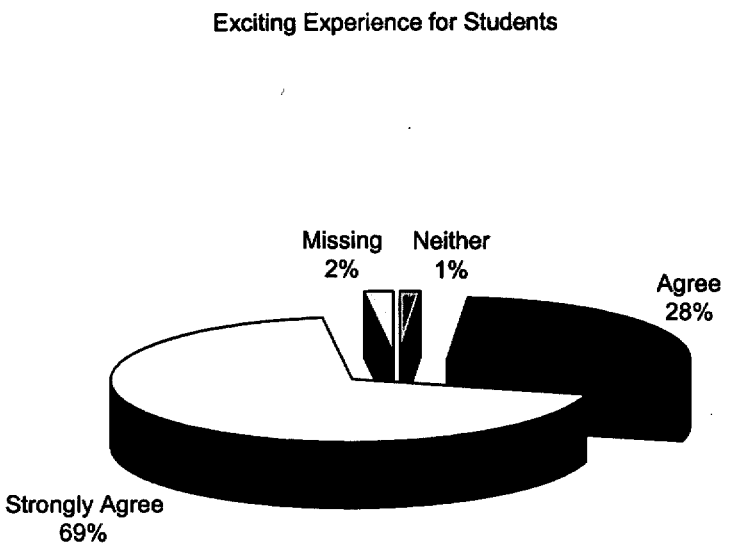


Figure 4. Perception that Zoo School provided an exciting experience for students

Survey Question 5: My students actively participated in the zoo program. For teacher's perception sixty-nine percent strongly agreed, twenty-seven percent agreed, two percent neither agreed nor disagreed and more than one percent disagreed that students actively participated in the zoo program. Less than one percent had missing data (see Figure 5).

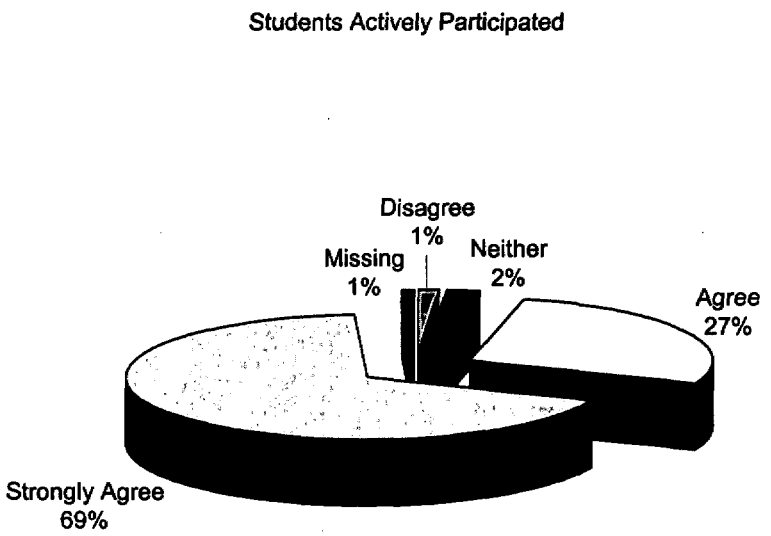


Figure 5. Perception that students actively participated in Zoo School

Survey Question 6: My students were captivated by the zoo program. For teacher's perception sixty percent strongly agreed, thirty-one percent agreed, six percent neither agreed nor disagreed and one percent disagreed that the zoo program captivated students. Two percent had missing data (see Figure 6).

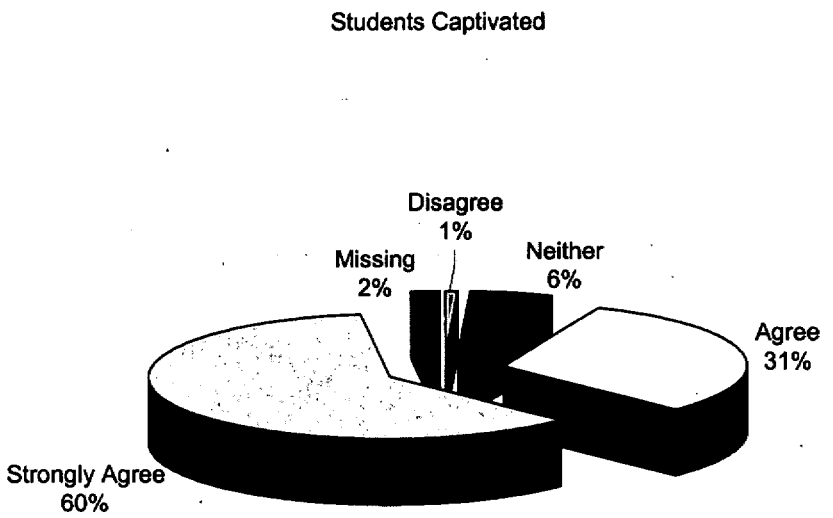


Figure 6. Perception that Zoo School activities captivated the students

*Presenter effectiveness.*

Survey Question 7: The zoo educator was informative. For teacher's perception seventy-one percent strongly agreed, twenty-nine percent agreed, and less than one percent neither agreed nor disagreed that the zoo educator was informative. Less than one percent had missing data (see Figure 7).

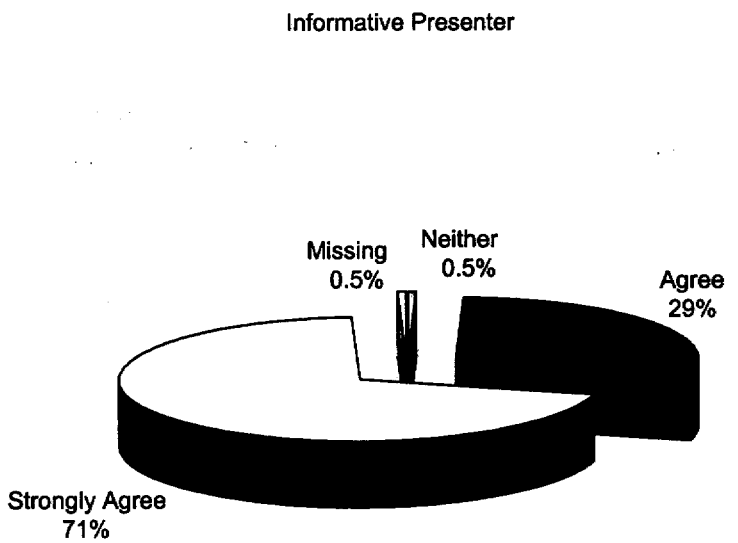


Figure 7. Perception that the presenter was informative

Survey Question 8: The zoo educator was entertaining. For teacher's perception sixty percent strongly agreed, thirty-five percent agreed, three percent neither agreed nor disagreed and less than one percent disagreed that the zoo educator was entertaining. Less than one percent had missing data (see Figure 8).

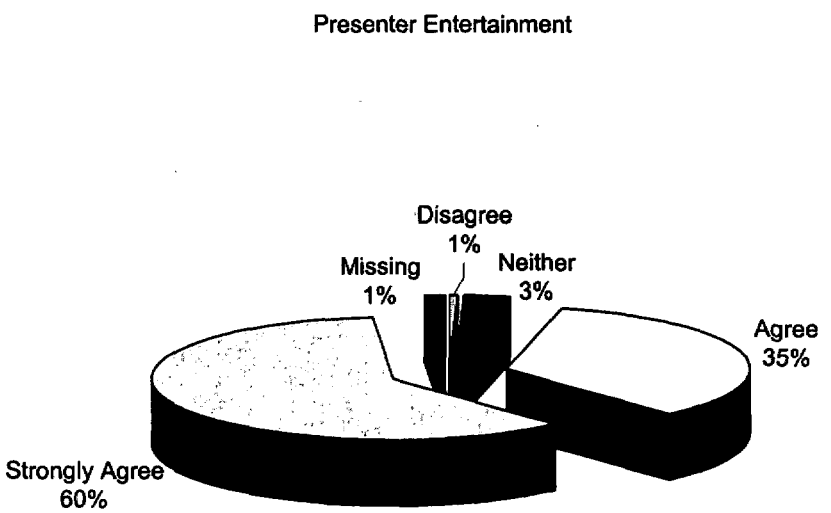


Figure 8. Perception that the presenter entertained students

Survey Question 9: The zoo educator involved my students in the lesson. For teacher's perception seventy-four percent strongly agreed, twenty-four percent agreed, and less than one percent strongly disagreed that the zoo educator involved students in the lesson. One percent had missing data (see Figure 9).

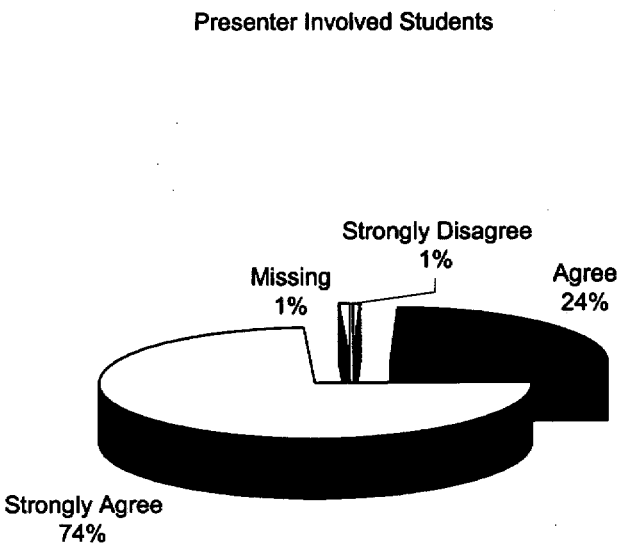


Figure 9. Perception that the presenter involved students

*Other Factors for Program Effectiveness.*

Survey Question 10: The zoo program's printed materials are effective learning tools. For teacher's perception thirty-two percent strongly agreed, thirty-two percent agreed, nineteen percent neither agreed nor disagreed and less than one percent disagreed that the zoo program's printed materials are effective learning tools. Nearly sixteen percent had missing data (see Figure 10).

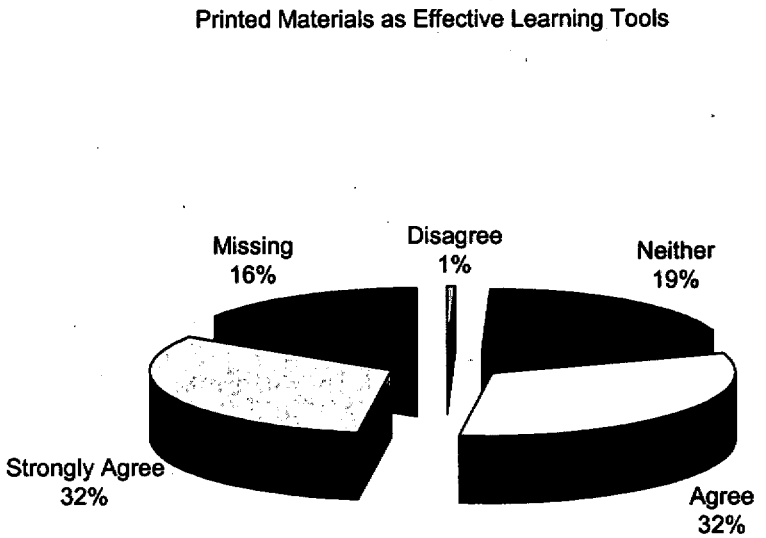


Figure 10. Perception that printed materials are effective learning tools

Survey Question 11: The zoo program is appropriate for my students' grade level. For teacher's perception sixty-two percent strongly agreed, thirty-three percent agreed, three percent neither agreed nor disagreed and less than one percent disagreed that the zoo program is appropriate for students' grade level. Two percent had missing data (see Figure 11).

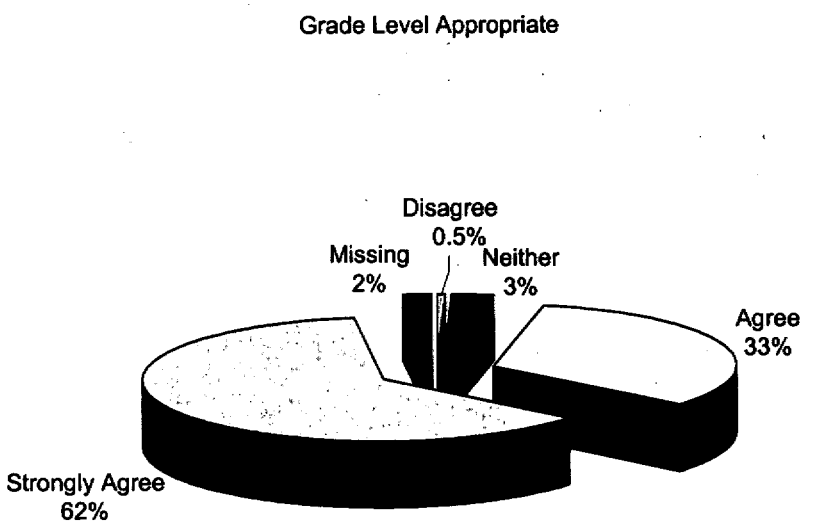


Figure 11. Perception that the program was grade level appropriate

Survey Question 12: The zoo program provided a valuable learning experience for my students. For teacher's perception sixty-seven percent strongly agreed, twenty-nine percent agreed, and over one percent neither agreed nor disagreed that the zoo program provided a valuable learning experience for students. Three percent had missing data (see Figure 12).

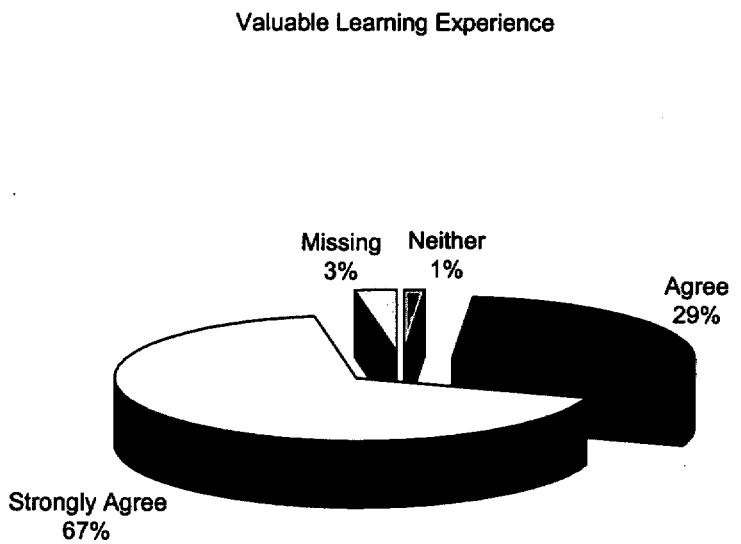


Figure 12. Perception that the program provided a valuable learning experience for students

Survey Question 13: I am interested in returning to Zoo School for future programs. For teacher's perception sixty-nine percent strongly agreed, twenty-seven percent agreed, three percent neither agreed nor disagreed and less than one percent strongly disagreed for an interest to return to Zoo School for future programs. One percent had missing data (see Figure 13).

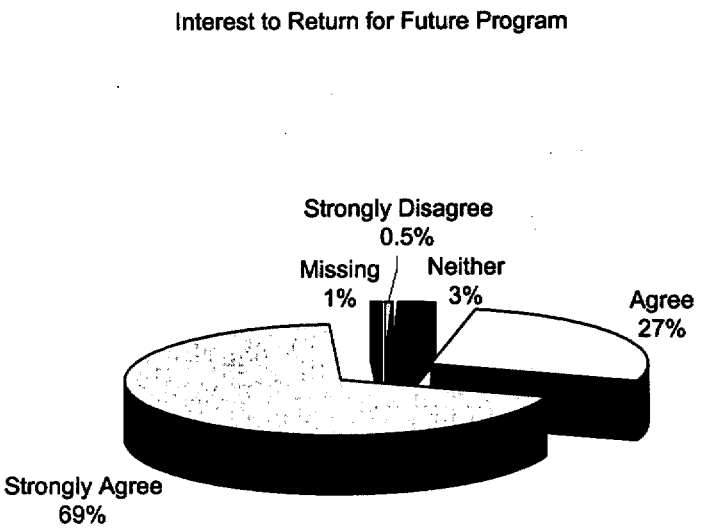


Figure 13. Interested in returning to Zoo School for future programs

*Teachers Met Expectations.*

Survey Question 14: How well did the zoo program meet your expectations for integration into your curriculum? For teacher's expectations thirty percent strongly exceeded met expectations, thirty-five percent exceeded expectations, thirty-three percent met expectations and less than one percent fell below met expectations for integration into curriculum. Two percent had missing data (see Figure 14).

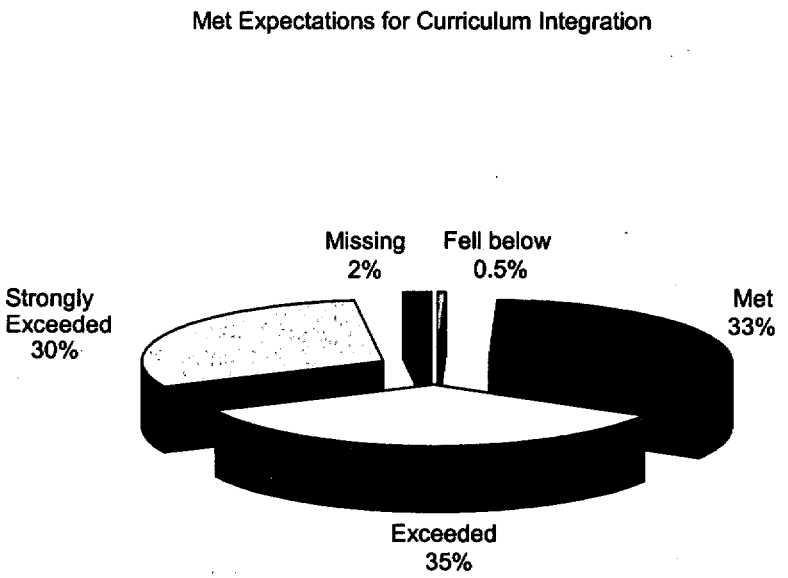


Figure 14. Program met teacher's expectations for curriculum integration

Survey Question 15: How well did the zoo program meet your expectations for meeting state education standards? For teacher's expectations twenty-six percent strongly exceeded met expectations, thirty-seven percent exceeded met expectations, thirty-three percent met expectations and less than one percent fell below met expectations for meeting state education standards. Four percent had missing data (see Figure 15).

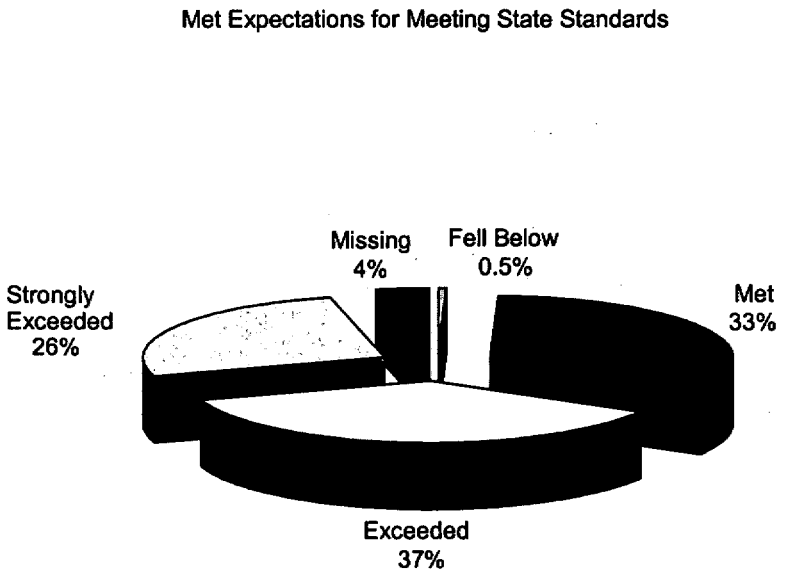


Figure 15. Program met teacher's expectations for meeting state education standards

Survey Question 16: How well did the zoo program meet your expectations as a fun reward for your students' hard work? For teacher's expectations thirty-nine percent strongly exceeded met expectations, thirty-one percent exceeded met expectations, twenty-four percent met expectations, less than one percent fell below met expectations, and more than one percent strongly fell below met expectations as a fun reward for students' hard work. Four percent had missing data (see Figure 16).

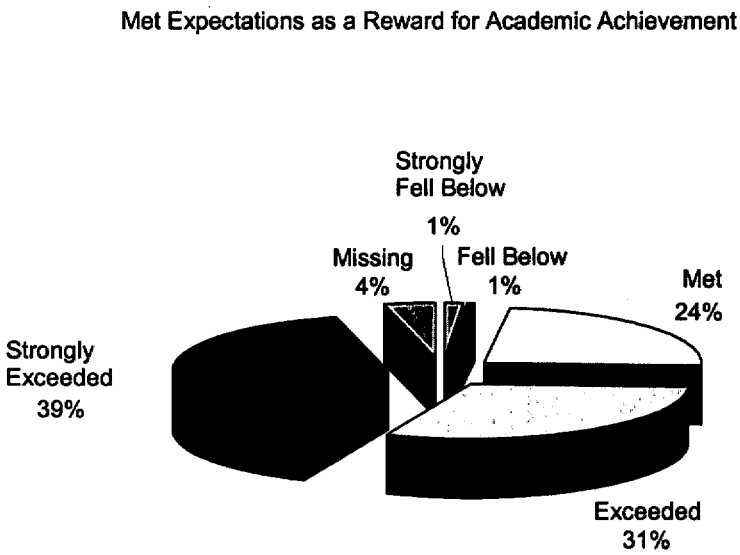


Figure 16. Program met teacher's expectations as a reward for academic achievement

There are five areas of teacher's perceptions. These areas are Type A, B, C, D and E. Type A is the teacher motivation to participate and includes questions one through three. Type B is student engagement and includes questions four through six. Type C is the presenter effectiveness and includes questions seven through nine. Type D is other

factors for program effectiveness and includes questions ten through thirteen. Moreover, Type E is how well the program met teacher expectations and includes question fourteen through sixteen. The Zoo School survey questions are:

1 I believe the zoo program should be an integral part of instruction for my class
2 It is essential for the zoo program to meet state education standards
3 I plan a trip to the zoo as a fun reward for my students' hard work
4 The zoo program provided an exciting experience for my students
5 My students actively participated in the zoo program
6 My students were captivated by the zoo program
7 The zoo educator was informative
8 The zoo educator was entertaining
9 The zoo educator involved my students in the lesson
10 The zoo program's printed materials are effective learning tools
11 The zoo program is appropriate for my students' grade level
12 The zoo program provided a valuable learning experience for my students
13 I am interested in returning to the Philadelphia Zoo for future programs
How well did the zoo program meet your expectations
14 ...*for integration into your curriculum?*
15 ...for meeting state education standards?
16 ...as a fun reward for your students' hard work?

Table 12. Survey Questionnaire Frequency Values

| Type | Q | % Strongly Disagree + Disagree | % Neither Disagree nor Agree | % Strongly Agree + Agree | Mean | SD | Supported |
|---|---|---|---|---|---|---|---|
| A | 1 | 2.3 | 10.2 | 87.5 | 4.32 | 0.75 | Curriculum integration and state standards |
| Teacher's | 2 | 5.6 | 13.0 | 80.6 | 4.16 | 0.87 | |
| Motivation | 3 | 11.6 | 26.4 | 61.1 | 3.72 | 1.05 | |
| B | 4 | 0 | 1.4 | 97.8 | 4.69 | 0.49 | Exciting experience, actively participated, and captivated |
| Student | 5 | 1.4 | 2.3 | 86.4 | 4.64 | 0.60 | |
| Engagement | 6 | 0.9 | 5.6 | 91.6 | 4.54 | 0.65 | |
| C | 7 | 0 | 0.5 | 99.1 | 4.70 | 0.47 | Informative, entertaining, and involved students |
| Presenter | 8 | 0.5 | 3.2 | 94.9 | 4.57 | 0.58 | |
| Effectiveness | 9 | 0.5 | 0 | 98.6 | 4.74 | 0.50 | |
| D | 10 | 0.5 | 19.4 | 64.3 | 4.14 | 0.79 | Grade appropriate, valuable learning experience, and return interest |
| Other Factors | 11 | 0.5 | 2.8 | 94.9 | 4.59 | 0.57 | |
| for Program | 12 | 0 | 1.4 | 95.3 | 4.67 | 0.50 | |
| Effectiveness | 13 | 0.5 | 2.8 | 95.9 | 4.65 | 0.58 | |
| | | Fell Below | Met | Exceeded | | | |
| E | 14 | 0.5 | 32.9 | 64.8 | 3.96 | 0.81 | Expectations not fully met by motivations |
| Teacher 's met | 15 | 0.5 | 32.9 | 63.0 | 3.92 | 0.79 | |
| Expectations | 16 | 1.9 | 24.5 | 69.9 | 4.11 | 0.90 | |

Table 12 shows a summary of frequency values for combined strongly agreed and agreed, and for combined strongly disagreed and disagreed. Neither agreed nor disagreed, and the means, standard deviation, and supported areas are listed.

*Participant Comments*

Two open-ended questions asked participants to comment on Zoo School: What did you like most about this program? What do you recommend that we change in the program (e.g.; content, format, timing, logistics, etc.)? Table 13 and 14 shows a selected list of quoted comments relevant to the research questions. Comments chosen are by relevance to the research questions, and their effectiveness to support positive change for Zoo School. Appendix G shows a complete list of quoted comments relevant to the research questions.

Table 13. Examples of Participant Comments for What They Like Most about the Program

| | |
|---|---|
| 1 | Lesson was perfect for 2nd graders! It was on their level and very educational. |
| 2 | Enhanced our classroom curriculum. Provided lots of factual information in a fun way. |
| 3 | Animals, addressing of PA standards, addressing misconceptions. |
| 4 | Live Animals are always a welcome addition to curriculum and the zoo provides the only real source of exotic animals. |
| 5 | Facilitator actively engaged students and was age/grade appropriate for the audience. |
| 6 | Great job tying in environmental issues. Very good techniques getting the kids attention. |
| 7 | The discussion of how animals camouflage themselves into the environment. |
| 8 | To have students be involved in the lesson and actually see them was excellent. |
| 9 | Students enjoyed the program, were involved, and learned things that supplemented learning in the classroom. |
| 10 | Animated, expressive, well informed instructor, dispelled myths, setting forth foundations for research projects, extremely interactive, questions truly challenged, and informed the class as well as the teacher. |
| 11 | Compare/contrast human habitat and needs to various animal habitats and needs |

Table 14. Examples of Participant Recommended Program Changes

| | |
|---|---|
| 1 | Short, colorful video showing animals camouflaged in their natural settings. Seeing this might be better than just telling us about it. |
| 2 | Provide lesson plans in addition to the program. |
| 3 | More colorful, lively pictures especially for younger students. |
| 4 | Can a program be designed to fit a "community" theme? Animals in the desert community? |
| 5 | More posters/visual aids to hit home certain points (mammals, amphibians, etc). |
| 6 | Missed the songs. Last year my class sang the mammal song for at least a month after. |
| 7 | I was hoping you would use more age appropriate vocabulary to reinforce what was taught in school (limiting factor, carrying capacity). |
| 8 | Live animals and information on them. Add more animals to discussion either through pictures or conversation even live ones since the kids like them the best. Maybe think about taking the lesson into part of the zoo for continued discussion. |
| 9 | Incorporate visuals where possible to show how animals are active in the wild. Examples: hawk in flight or eating; snake crawling and swallowing prey, etc. A simple animal coloring book that reflects the animals in lesson and simple descriptions. |

## Module Analysis

Three Zoo School educators wrote the modules in-house. Two of the three educators co-authored nine of the thirteen modules: *Five Alive; Wild Colors; What am I; Habitat Hotel; Animal Antics; Links of Life; Creepy, Buggy, Scaly, Slimy;* and *Going, Going, Gone.* The third educator authored two of the thirteen modules: *Primates at Home* and *Primate Watch. Genetic Jumble* and *Saving Giant Otters* modules are in development. As shown in Table 15, the Zoo School modules, abbreviations and appropriate grade levels are:

Table 15. Zoo School Modules and Target Grade Levels

| | | | | | |
|---|---|---|---|---|---|
| FA | Five Alive | PK – 2 | RR | Reptile Rage | 3 – 12 |
| WC | Wild colors | PK – 2 | CB | Creepy, Buggy, Scaly, Slimy | 3 – 12 |
| WA | What Am I? | PK – 2 | GG | Going, Going, Gone | 6 – 12 |
| PH | Primates at Home | K – 6 | PW | Primate Watch | 6 – 12 |
| HH | Habitat Hotel | 2 – 5 | GJ | Genetic Jumble | 9 – 12 |
| AA | Animal Antics | 3 – 8 | SO | Saving Giant Otters | 9 – 12 |
| LL | Links of Life | 3 – 8 | | | |

The Zoo School modules obtained, determine if they address the New Jersey Core Curriculum Content Standards (NJCCCS), Pennsylvania Academic Standards (PAS), and the North American Association for Environmental Education (NAAEE) *Guidelines for Excellence*, and parts of a lesson plan format. The eleven modules evaluated have objective statements. The evaluation indicate standards stated (X), standards not stated (A), and stated standards by *Zoo* School that do not address the curriculum (N).

*New Jersey Core Curriculum Content Standards Evaluation*

The Zoo School modules address Science and Social Studies standards. Associated strands and cumulative progress indicators begin at second grade level and progress to the fourth, eighth and twelfth grade levels. The standards for Science and Social Studies are:

| | | | |
|---|---|---|---|
| 5.1 | Scientific Process | 6.1 | Social Studies Skills |
| 5.2 | Science and Society | 6.2 | Civics |
| 5.3 | Mathematical Applications | 6.3 | World History |
| 5.4 | Nature and Process of Technology | 6.4 | United States/New Jersey History |
| 5.5 | Life Science | 6.5 | Economics |
| 5.6 | Physical Science- Chemistry | 6.6 | Geography |
| 5.7 | Physical Science- Physics | 6.7 | World in Spatial Terms (1996) |
| 5.8 | Earth Science | 6.8 | Human Systems (1996) |
| 5.9 | Astronomy and Space Science | 6.9 | Environment and Society (1996) |
| 5.10 | Environmental Science | | |

(NJDOE, 2002-04)

The analysis of three modules shown in Tables 16, 17, and 18 are evaluations for how Zoo School modules resulted against the New Jersey standards. The modules are *Habitat Hotel, Links of Life* and *Creepy, Buggy, Scaly, Slimy.*

Table 16. Habitat Hotel Module Objectives that Address the New Jersey Core Curriculum Content Standards for Science and Social Studies

Module Objectives

1 Students will be able to identify four different habitats
2 Students will be able to identify the four basic needs of animals and how they find them in four different habitats
3 Students will be able to observe an animal's adaptations and predict what habitat it would survive best in, in the wild
4 Students will be able to compare and contrast four different habitats

(Zoo School, 2004a)

| Obj | | Standard | |
|---|---|---|---|
| 1, 2 | 5.5 | Life Science | "Students will gain an understanding of the structure, characteristics, and basic needs of organisms and will investigate the diversity of life" |
| 3 | 5.8 | Earth Science | "Students will gain an understanding of the structure, dynamics, and geophysical systems of the earth" |
| 4 | 5.10 | Environmental Science | "Students will develop an understanding of the environment as a system of interdependent components affected by human activity and natural phenomena" |
| 4 | 6.7 | World in Spatial Terms | "Students will explain the spatial concepts of location, distance and direction" |
| 1, 4 | 6.9 | Environment and Society | "Students will differentiate between living and non-living natural resources" |

(NJDOE, 2002-04)

Table 17. Links of Life Module Objectives that Address the New Jersey Core Curriculum Content Standards for Science and Social Studies

Module Objectives

1 Students will be able to define herbivore, omnivore, carnivore, insectivore, decomposer, producer, primary consumer, secondary consumer and tertiary consumer, and the food chain
2 Students will be able to identify and describe at least one food chain and/or food web
3 Students will be able to compare and contrast herbivore, carnivore, omnivore and insectivore
4 Students will be able to predict the next link in a food chain

(Zoo School, 2004a)

| Obj | | Standard | |
|---|---|---|---|
| 1, 3 | 5.5 | Life Science | Students will gain an understanding of the structure, characteristics, and basic needs of organisms and will investigate the diversity of life |
| 2, 4 | 5.8 | Earth Science | Students will gain an understanding of the structure, dynamics, and geophysical systems of the earth |
| 1, 3 | 5.10 | Environmental Science | Students will develop an understanding of the environment as a system of interdependent components affected by human activity and natural phenomena |
| 2, 4 | 6.9 | Environment and Society | Students will differentiate between living and non-living natural resources |

(NJDOE, 2002-04)

Table 18. Creepy, Buggy, Scaly, Slimy Module Objectives that Address the New Jersey Core Curriculum Content Standards for Science and Social Studies

Module Objectives

1 Students will be able to identify and describe at least two animals that students come in contact with on a regular basis that might be considered harmful or yucky
2 Students will be able to differentiate between fact and myth relating to at least four animals
3 Students will be able to understand that the elements of natural systems are interdependent
4 Students will be able to explain biological diversity as an indicator of a healthy environment

(Zoo School, 2004a)

| Obj | | Standard | |
|---|---|---|---|
| 1, 2 | 5.5 | Life Science | Students will gain an understanding of the structure, characteristics, and basic needs of organisms and will investigate the diversity of life |
| 2, | 5.10 | Environmental Science | Students will develop an understanding of the environment as a system of interdependent components affected by human activity and natural phenomena |
| 3, 4 | 6.9 | Environment and Society | Students will differentiate between living and non-living natural resources |

(NJDOE, 2002-04)

A full curriculum analysis conducted for the Zoo School modules against the New Jersey standards showed the following. For the area of Science, Zoo School modules objectives mostly address standards 5.3 (Mathematical Applications), 5.5 (Life Science) and 5.10 (Environmental Science). Mathematical Applications address: "students will integrate mathematics as a tool for problem-solving in science, and as a means of expressing and/or modeling scientific theories" (NJDOE, 2004). Five of the eleven modules address the standard for Mathematical Applications. The kindergarten through second grade level classes, *Five Alive* and *Wild Colors* modules, do not address the standard for Mathematical Applications. The associated strands and cumulative progress indicators are expectations that begin at the fourth grade and progress to the eighth and twelfth grade levels. *Five Alive* and *Wild Colors* do not have module objectives that integrate mathematics as a tool for problem solving.

Life Science addresses: "students will gain an understanding of the structure, characteristics, and basic needs of organisms, and will investigate the diversity of life"

(NJDOE, 2004). Nine of eleven modules address the standard for Life Science. The *Links of Life* module does not state that they address the standard for Life Science. However, from further analysis, the standard for Life Science was even though not stated by the module objectives. The module objectives for *Links of Life* address the identification and description of food webs and food chains, and contrast and compare herbivores, carnivores, omnivores and insectivores.

Environmental Studies addresses: "students will develop an understanding of the environment as a system of interdependent components affected by human activity and natural phenomena" (NJDOE, 2004). Seven of the eleven modules address the standard for Environmental Studies. Four of the eleven modules, *Wild Colors, What Am I, Habitat Hotel* and *Links of Life* do not state that they address the standard for Environmental Studies. However, from further analysis, the standard for Environmental Studies was addressed even though not stated by the module objectives. The module objectives for *Wild Colors, What Am I, Habitat Hotel* and *Links of Life* address systems of the environment such as food webs, food chains, habitats, and camouflaging, cryptic coloration, counter shading and disruptive pattern of animals for natural survival.

For the area of Social Studies, Zoo School modules objectives mostly address standard 6.6 (Geography): "All students will apply knowledge of spatial relationships and other geographic skills to understand human behavior in relation to the physical and cultural environment" (NJDOE, 2002-04). The associated strands for the standard for Geography (2004), were labeled as standards 6.7 (World in Spatial Terms), 6.8 (Human Systems) and 6.9 (Environment and Society) in 1996.

Four of the eleven modules, address the strands for the World in Spatial Terms and Human Systems. Seven of the eleven modules do not address the strands for the World in Spatial Terms and Human Systems. The *Primates at Home* module does not state that they address the strands for the World in Spatial Terms and Human Systems. However, from further analysis, the module objectives do address the World in Spatial Terms and Human Systems even though not stated. In addition, all modules appear to address Environment and Society. Table 19 shows a full analysis of the Zoo School modules summarized stated and unstated standards.

Table 19. Full Analysis of Zoo School Modules that Address the New Jersey Core Curriculum Content Standards

| | X= stated addressed standards<br>A= addressed standards not stated<br>N= stated standards that do not address | FA (PK-2) | WC (PK-2) | WA (PK-2) | PH (K-6) | HH (2-5) | AA (3-8) | LL (3-8) | RR (3-12) | CB (3-12) | GG (6-12) | PW (6-12) | GJ (9-12) | SO (9-12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Health, Physical Education | | | | | | | | | | | | | |
| 2.1 | Wellness | | X | | | X | | | | | | | | |
| | Language Arts Literacy | | | | | | | | | | | | | |
| 3.1 | Reading | | X | | | X | | | | X | | | | |
| 3.2 | Writing | | | | | | | | | | | | | |
| 3.3 | Speaking and Inquiry | | X | | X | | | | | | | X | | |
| 3.4 | Listening | | X | | | | | | | | | X | | |
| | Mathematics | | | | | | | | | | | | | |
| 4.2 | Geometry and Measurement | | X | | A | | X | | X | | | X | | |
| 4.4 | Data Analysis, Probability | | X | | | | | X | | | X | X | | |
| 4.5 | Mathematical Processes | | | | | | | | | | | | | |
| | Science | | | | | | | | | | | | | |
| 5.1 | Scientific Processes | | | | | | | | | | | | | |
| 5.3 | Mathematical Applications | N | N | | X | | X | | X | | X | X | | |
| 5.5 | Characteristics of Life | X | X | | X | X | X | A | X | X | X | X | | |
| 5.6 | Chemistry | X | | | | | | | | | | | | |
| 5.8 | Earth Science | | | | | X | | A | | | A | | | |
| 5.10 | Environmental Studies | X | A | A | X | A | X | A | X | X | X | X | | |
| | Social Studies (Strands) | | | | | | | | | | | | | |
| 6.7 | World in Spatial Terms | | | | A | X | | | X | | X | X | | |
| 6.8 | Human Systems | | | | A | | | | X | | X | X | | |
| 6.9 | Environment and Society | A | A | A | A | A | A | A | A | A | A | A | | |

| Modules | | | | | | | |
|---|---|---|---|---|---|---|---|
| FA | Five Alive | PH | Primates at Home | RR | Reptile Rage | CB | Creepy, Buggy, Scaly, Slimy |
| WC | Wild colors | HH | Habitat Hotel | GG | Going, Going, Gone | SO | Saving Giant Otters |
| WA | What Am I? | AA | Animal Antics | PW | Primate Watch | | |
| | | LL | Links of Life | GJ | Genetic Jumble | | |

*Pennsylvania Academic Standards Evaluation*

The Zoo School modules address Science and Technology, and Environment and Ecology. Associated strands and cumulative progress indicators begin at the fourth grade level and progress to the seventh, tenth and twelfth grade levels. The standards for Science and Technology, and Environment and Ecology are:

| | |
|---|---|
| 3.1 Unifying Themes | 4.1 Watersheds and Wetlands |
| 3.2 Inquiry and Design | 4.2 Renewable, Nonrenewable Resources |
| 3.3 Biological Sciences | 4.3 Environmental Health |
| 3.4 Physical Science- Chemistry and Physics | 4.4 Agriculture and Society |
| 3.5 Earth Sciences | 4.5 Integrated Pest Management |
| 3.6 Technology Education | 4.6 Ecosystems and their Interactions |
| 3.7 Technological Devices | 4.7 Threatened, Endangered, Extinct Species |
| 3.8 Science, Technology, Human Endeavors | 4.8 Humans and the Environment |
| | 4.9 Environmental Laws and Regulations |

(PDE, 2002-03)

The analysis of three modules shown in Tables 20, 21, and 22 are evaluations for how Zoo School modules resulted against the Pennsylvania standards. The modules are *Animal Antics, Reptile Rage* and *Going, Going, Gone.*

Table 20. Animal Antics Module Objectives that Address the Pennsylvania Academic Standards for Science and Technology, and Environment and Ecology

Module Objectives

1 Students will be able to define adaptation
2 Students will be able two identify at least two adaptations about each animal presented
3 Students will be able to predict and generalize adaptations of animals who live in the same habitat
(Zoo School, 2004a)

| Obj | | Standard | |
|---|---|---|---|
| 1, 2 3 | 3.3 | Biological Sciences | Students learn living things, their appearance, different types of life, scope of their similarities and differences, where they live, diversity of life, and how life has changed over a long period of time |
| 2, 3 | 4.6 | Ecosystems and their Interactions | Students learn the dependence and survival of living things on nonliving things in the environment, energy flow, matter from organism to organism, biotic and abiotic components, interdependence, cycles affect and influence, change over time, and human action and natural changes |
| 2, 3 | 4.7 | Threatened, Endangered, Extinct Species | Students learn differences in living things, biodiversity and stability of plants and animals, species adaptation to their environment, biodiversity and ability to survive, natural and human caused extinction, natural or human actions for extinction, specialization; and relation of threatened, endangered or extinct species to human and natural systems |

(PDE, 2002-03)

Table 21. Reptile Rage Module objectives that Address the Pennsylvania Academic Standards for Science and Technology, and Environment and Ecology

Module Objectives

1 Students will be able to identify the four main groups of reptiles and their Cs
2 Students will be able to compare and contrast sea turtles and tortoises
3 Students will be able to identify two facts about lizards
4 Students will be able to describe how a snake finds, catches, kills and eats its prey
5 Students will be able to compare and contrast alligators and crocodiles
(Zoo School, 2004a)

| Obj | | Standard | |
|---|---|---|---|
| 1, 2 3, 5 | 3.3 | Biological Sciences | Students learn living things, their appearance, different types of life, the scope of their similarities and differences, where they live, diversity of life, and how life has changed over a long period of time |
| 4 | 4.6 | Ecosystems and their Interactions | Students learn the dependence and survival of living things on nonliving things in the environment, energy flow, matter from organism to organism, biotic and abiotic components, interdependence, cycles affect and influence, change over time, and human action and natural changes |
| 1, 2 3, 5 | 4.7 | Threatened, Endangered, Extinct Species | Students learn differences in living things, biodiversity and stability of plants and animals, species adaptation to their environment, biodiversity and ability to survive, natural and human caused extinction, natural or human actions for extinction, specialization; and relation of threatened, endangered or extinct species to human and natural systems |

(PDE, 2002-03)

A full curriculum analysis conducted for the Zoo School modules against the Pennsylvania standards showed the following. For the area of Science and Technology, Zoo School module objectives mostly address standards 3.1 (Unifying Themes) and 3.3 (Biological Sciences). For standard 3.1, Unifying Themes address "science and technology provide big ideas that integrate with significant concepts. There are only a few fundamental concepts and processes that form the framework upon which science and technology knowledge are organized - motion and forces, energy, structure of matter, change over time and machines" (PDE, 2002-03). Three of eleven modules address the standard Unifying Themes. Three of the eleven modules do not address the standard for Unifying Themes. However, from further analysis, the standard for Unifying Themes was even though not stated by the module objectives.

Table 22. Going, Going, Gone Module Objectives that Address the Pennsylvania Academic Standards for Science and Technology, and Environment and Ecology

Module Objectives

1 Students will be able to describe why as many as five animals are threatened or endangered as they relate to HIPPO
2 Students will be able to compare and contrast the different ways that animals have become threatened or endangered in their native habitats
3 Students will be able to identify the actions that people are taking to help threatened or endangered animals in the wild and in the zoo (Zoo School, 2004a)

| Obj | | Standard | |
|---|---|---|---|
| 1, 2 | 3.1 | Unifying Themes | Science and technology provide big ideas that integrate with significant concepts. There are only a few fundamental concepts and processes that form the framework upon which science and technology knowledge are organized - motion and forces, energy, structure of matter, change over time and machine |
| 1, 2 | 3.3 | Biological Sciences | Students learn living things, their appearance, different types of life, the scope of their similarities and differences, where they live, diversity of life, and how life has changed over a long period of time |
| 1 | 4.1 | Watersheds and Wetlands | Students learn water environment types, origin to outflow stream changes, stream order, moving and still water differences, watershed role and cycle role, landforms, vegetation, amount and speed of water relationships, U.S. watersheds relationships, living organism types in aquatic environments and effects in water environments, physical stream characteristics, watershed parameters, wetland plants, animals, characteristics, multiple functions, and wetland ecosystems |
| 1, 2, 3 | 4.3 | Environmental Health | Students learn that plants, animals and humans are dependent on air and water, environmental health issues, how human actions affect environmental health, interdependent elements of natural systems, biological diversity as an indicator of a healthy environment; and need for a healthy environment |
| 1, 2, 3 | 4.5 | Integrated Pest Management | Students learn the types, benefits and harmful effects of pests, classifications of different regions, integrated pest management systems, pest control, affects on the environment, health benefits and risks, global practices, need, uses, effects and historical significance |
| 1, 2 | 4.6 | Ecosystems and Interactions | Students learn the dependence and survival of living things on nonliving things in the environment, energy flow, matter from organism to organism, biotic and abiotic components, interdependence, cycles affect and influence, change over time, and human action and natural changes |
| 1, 2, 3 | 4.7 | Threatened, Endangered and Extinct Species | Students learn differences in living things, biodiversity and stability of plants and animals, species adaptation to their environment, biodiversity and ability to survive, natural and human caused extinction, natural or human actions for extinction, specialization; and relation of threatened, endangered or extinct species to human and natural systems |
| 2, 3 | 4.8 | Humans and the Environment | Students learn biological requirements of humans, civilization development, society's needs, technology and natural resources sustainability and uses, environmental conditions and peoples lives, sustainability, human activities and the environment, importance of maintaining natural resources, concept of supply and demand affects the environment, and international implications of environmental occurrences |

(PDE, 2002-03)

In addition, *Five Alive* and *What Am I* do not address pre-kindergarten through second grade. They have characteristics that address fourth grade associated strands- "(B) know models as useful simplifications of objects or processes, (C) illustrate patterns that regularly occur and reoccur in nature and (D) know that scale is an important attribute of natural and human made objects, events and phenomena" (PDE, 2002-03).

Biological Science address: "living things, their appearance, different types of life, the scope of their similarities and differences, where they live and how they live. Living things are made of the same components as all other matter, involve the same kinds of transformations of energy and move using the same basic kinds of forces as described in chemistry and physics standards. Through the study of the diversity of life, students learn to understand how life has changed over a long period of time. This great variety of life forms continues to change even today as genetic instructions within cells are passed from generation to generation, yet the amazing integrity of most species remains" (PDE, 2002-03). All eleven modules address the standard for Biological Science. In addition, the module design for *Five Alive*, *Wild Colors* and *What Am I*, was for pre-kindergarten through second grade and have characteristics addressed to fourth grade strands. The associated strands are (a) know the similarities and differences of living things, (b) know that living things are made up of parts that have specific functions, and (c) know that characteristics are inherited and, thus, offspring closely resemble their parents.

For the area of Environment and Ecology, module objectives mostly address standards 4.3 (Environmental Health), 4.6 (Ecosystems and interactions) and 4.7 (Threatened, Endangered and Extinct Species). The standard for Environmental Health addresses students learning of plants, animals and humans dependence on air and water,

environmental health issues, human actions affect on environmental health; elements of natural systems interdependence, biological diversity as an indicator of a healthy environment; and the need for a healthy environment" (PDE, 2002-03). Six of eleven modules address the standard for Environmental Health. Three of the eleven modules, *Five Alive, Wild Colors,* and *What Am I* do not state that they address the standard for Environmental Health. However, from further analysis, the standard for Environmental Health was even though not stated by the module objectives. The module objectives for *Five Alive, Wild Colors,* and *What Am I* address issues of animal survival such as food and shelter, camouflaging, and cold-blooded reptile and amphibian characteristics.

The standard for Ecosystems and Interactions addresses students learning the dependence of living things on nonliving things in the environment for survival. The associated strands for ecosystems and interactions address energy flow, matter from organism to organism, biotic and abiotic components, interdependence, cycles affect and influence, change over time, and human action and natural changes (PDE, 2002-03). Six of eleven modules address the standard for Ecosystems and Interactions. Five of eleven modules, *Five Alive, Wild Colors, What Am I , Links of Life,* and *Creepy, Buggy, Scaly, Slimy* do not state that they address the standard for Ecosystems and Interactions. However, from further analysis, the standard for Ecosystems and Interactions was even though not stated by the module objectives. These modules address food webs and food chains, diverse habitats and concepts of an ecosystem.

The standard for Threatened, Endangered and Extinct Species addresses differences in living things, biodiversity and stability of plants and animals, species adaptation to their environment, biodiversity and ability to survive, natural and human

caused extinction, natural or human actions for extinction; specialization; and relation of threatened, endangered or extinct species to human and natural systems (PDE, 2002-03).

Table 23. Full Analysis of Zoo School Module that Address the Pennsylvania Academic Standards

| | X= stated addressed standards<br>A= addressed standards not stated | FA (PK-2) | WC (PK-2) | WA (PK-2) | PH (K-6) | HH (2-5) | AA (3-8) | LL (3-8) | RR (3-12) | CB (3-12) | GG (6-12) | PW (6-12) | GJ (9-12) | SO (9-12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Science and Technology | | | | | | | | | | | | | |
| 3.1 | Unifying Themes of Science | X | | X | | A | | A | | | A | X | | |
| 3.2 | Inquiry and Design | | X | | | | | | | | | X | | |
| 3.3 | Biological Sciences | X | X | X | X | X | X | X | X | X | X | X | | |
| 3.7 | Technological Devices | | | | | | | | | | | X | | |
| 3.8 | Science, Technology, Human | | | | X | | | | | | | | | |
| | Environment and Ecology | | | | | | | | | | | | | |
| 4.1 | Wetland and Watersheds | | | X | | X | | | | | X | | | |
| 4.2 | Renewable and Nonrenewable | | | | | X | | X | | | | | | |
| 4.3 | Environmental Health | A | A | A | X | X | | X | X | X | X | | | |
| 4.5 | Integrated Pest Management | | | | | | | X | | X | X | | | |
| 4.6 | Ecosystems and Interactions | A | A | A | X | X | X | A | X | A | X | | | |
| 4.7 | Adaptations, Endangered Sp. | | X | X | A | | X | X | X | | X | A | | |
| 4.8 | Humans and the Environment | | | | X | | | | | | A | A | | |
| 4.9 | Environmental Laws | | | | | | | | | | | | | |
| | Geography | | | | | | | | | | | | | |
| 7.1 | Basic Geographic Literacy | | | | | X | | | | | | | | |
| 7.2 | Physical Character Places | | | | A | A | | | | | | | | |
| | History | | | | | | | | | | | | | |
| 8.1 | Analysis and Skill Development | | | | | | A | | | | | | | |
| | Health, Safety, Physical Ed. | | | | | | | | | | | | | |
| 10.2 | Healthful Living | | | | | | | | | | X | | | |
| | Family, Consumer Sciences | | | | | | | | | | | | | |
| 11.1 | Financial and Resource Mgmt. | | | | | X | | X | | | X | | | |
| 11.2 | Family, Work and Community | | | | | X | | | | | X | | | |
| 11.3 | Food Science and Nutrition | X | | | A | | | X | | | | | | |

| *Zoo School* Modules | | | | | | | |
|---|---|---|---|---|---|---|---|
| FA | Five Alive | PH | Primates at Home | RR | Reptile Rage | CB | Creepy, Buggy, Scaly, Slimy |
| WC | Wild colors | HH | Habitat Hotel | GG | Going, Going, Gone | | |
| WA | What Am I? | AA | Animal Antics | PW | Primate Watch | SO | Saving Giant Otters |
| | | LL | Links of Life | GJ | Genetic Jumble | | |

Six of eleven modules address the standard for Threatened, Endangered and Extinct Species. Five of the eleven modules do not address the standard for Threatened, Endangered and Extinct Species. *Primates at Home* and *Primate Watch* modules do not state that they address the standard for Threatened, Endangered and Extinct Species. However, from further analysis, the standard for Threatened, Endangered and Extinct Species was even though not stated by the *Primates at Home* and *Primate Watch* module

objectives. These modules address species adaptation to their environment, biodiversity and ability to survive, natural and human caused extinction, specialization; and relation of threatened, endangered or extinct species to human and natural systems. Table 23 shows a full analysis of the *Zoo School* modules that summarizes stated and unstated standards.

*NAAEE Guidelines for Excellence Evaluation*

The NAAEE *Guidelines for Excellence* (1996) is a collection of recommendations to develop and select environmental education materials. The *Guidelines for Excellence* have six key characteristics: fairness and accuracy; depth; emphasis on skill building; action orientation; instructional soundness; and usability and associated guideline. The requirements for NAAEE key characteristics and the *Guidelines for Excellence* include environmental materials that should ...

| | Key Characteristic | |
|---|---|---|
| 1 | Fairness and Accuracy | be fair & accurate in describing environmental problems, issues and conditions and reflecting diversity of perspectives on them |
| 2 | Depth | foster awareness of the natural and built environment, an understanding of environmental concepts, conditions and issues, and an awareness of values, attitudes, perceptions at heart of issues |
| 3 | Emphasis on Skills Building | build lifelong skills that enable learners to address environmental issues |
| 4 | Action Orientation | promote civic responsibility, encourage learners to use knowledge, personal skills and assessments of problems and issues for problem solving and action |
| 5 | Instructional Soundness | rely on instructional techniques that create an effective learning environment |
| 6 | Usability | be clear to educators and learners concerning the overall structure (purpose, direction, and logic of presentation) |

(NAAEE, 2004)

| | NAAEE Guideline | |
|---|---|---|
| 1.1 | Factual accuracy | reflect sound theories and well-documented facts about subjects and issues |
| 1.2 | Balanced presentation of differing viewpoints and theories | be presented in a balanced way where there are a range of perspectives, differences of opinion or competing scientific explanations |

| | | |
|---|---|---|
| 1.3 | Openness to inquiry | encourage learners to explore different perspectives and form their own opinions |
| 1.4 | Reflection of diversity | included with respect and equity different cultures, races, genders, social groups, ages |
| 2.1 | Awareness | acknowledge that feelings, experiences, and attitudes shape environmental perceptions and issues |
| 2.2 | Focus on concepts | use unifying themes and important concepts rather than presenting a series of facts |
| 2.3 | Concepts in context | set in a context that includes social, economic and ecological aspects. |
| 2.4 | Attention to different scales | be explored using a variety of scales as appropriate- short to long time spans, localized to global effects, and local to international community levels |
| 3.1 | Critical and creative thinking | challenge learners to use and improve critical thinking and creative skills |
| 3.2 | Applying skills to issues | have students learn to arrive at their own conclusions based on thorough research and study, rather than being taught that a certain course of action is best |
| 3.3 | Action skills | gain learners basic skills needed to participate in resolving environmental issues. |
| 4.1 | Sense of personal stake | help learners to examine the possible consequences of their behaviors on the environment and evaluate choices they can make which may help resolve environmental issues |
| 4.2 | Self-efficacy | aim to strengthen learners' perception and ability to influence the outcome of a situation |
| 5.1 | Learner-centered instruction | be based on learner interest and ability to construct knowledge and conceptual understanding when appropriate |
| 5.2 | Different ways of learning | offer opportunities for different modes of teaching and learning |
| 5.3 | Connections to learners' everyday lives | present information and ideas relevant to learners |
| 5.4 | Expanded learning environment | teach students in environments that extend beyond the classroom. |
| 5.5 | Interdisciplinary | recognize the interdisciplinary nature of environmental education |
| 5.6 | Goals and objectives | be clearly spelled out |
| 5.7 | Appropriateness for specific learning settings | have claims about the appropriateness for the targeted grade level(s) and the implementation of the activity consistent with educator experience |
| 5.8 | Assessment | have a variety of means for assessing learner progress included in the materials |
| 6.1 | Clarity and logic | be clear to educators and learners concerning the overall structure (purpose, direction, and logic of presentation) |

| | | |
|---|---|---|
| 6.2 | Easy to use | be inviting and easy to use |
| 6.3 | Long-lived | have a life span that extends beyond one use. |
| 6.4 | Adaptable | be adaptable to a range of learning situations |
| 6.5 | Accompanied by instruction and support | be provided to meet educators' needs with additional support and instruction |
| 6.6 | Make sustained claims | accomplish what they claim to accomplish |
| 6.7 | Fit with national, state or local requirements | fit within national, state, or local standards or curricula. |

(NAAEE, 2004)

The analysis of module *Going, Going, Gone* shown in Table 24 is an evaluation for how Zoo School modules resulted against the NAAEE guidelines and indicators. In this module and the full analysis for all modules, *Zoo School* does not address the NAAEE characteristics for Emphasis on Skills Building and Action Orientation.

Table 24. Going, Going, Gone Curriculum Objectives that Address the North American Association for Environmental Education *Guidelines for Excellence*

| | Module Objectives |
|---|---|
| 1 | Students will be able to describe why as many as five animals are threatened or endangered as they relate to HIPPO |
| 2 | Students will be able to compare and contrast the different ways that animals have become threatened or endangered in their native habitats |
| 3 | Students will be able to identify the actions that people are taking to help threatened or endangered animals in the wild and in the zoo |

(Zoo School, 2004a)

| | NAAEE Guideline | NAAEE Indicator | Module Content |
|---|---|---|---|
| 1.1 | Factual accuracy: reflect sound theories and well-documented facts about subjects and issues | Factual information is presented in language appropriate for education rather than for propagandizing | Marine toad, rabbit, sea turtle, hawk, bald eagle... descriptions |
| 2.1 | Awareness: acknowledge that feelings, experiences, attitudes shape environmental perceptions and issues | Opportunities provide for learners to explore the world around them. | Above objectives: 2 and 3 |
| 2.2 | Focus on concepts: use unifying themes and important concepts rather than presenting a series of facts | Ideas presented logically and connected through the materials, emphasizing a depth of understanding | Transitions provide questioning and flow of concepts |
| 2.3 | Concepts in context: set in a context that includes social, economic and ecological aspects | Historical, ethical, cultural, geographic, economic, sociopolitical relationships are addressed | Activities: historical, economic, geographic, ecologic relationships |

| | | | |
|---|---|---|---|
| 5.1 | Learner-centered instruction: based on learner interest, ability to construct knowledge and conceptual understanding | Activities allow learners to build from previous knowledge, lead toward further learning; Activities use learner questions, concerns as starting point | Transitions: questioning, reinforcing prior activity, lead to next activity |
| 5.2 | Different ways of learning: offer opportunities for different modes of teaching and learning | Important concepts are conveyed in several ways (visual, auditory, tactile, etc.) so that all students can understand them | Activities: students allowed to touch and see animals up close |
| 5.3 | Connections to learners' lives: present information, ideas relevant to learners | Concepts related directly to students' experiences. | Activities: discuss illegal shooting, pollution, Habitat loss, pesticides |
| 5.4 | Expanded learning environment: teach students in environments that extend beyond classroom | Materials use examples that reflect real-world experiences | Activities: live bio-facts in a zoo education program |
| 5.5 | Interdisciplinary: recognize the interdisciplinary nature of environmental education | Materials are keyed to standards adopted by the state. | PA: 3.3, 4.1, 4.3, 4.5, 4.6, 4.7, 10.2, 11.1, 11.2<br>NJ: 4.4, 5.3, .5, 5.10, 5.10, 6.7, 6.8, 6.9 |
| 5.6 | Goals and objectives: clearly spelled out | Goals and objectives for learner outcomes are clearly stated. | See objectives above for *GG* |
| 5.7 | Appropriateness for learning settings: targeted grade level(s) and the implementation of the activity consistent with educator experience | Content appropriate (level and language). Examples, terminology, and comparisons used within the probable vocabulary and experience of students | *Zoo School* modules written by zoo educators; zoo presenters mostly have education, biology and other degrees |
| 6.1 | Clarity and logic: clear to educators and learners (purpose, direction, and presentation) | Instructions for educators are clear and concise. | Main points/rational, objectives, standards, warm-up, transitions, activities are very clear |
| 6.2 | Easy to use: inviting | Easy for educators to keep and use (8.5x 11", 3-hole punched, able to lie flat on desk) | Bold titles, space between activities, bullet points |
| 6.3 | Long-lived: life span that extends beyond one use | Equipment and materials are listed, reasonably accessible, inexpensive, and simple to use. | Zoo bio-facts and education department resources |
| 6.5 | Accompanied by instruction and support: meet educators' needs, additional support and instruction | Materials include lists of essential resource and supporting materials, such as references and websites | References to zoo and government sources, and internet websites |
| 6.7 | Fit with state requirements | Materials easily correlated with state requirements | See above PA, NJ standards evaluation |

(NAAEE, 2004)

| | NAAEE Characteristic | NAAEE Guideline | Module Design |
|---|---|---|---|
| 3 | Emphasis on Skills Building: build lifelong skills that enable learners to address environmental issues | 3.1 Critical and creative thinking<br>3.2 Applying skills to issues<br>3.3 Action skills | Program designed as a nonformal, short-term (45-minutes) learning experience |

| | | | |
|---|---|---|---|
| 4 | Action Orientation: promote civic responsibility, encourage learners to use knowledge, personal skills and assessments of problems and issues for problem solving and action | 4.1 Sense of personal stake<br>4.2 Self-efficacy | Program designed as a nonformal, short-term (45-minutes) learning experience |

(NAAEE, 2004)

The co-authored modules, *Five Alive; Wild Colors; What am I; Habitat Hotel; Animal Antics; Links of Life; Creepy, Buggy, Scaly, Slimy;* and *Going, Going, Gone*, are very consistent with the NAAEE *Guidelines for Excellence* and key characteristics one through six. The modules support the key characteristic for Depth, Instructional Soundness and Usability. The modules do not support the key characteristic for Fairness and Accuracy, emphasis on skills building and action orientation.

For the key characteristic Depth, Zoo School modules address the guidelines for awareness, focus on concepts, and social and ecological concepts. Students exposed to environmental awareness see, hear, touch and smell different educational reptiles, birds and amphibians *at Zoo School.* The modules addresses concepts and draws the connection to understand the ecological and environmental relationships between different animal species, habitats, food chains, food web, ecosystems and animal survival techniques. However, in the guideline for attention to different scales, the modules lack the attention to environmental issues and the feelings, values, attitudes and perceptions from a local to global level.

For the key characteristic Instructional Soundness, Zoo School modules address the guidelines for learner-centered instruction, different ways of learning, connections to learners' everyday lives, expanded learning environment, goals and objectives, and appropriateness for specific learning settings. The modules expose students to different learning styles by listening, watching and touching, and emphasize an active role and

participation in the lesson. In addition, students exposed to different learning environments utilize an interdisciplinary approach with science, ecology, social studies and math as related to the environment. The modules have stated goals and objectives. However, for the guideline on assessment, the modules do not specify where they want the student to go and what the student should learn after the lesson.

For key characteristic Usability, Zoo School modules addresses the guidelines for clarity and logic, easy to use, long-lived, accompanied by instruction and support, and fit with national, state or local requirements. However, the guidelines for adaptability and making sustained claims, the modules do not suggest adaptive lessons, claim learning outcome, or support by experts in learning theory. The lesson plans are accessible to the presenters in a clear and logical easy to use format, have the volume of appropriate resources and materials to implement in their lessons, and appropriately compliment the New Jersey and Pennsylvania standards.

For the key characteristic Fairness and Accuracy, the modules address the guideline for factual accuracy with update and current information. However, the guidelines for balanced presentation of differing viewpoints and theories, openness to inquiry, and reflection of diversity are not in the modules. Modules may be oversimplified with generalizations and not reflect on cultural, economic and ecologic perspectives.

For the key characteristics, Emphasis on Skill Building and Action Orientation, the modules do not address the guidelines for critical and creative thinking, applying skills to issues, action skills, sense of personal stake, and self-efficacy. The Zoo School modules do not implement lifelong skills for critical and creative thinking, issue analysis,

citizenship action, civic responsibility or sense of personal stake and responsibility. The evaluation findings suggest that the Zoo School modules address Hungerford, Peyton and Wilke (1980) Goals for Curriculum Development in Environmental Education Goal Levels I and II- knowledge and issue awareness, yet do not address Goal Level III and IV to achieve skill development for issue analysis and citizenship action, and fulfillment of true environmental literacy.

*Primates at Home* and *Primate Watch* modules are similar to an outline or skit. The two modules are very consistent with the NAAEE *Guidelines for Excellence* and key characteristics one through six. The modules address the key characteristic for Fairness and Accuracy, Depth) and Usability, and partially address the key characteristic for Emphasis on Skills Building. The modules do not address the key characteristic for Depth, Action Orientation), and Instructional Soundness.

*Primates at Home* and *Primate Watch* modules have the flexibility to address guidelines for critical and creative thinking, balanced presentation of differing viewpoints and theories, openness to inquiry, and reflection of diversity. Students actively learn through demonstration, the physical differences of four primate species, habitat survival, principles of conservation, building skills for appropriate note taking, and techniques to observe wildlife.

*Primates at Home* and *Primate Watch* modules do not address the guidelines for lifelong skills for critical and creative thinking, issue analysis, citizenship action, civic responsibility or sense of personal stake and responsibility. The evaluation findings suggest that the two lesson plans address the Hungerford, Peyton and Wilke (1980) Goals for Curriculum Development in Environmental for knowledge and issue awareness, yet

lack higher order goals to achieve issue analysis skill development, citizenship action skills, and fulfill true environmental literacy. Table 25 shows a full analysis of the Zoo School modules that addressed the NAAEE *Guidelines for Excellence.*

Table 25. Full Analysis of Zoo School Modules that Address the North American Association for Environmental Education *Guidelines for Excellence*

| | X= evaluated addressed guidelines | FA (PK-2) | WC (PK-2) | WA (PK-2) | PH (K-6) | HH (2-5) | AA (3-8) | LL (3-8) | RR (3-12) | CB (3-12) | GG (6-12) | PW (6-12) | GJ (9-12) | SO (9-12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fairness and Accuracy | | | | | | | | | | | | | |
| 1.1 | Factual accuracy | X | X | X | X | X | X | X | X | X | X | | | |
| 1.2 | Balanced presentation of differing viewpoints & theories | | | | X | | | | | | | X | | |
| 1.3 | Openness to inquiry | | | | X | | | | | | | X | | |
| 1.4 | Reflection of diversity | | | | X | | | | | | | X | | |
| | Depth | | | | | | | | | | | | | |
| 2.1 | Awareness | X | X | X | X | X | X | X | X | X | X | | | |
| 2.2 | Focus on concepts | X | X | X | X | X | X | X | X | X | X | | | |
| 2.3 | Concepts in context | X | X | X | X | X | X | X | X | X | X | | | |
| 2.4 | Attention to different scales | | | | | | | | | | | | | |
| | Emphasis on Skills Building | | | | | | | | | | | | | |
| 3.1 | Critical and creative thinking | | | | X | | | | | | | X | | |
| 3.2 | Applying skills to issues | | | | | | | | | | | | | |
| 3.3 | Action skills | | | | | | | | | | | | | |
| | Action Orientation | | | | | | | | | | | | | |
| 4.1 | Sense of personal stake | | | | | | | | | | | | | |
| 4.2 | Self-efficacy | | | | | | | | | | | | | |
| | Instructional Soundness | | | | | | | | | | | | | |
| 5.1 | Learner-centered instruction | X | X | X | X | X | X | X | X | X | X | | | |
| 5.2 | Different ways of learning | X | X | X | X | X | X | X | X | X | X | | | |
| 5.3 | Connections to learners' everyday lives | X | X | X | X | X | X | X | X | X | X | | | |
| 5.4 | Expanded learning environment | X | X | X | X | X | X | X | X | X | X | | | |
| 5.5 | Interdisciplinary | X | X | X | X | X | X | X | X | X | X | | | |
| 5.6 | Goals and objectives | X | X | X | X | X | X | X | X | X | X | | | |
| 5.7 | Appropriateness for specific learning settings | X | X | X | X | X | X | X | X | X | X | | | |
| 5.8 | Assessment | | | | | | | | | | | | | |
| | Usability | | | | | | | | | | | | | |
| 6.1 | Clarity and logic | X | X | X | X | X | X | X | X | X | X | X | | |
| 6.2 | Easy to use | X | X | X | X | X | X | X | X | X | X | X | | |
| 6.3 | Long-lived | X | X | X | X | X | X | X | X | X | X | X | | |
| 6.4 | Adaptable | | | | | | | | | | | | | |
| 6.5 | Accompanied by instruction and support | X | X | X | | X | X | X | X | X | X | | | |
| 6.6 | Make sustained claims | | | | | | | | | | | | | |
| 6.7 | Fit with national, state or local requirements | X | X | X | X | X | X | X | X | X | X | X | | |

*Zoo School* Modules

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| FA | Five Alive | PH | Primates at Home | RR | Reptile Rage | CB | Creepy, Buggy, Scaly, Slimy |
| WC | Wild colors | HH | Habitat Hotel | GG | Going, Going, Gone | SO | Saving Giant Otters |
| WA | What Am I? | AA | Animal Antics | PW | Primate Watch | | |
| | | LL | Links of Life | GJ | Genetic Jumble | | |

*Lesson Plan Format Evaluation*

The Zoo School lesson plan format is very consistent for the nine co-authored modules. The modules address several areas: main points and rationale; objectives; standards; materials and equipment; introduction; warm-up; alternating transitions and activities; closing; additional activities; and references. The main points and rationale for the lesson plans consists of a statement that summarizes topic discussion and a discovery statement. The objectives summarize what students will be able to define, identify, predict, generalize, and compare and contrast. The addressed New Jersey and Pennsylvania standards are stated. The materials and equipment section summarizes the props, artifacts and animals that are necessary for this lesson plan. The introduction provides general classroom rules. The warm-up may last two to eight minutes, begins the lesson, and captures the attention and interest of the student. The methodology (alternating activities and transitions) provide flow to the lesson plan and connect mini-lessons. The transitions provide a moment to reflect on the previous activity, re-captures the attention and interest of the student, and introduces the next activity. The closure offers reflection and review of the lesson. Additional activities are provided for the presenter if time permits.

The evaluation suggests that the modules address cognitive domain and standards objectives. Modules *Five Alive, Wild Colors, What Am I, Habitat Hotel,* and Animal Antics address the affective domain, where the students are in close contact and they are allowed to touch reptiles and mammals. Modules *Links of Life, Reptile Rage,* and *Creepy, Buggy, Scaly, Slimy* do not appear to address the affective domain. The methodology for the class instruction with activities and transitions is consistent in the modules. Every

lesson plan addresses materials and resources, set induction, methodology (activities and transitions) and closure.

*Primates at Home* and *Primate Watch* have a single author and have a lesson plan format similar to a rough outline or skit. The module objectives address the cognitive and affective domains, but do not address New Jersey and Pennsylvania standards. *Primates at Home* and *Primate Watch* modules lack consistency to address the introduction, materials and resources, and lesson closure. The module design appears as a nonformal teaching experience for the presenter and a nonformal learning experience for the student. *Primates at Home* and *Primate Watch* module format appears as notes or a skit for the Zoo School presenter. A full analysis of the Zoo School modules in Table 26 summarizes addressed parts of Cruickshank, Jenkins and Metcalf (2003) lesson plan format.

Table 26. Evaluation of Zoo School Curriculum that Address a Lesson Plan Format

| | X= evaluated addressed items<br>N= evaluated, not address | FA (PK-2) | WC (PK-2) | WA (PK-2) | PH (K-6) | HH (2-5) | AA (3-8) | LL (3-8) | RR (3-12) | CB (3-12) | GG (6-12) | PW (6-12) | GJ (9-12) | SO (9-12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Objectives: | | | | | | | | | | | | | |
| | Cognitive Domain | X | X | X | X | X | X | X | X | X | X | X | | |
| | Psychomotor Domain | N | N | N | N | N | N | N | N | N | N | N | | |
| | Affective Domain | X | X | X | X | X | X | X | X | X | X | X | | |
| | Standards | X | X | X | N | X | X | X | X | X | X | N | | |
| 2 | Resources (Materials) | X | X | X | X | X | X | X | X | X | X | X | | |
| 3 | Set Induction | X | X | X | N | X | X | X | X | X | X | N | | |
| 4 | Methodology | X | X | X | N | X | X | X | X | X | X | N | | |
| 5 | Assessment | N | N | N | N | N | N | N | N | N | N | N | | |
| 6 | Closure | X | X | X | N | X | X | X | X | X | X | X | | |

(Cruickshank, Jenkins and Metcalf, 2003, p.161)

| *Zoo School* Modules | | | | | | | |
|---|---|---|---|---|---|---|---|
| FA | Five Alive | PH | Primates at Home | RR | Reptile Rage | CB | Creepy, Buggy, Scaly, Slimy |
| WC | Wild colors | HH | Habitat Hotel | GG | Going, Going, Gone | | |
| WA | What Am I? | AA | Animal Antics | PW | Primate Watch | SO | Saving Giant Otters |
| | | LL | Links of Life | GJ | Genetic Jumble | | |

## Summary

Chapter four details the research findings of participating teacher's perceptions of the program effectiveness, and an evaluation of the curriculum to the New Jersey Core Curriculum Content Standard, Pennsylvania Academic Standards, and the North American Association for Environmental Education *Guidelines for Excellence,* and a lesson plan format.

In summary, the survey analysis showed consistent and high agreement for teacher's perception of student engagement and presenter performance. Teacher's perception for their motivation to participate had mixed results. Participation as a fun reward for academic achievement had the lowest rating. Teachers have highly exceeded, exceeded and met their expectations for integrating curriculum and standards, although met expectations for a fun reward were high, initial motivation to participate for this reason was low. Teacher's perception for program effectiveness had mixed results. Printed materials as an effective learning tool resulted in the lowest value and had the highest missing data results.

The module evaluation showed consistent findings for the New Jersey Core Curriculum Content Standards and Pennsylvania Academic Standards stated by Zoo School. However, noted for future revisions were additional education standards not stated, but evaluated as addressing education standards. The module evaluation against the North American Association for Environmental Education *Guidelines for Excellence* showed positive results for clarity and organization, but lack action orientation skill development. The module evaluation for a general lesson plan format had positive results in most areas, except the area of assessing student learning and achievement.

# CHAPTER 5

# CONCLUSIONS AND DISCUSSION

## Research Overview

The intent of the study was to investigate (a) teacher's perceptions of the Zoo school program and (b) evaluate Zoo School modules. The study examined if Zoo School has an effective program by evaluating teacher's motivation to participate, student's engagement of learning activities, and effective learning experience and met expectations for integrating curriculum, supporting the New Jersey Core Curriculum Content Standards (NJCCCS) and Pennsylvania Academic Standards (PAS), or rewarding their students for academic achievement. In addition, the study examined if the Zoo School curriculum addresses the New Jersey and Pennsylvania standards, and the North American Association for Environmental Education (NAAEE) *Guidelines for Excellence* and a lesson plan format.

## Research Questions

### *Teachers Perceptions of Student Engagement*

Research question 1 for the Zoo School study was "To what extent do teachers perceive that module activities engage their students"? The data source resulting for research question 1 was from survey questions 4, 5 and 6 for student engagement. The research question showed that ninety-eight percent of the teachers perceived that Zoo School activities provided their students with an exciting experience. Eighty-six percent

perceived that students actively participated and nearly ninety-two percent perceived that Zoo School activities captivated students. Six percent neither agreed nor disagreed if learning activities captivated students.

*Teachers Perceptions of Effective Experience for Students*

Research question 2 for the Zoo School study was "To what extent do teachers perceive that Zoo School provides their students an effective experience"? The data source resulting for research question 2 was from survey questions 7, 8 and 9 for presenter effectiveness and survey questions 10, 11, 12 and 13, other factors for program effectiveness. The research question showed that ninety-nine percent perceived that the zoo presenter was informative for students. Ninety-five percent perceived that the presenter was entertaining for students and ninety-nine percent perceived that the presenter involved students in lesson activities. Three percent neither agreed nor disagreed that the presenter was entertaining for students. Teachers perceived printed materials as an effective learning tool with skepticism. Just sixty-four percent perceived printed materials as effective learning tools, nineteen percent neither agreed nor disagreed and sixteen percent did not respond to the question. Ninety-five percent perceived that Zoo School was grade level appropriate for students and ninety-five percent perceived that Zoo School was a valuable learning experience, and ninety-six percent are interested in returning to Zoo School for future programs.

*Teachers Met Expectations for Integrating Curriculum*

Research question 3 for the Zoo School study was "To what extent do teachers meet their expectations with regard to integrate curriculum". The data source resulting for research question 3 was from survey question 1 for teacher's motivation to participate

and survey question 14 for teachers met expectations. The research question showed that eighty-eight percent of the teachers were motivated to participate in for integrating into their curriculum. Sixty-five percent of the teachers exceeded their expectations and thirty-three percent met their expectations for integrating into their curriculum.

*Teachers Met Expectations for Meeting New Jersey and Pennsylvania Standards*

Research question 4 for the Zoo School study was "To what extent do teachers meet their expectations with regard to support New Jersey and Pennsylvania academic standards"? The data source resulting for research question 4 was from survey question 2 for teacher's motivation to participate and survey question 15 for teachers met expectations. The research question showed that eighty-one percent of the teachers were motivated to participate for meeting state education standards. Thirteen percent neither agreed nor disagreed for motivation to participate and six percent were not motivated to participate to meet state education standards. Sixty-three percent of the teachers exceeded their expectations and thirty-three percent met their expectations for meeting state education standards.

*Teachers Met Expectations for Rewarding Students for Academic Achievement*

Research question 5 for the Zoo School study was "To what extent do teachers meet their expectations with regard to reward their students for academic achievement"? The data source resulting for research question 5 was from survey question 3 for teacher's motivation to participate and survey question 16 for teachers met expectations. The research question showed that sixty-one percent of the teachers were motivated to participate in for rewarding students for academic achievement. Although, twenty-six percent neither agreed nor disagreed for motivation to participate and twelve percent

were not motivated to participate for rewarding students for academic achievement. Seventy percent of the teachers exceeded their expectations and twenty-five percent met their expectations for rewarding their students for academic achievement.

*New Jersey and Pennsylvania Standards Analysis*

Research question 6 for the Zoo School study was "To what extent do the Zoo School modules address the New Jersey and Pennsylvania academic standards"? The data source for research question 6 resulted from the curriculum analysis for the modules against the New Jersey Core Curriculum Content Standards and Pennsylvania Academic Standards. The research question showed that for the New Jersey standards for Science and Social Studies, the module objectives for *Habitat Hotel, Links of Life* and *Creepy, Buggy, Scaly, Slimy* address standards 5.5, and 5.10, and cumulative strand 6.9.

Standard 5.5 is for Life Science: "students gain an understanding of the structure, characteristics, and basic needs of organisms and will investigate the diversity of life." Standard 5.10 is for Environmental Science: "students develop an understanding of the environment as a system of interdependent components affected by human activity and natural phenomena" (NJDOE, 2002-04). Environment and Society was a standard in 1996, but became a cumulative strand for Geography standards in 2003. Environment and Society: "students differentiate between living and non-living natural resources" (NJDOE, 2002-04).

In addition, *Habitat Hotel* and *Links of Life* module objectives address standards 5.8 and 6.6, and strand 6.7. Standard 5.8 is for Earth Science: "students gain an understanding of the structure, dynamics, and geophysical systems of the earth" (NJDOE, 2002-04).

Standard 6.6 is for Geography: "students apply knowledge of spatial relationships and other geographic skills to understand human behavior in relation to the physical and cultural environment" (NJDOE, 2002-04). World in Spatial Terms was a standard in 1996, but became a cumulative strand for Geography standards in 2003. World in Spatial Terms: "students explain the spatial concepts of location, distance and direction" (NJDOE, 2002-04). Full analysis of the modules objectives showed that addressed standards for Health and Physical Education, Language Arts Literacy, and Mathematics addressed in addition to the prior standards.

Research question 6 showed that for the Pennsylvania standards for Science and Technology, and Environment and Ecology, the Zoo School module objectives for *Animal Antics, Reptile Rage* and *Going, Going, Gone* address standards 3.3, 4.6 and 4.7. Standard 3.3 is for Biological Sciences: students learn living things, their appearance, different types of life, the scope of their similarities and differences, where they live, diversity of life, and how life has changed over a long period (PDE, 2002-03).

Standard 4.6 is for Ecosystems and Interactions: students learn the dependence and survival of living things on nonliving things in the environment, energy flow, matter from organism to organism, biotic and abiotic components, cycles affect and influence, interdependence, change over time, and human action and natural changes (PDE, 2002-03).

Standard 4.7 is for Threatened, Endangered and Extinct Species: students learn differences in living things, biodiversity and stability of plants and animals, species adaptation to their environment, biodiversity and ability to survive, natural and human

caused extinction, natural or human actions for extinction, specialization; and relation of threatened, endangered or extinct species to human and natural systems (PDE, 2002-03).

In addition, *Going, Going Gone* module objectives address standards 3.1, 4.1, 4.3, 4.5 and 4.8. Standard 3.1 is for Unifying Themes: science and technology provide ideas that integrate with significant concepts (PDE, 2002-03).

Standard 4.1 is for Watersheds and Wetlands: students learn water environment types and cycles; origin to outflow stream changes; stream order; moving and still water differences; living organisms and effects in water environments; physical stream characteristics; organisms types in aquatic environments, watershed parameters; and wetland plants, animals, characteristics, multiple functions, and complex and diverse wetland ecosystems (PDE, 2002-03).

Standard 4.3 is for Environmental Health: students learn that plants, animals and humans are dependent on air and water, environmental health issues, how human actions affect environmental health, interdependent elements of natural systems, biological diversity as an indicator of a healthy environment; and need for a healthy environment (PDE, 2002-03).

Standard 4.5 is for Integrated Pest Management: students learn the types, benefits and harmful effects of pests, classifications of different regions, pest control, integrated pest management systems, pest management affects on the environment, health benefits and risks, global practices of integrated pest management, need, uses, and effects, and historical significance of integrated pest management practices (PDE, 2002-03).

Standard 4.8 is for Humans and the Environment: students learn biological requirements of humans; civilization development; society's needs and natural resources

sustainability; environmental conditions; technology and natural resources uses and sustainability; human activities and the environment; importance of maintaining natural resources; concept of supply and demand affects on the environment; and international implications of environmental occurrences (PDE, 2002-03). Full analyses of the modules objectives show that in additions to prior standards, also addressed were Geography, History, and Health, Safety, and Physical Education, and Family and Consumer Sciences.

*NAAEE Guidelines for Excellence Analysis*

Research question 7 for the Zoo School study was "To what extent do the Zoo School modules address the North American Association for Environmental Education *Guidelines for Excellence*"? The data source for research question 7 resulted from the curriculum analysis of modules that addressed the North American Association for Environmental Education (NAAEE) *Guidelines for Excellence*. The research question showed that the module content for the Going, Going, Gone module addressed the characteristics for Depth, Instructional Soundness, and Usability. Within the characteristic for Depth, guidelines addressed were awareness; focus on concepts; and concepts in context. Within the characteristic for Instructional Soundness, guidelines addressed were learner-centered instruction; different ways of learning; connections to learners everyday lives; expanded learning environment; interdisciplinary; goals and objectives; and the appropriateness for learning settings. Not addressed was the guideline for learner assessment. Within the characteristic for Usability, guidelines addressed were clarity and logic; easy to use; long-lived; accompanied by instruction and support; and fit with state requirements. Not addressed were the guidelines for adaptability and making sustained claims.

The Going, Going, Gone module does not address characteristics for Fairness and Accuracy, Skill Building Emphasis and Action Skills. Within the characteristic for Fairness and Accuracy, guidelines not addressed were balanced presentation of differing viewpoints and theories; openness to inquiry; and reflection of diversity. The guideline addressed was for factual accuracy. Within the characteristic for Skill Building Emphases, guidelines not addressed were critical and creative thinking, and applying skills to issues and action. Within the characteristic for Action Skills, guidelines not addressed were sense of personal stake and self-efficacy. A full analysis of the Zoo School modules objectives showed addressed characteristics were Depth, Instructional Soundness, and Usability. Those not addressed were characteristics of Fairness and Accuracy, Skill Building Emphasis, and Action Skills.

*Lesson Plan Analysis to the Program Modules*

Research question 8 for the Zoo School study was "To what extent does Zoo School use a lesson plan format"? The data source for research question 8 resulted from the curriculum analysis of modules that addressed components of a lesson plan format. The research question showed that nine of the eleven modules have lesson plan parts that follow the Cruickshank, Jenkins and Metcalf (2003) format with the exclusion of objectives for psychomotor domain and assessing student understanding. Modules are forty-five minutes, nonformal, and very effective for encouraging beneficial affective learning with respect to environmental attitudes and values, teaching awareness of environmental issues and providing students with the benefits of motivation. Objectives for psychomotor domain skills are not emphasized or practical in such a short-term program. Student assessments in the lesson plan format are in the form of transitions that

question and review the lesson activity ending and introduce the following lesson activity. Zoo School did not implement standardized testing or other similar to assess or measure student knowledge.

## Research Hypotheses

### *Teachers Perceptions of Program Engagement*

Research hypothesis 1 for the Zoo School study was "Teachers perceive that Zoo School provides their students with an engaging education program." The data source for research question 1 resulted from the findings of research question 1, was survey questions 4, 5 and 6 for student engagement. The results showed that ninety-eight percent of the teachers perceived the program provided students an exciting experience, eighty-six percent perceived students actively participated, and ninety-two percent perceived the program captivated students by activities. Therefore, the hypothesis that "Teachers perceive that Zoo School provides their students with an engaging education program" was accepted.

### *Teachers Perceptions of Program Effectiveness for Students*

Research hypothesis 2 for the Zoo School study was "Teachers perceive that Zoo School provides their students with an effective experience." The data source for research hypothesis 2 derived from research question 2, was survey questions 7, 8 and 9 for presenter effectiveness, survey questions 10, 11, 12 and 13 for other factors for program effectiveness, and the curriculum analysis for the modules. The research question showed that ninety-nine percent perceived the presenter was informative. Ninety-five percent perceived the presenter was entertaining. Ninety-nine percent perceived the presenter

involved students in the lesson activities. Ninety-five percent perceived the program was grade level appropriate. Ninety-five percent perceived the program was a valuable learning experience, and ninety-six percent were interested in returning to Zoo School for future programs. On the other hand, sixty-four percent perceived printed materials as effective learning tools, nineteen percent neither agreed nor disagreed and sixteen percent did not respond to the question. With the exception for the effectiveness of printed materials as a valuable learning tool, the hypothesis that "Teachers perceive that Zoo School provides their students with an effective experience" was accepted.

*Teachers Motivation for Integrating Curriculum*

Research hypothesis 3 for the Zoo School study was "Teachers enroll in Zoo School because they believe that these courses are an integral part of instruction." The data source for research hypothesis 3 resulted from research question 3, was survey question 1 for teacher's motivation to participate, and survey question 14 for teachers met expectations. The research question showed that eighty-eight percent of the teachers were motivated to participate for integrating into their curriculum. Sixty-five percent of the teachers exceeded their expectations and thirty-three percent met their expectations for integrating into their curriculum. The hypothesis that "Teachers enroll in Zoo School because they believe that these courses are an integral part of instruction" was accepted.

*Teachers Motivation for Supporting State Education Standards*

Research hypothesis 4 for the Zoo School study was "Teachers enroll in Zoo School because they perceive these courses support their state academic standards." The data source for research hypothesis 4 resulted from research question 4, was survey question 2 for teacher's motivation to participate and survey question 15 for teachers met

expectations. The research question showed that eighty-one percent were motivated to participate for meeting standards, thirteen percent neither agreed nor disagreed and six percent were not motivated to participate for meeting standards. Sixty-three percent exceeded their expectations and thirty-three percent met their expectations for meeting standards. Despite thirteen of one hundred teachers, neither agreed nor disagreed initially that modules supported the standards, the hypothesis that "Teachers enroll in Zoo School because they perceive these courses support their state academic standards" was accepted. Eight out of ten teachers were motivated for this reason, and ninety-nine percent had met or exceeded their initial expectations.

*Teachers Motivation for Rewarding Students for Academic Achievement*

Research hypothesis 5 for the Zoo School study was "Teachers enroll in Zoo School because they believe that these courses are a reward to their students for academic achievement." The data source for research hypothesis 5 resulted from research question 5, was survey question 3 for teacher's motivation to participate and survey question 16 for teachers met expectations. The research question showed that sixty-one percent were motivated to participate, twenty-six percent neither agreed nor disagreed and twelve percent were not motivated to participate for rewarding students for academic achievement. On the other hand, seventy percent of the teachers exceeded their expectations and twenty-five percent met their expectations for rewarding their students for academic achievement. Despite nine out of ten teachers met and exceeded their expectations, the hypothesis was rejected for "Teachers enroll in Zoo School because they believe that these courses are a reward to their students for academic achievement".

Initially, just six out of ten teachers were motivated to participate for rewarding their students for academic achievement.

## Discussion

### *Program Engagement*

Zoo School provided students the curiosity, improved motivation and attitude, and engaged students through participation and social interaction. At the zoo, students can observe animal characteristics, compare species behavior, investigate habitat and life-style adaptations, support and obtain concepts for conservation, and gain real experience of the diversity of life (Woolard, 1995). It appears that teachers perceived students engaged by program activities. Learning that takes place outside the school, perhaps created a valuable, exciting and captivating learning experience for students. It appears that teachers perceived active participation with less agreement than an exciting experience and captivation. Perhaps, personality has an affect on this issue.

### *Program Effectiveness*

Nonformal education resources like zoos enhance formal education programs and provide curriculum enrichment for teachers. It appears that teachers perceived the presenter's effectiveness similar to their perceived student engagement. Zoo School presenters provided information, entertained and involved students with effectiveness. It appears that teachers observed an effective way to engage students not normally seen in the classroom, as well as integrate content and style to their classroom.

A curriculum analysis found that the modules addressed the New Jersey and Pennsylvania standards. Standards are objectives that outline what students should know

and be able to perform at various grade levels and it appears that the modules address New Jersey and Pennsylvania standards.

It appears that the program was an effective setting for learning and a valuable learning experience for students. Nonformal education is a variety of "out-of-school" settings for students to gain knowledge of environmental concepts, problems and issues. The most effective settings may include woodlands, zoos, museums, aquaria, arboreta, community areas and environmental centers (Howe and Disinger, 1988).

In addition, it appears that there is a high level of interest in returning to Zoo School for future programs. Teachers perceived that students received a valuable learning experience through nonformal education, an outside setting that provided students an effective experience. It appears that Zoo School addressed module content to New Jersey and Pennsylvania standards. Curriculum that addresses to standards provides schools the justification to participate in a nonformal education program.

Zoo School was not effective for printed materials as a tool for learning. Pre-visit learning and post-visit reinforcement activities were beneficial in a study of sixth grade students at a zoological garden (Gennaro et al., 1983 (as cited in de White and Jacobson, 1994, p.19)). It appears that the study findings showed that the teacher's approval of instructional materials and their opinions influenced pre-visit activities and post-visit reinforcement. It appears that school administrators and teachers mishandled printed materials, which prevented teachers from receiving them. Nearly half of the missing data from the survey questions relate to printed materials, and less than two-thirds that responded agreed that printed materials were effective. Nearly one-fifth responded neither agreed nor disagreed.

*Integrating Curriculum*

Nonformal education resources like zoos and museums enhance formal educational programs and provide curriculum enrichment for teachers. Integrating curriculum may encourage students to experience themselves and their surroundings. Nonformal education supports "Hands-on" learning conditions for teaching diverse and meaningful information (Beane (1995), Alleman (1993), and McDonald and Czermiak (1994) (as cited in James and Adams, 1998, p.4)). It appears that teachers perceived their motivations to participate for integrating curriculum with higher importance than standards or a reward for academic achievement. Teachers perceived the importance of integrating diversity and real-life experiences into their curriculum.

*Education Standards*

Standards are objectives that outline what students should know and be able to perform at various grade levels. The Governor's Advisory Commission for Pennsylvania recommends that "standards must be measurable, and students need to be able to make the connection between what it is they are expected to learn in school and what is critical to success in life (PDE, 2002-03). Teachers are under pressure to meet accountability targets set by the standards. It appears that thirteen of one hundred teachers initially neither agreed nor disagreed to the survey question. Is it possible teachers do not see the benefits for standards in an outside school setting that nonformal education provides students? It appears that integrating curriculum is easier to see, and standards are still relatively new, stressful and less meaningful for the teacher.

*Rewarding Students for Academic Achievement*

Extrinsic rewards used in a classroom, maintain a learning environment, provide added interest and excitement to classroom routines, and enhance pro-social learning behavior (Cruickshank, Jenkins and Metcalf, 2003, p.489). On the other hand, extrinsic rewards are not beneficial in the long-term when students perceive them as a bribes or limits to their freedom (Deci et al; Hennessey; Lepper and Hodell; Ryan, Mims and Koestner; and Spaulding (as cited in Omrod, 2004, p.458)). "The fact is that extrinsic motivators do not alter the attitudes that underlie our behaviors. They do not create an enduring commitment to a set of values or to learning; they merely, and temporarily, change what we do" (Kohn (as cited in Rehmke-Ribary, 2004)). It appears that teachers did not perceive the importance of rewarding their students for academic achievement as a motivation to participate. The survey question itself had a greater range of perception and a higher standard deviation as compared to the other survey questions. It appears that the engagement and valuable learning experience for students went beyond what the teachers initially expected.

## Concerns for Validity

You really do not know the internal validity of the research design until the survey has been in the field for some time and the results analyzed. For example, the survey positions every statement in a positive manner and the participant may be inclined to respond with all "strongly agree". Did the participant read the question or race through the survey to be with the students as they prepared for the zoo tour? Nearly thirteen percent of the total surveys were valued at "strongly agreed" for all Likert questions.

The external validity of a study is another concern. The surveyed population in the study relied on volunteer participation selected non-randomly, which may have an inherent non-response bias. The study used a survey of convenience for volunteer participants to determine conclusions. Another external validity concern is that the module analysis was subjective against the New Jersey and Pennsylvania standards, and the NAAEE *Guidelines for Excellence* and a lesson plan format. The question became how to evaluate the modules with validity and reliability given the subjective nature.

These issues are not an inherent weakness or disclaimer for this study. It is impossible to design a study that takes into account all teachers in different places and times in which to generalize. All things thrown into account, a preliminary calculation showed that the survey results were accurate and would not change significantly by eliminating these surveys. According to McMillan (2004, p.116), volunteer participants "tend to be better educated, higher socio-economically, more intelligent, more in need of social approval, more sociable, more unconventional, less authoritarian, and less conforming than non-volunteers" The subjective nature for the module analysis was a truthful interpretation of objectives and content against the standards and guidelines. Even with the validity concerns to use volunteer participants, and evaluate teacher's perceptions and modules, the benefits to evaluate outweigh the concerns.

## Recommendations

The intent of the study was to investigate (a) teacher's perceptions of the Zoo school program and (b) evaluate Zoo School modules. The study examined if Zoo School has an effective learning program.

*Programmatic Recommendations*

Programmatic recommendations to improve the effectiveness of the program may include:

1. Review module objectives with current New Jersey and Pennsylvania standards and make appropriate revisions.
2. Evaluate and modify affective domain objectives for the modules.
3. Evaluate to what extent the delivered or operational lesson plan meet the intended lesson plan? Are the zoo presenters delivering the intended lesson?
4. Evaluate and modify zoo entrance and other related operations to process schools efficiently prior to class start-up time.

*Research Recommendations*

Research recommendations to determine and improve the effectiveness of the program may include:

1. Research intended to measure if sensitivity exposure (affective domain) to zoo animals modifies student behavior. The program modules directly focus on the cognitive domain with no direct attention to emphasize the affective domain.
2. Research intended to develop and evaluate the effectiveness of pre lesson and post lesson activities, and assessment tools.
3. Research intended to measure teacher's expectations prior to participation, in relation to integrate curriculum, academic standards, and to reward students for academic achievement.
4. Research intended to investigate teacher's comments and recommendations by asking open-ended questions by telephone interview.

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## Appendix A. Zoo School Program - Teacher Satisfaction Survey

*Please take a few minutes to complete this survey. We value your feedback and we rely on your insights, comments and suggestions to improve our education programs. Thank you for your support of Zoo School!*

| Program title: | School: |
|---|---|
| Zoo educator: Date: | Grade level(s): Zip Code: |
| Before today, had you ever attended a Zoo School education program? YES NO | |

| **Please rate your level of agreement with the following statements:** | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree |
|---|---|---|---|---|---|
| I believe the zoo program should be an integral part of instruction for my class | 1 | 2 | 3 | 4 | 5 |
| It is essential for the zoo program to meet state education standards | 1 | 2 | 3 | 4 | 5 |
| I plan a trip to the zoo as a fun reward for my students' hard work | 1 | 2 | 3 | 4 | 5 |
| The zoo program provided an exciting experience for my students | 1 | 2 | 3 | 4 | 5 |
| My students actively participated in the zoo program | 1 | 2 | 3 | 4 | 5 |
| My students were captivated by the zoo program | 1 | 2 | 3 | 4 | 5 |
| The zoo educator was informative | 1 | 2 | 3 | 4 | 5 |
| The zoo educator was entertaining | 1 | 2 | 3 | 4 | 5 |
| The zoo educator involved my students in the lesson | 1 | 2 | 3 | 4 | 5 |
| The zoo program's printed materials are effective learning tools | 1 | 2 | 3 | 4 | 5 |
| The zoo program is appropriate for my students' grade level | 1 | 2 | 3 | 4 | 5 |
| The zoo program provided a valuable learning experience for my students | 1 | 2 | 3 | 4 | 5 |
| I am interested in returning to Zoo School for future programs | 1 | 2 | 3 | 4 | 5 |
| **How well did the zoo program meet your expectations...** | below | | Met | Exceeded | |
| ...for integration into your curriculum? | 1 | 2 | 3 | 4 | 5 |
| ...for meeting state education standards? | 1 | 2 | 3 | 4 | 5 |
| ...as a fun reward for your students' hard work? | 1 | 2 | 3 | 4 | 5 |

**What did you like most about this program?**

**What do you recommend that we change in the program (e.g.; content, format, timing, logistics, etc.)?**

| May we contact you to further discuss your reactions to today's program? YES NO | | |
|---|---|---|
| Teacher: | Phone #: | E-mail: |

**THANK YOU FOR YOUR FEEDBACK!!!**

**Please return to:** Lynn Parrucci, Director of Group Programs
**FAX #:** (215) 243-5385 **ADDRESS:** Philadelphia Zoo, 3400 West Girard Avenue, Philadelphia, PA 19104

Appendix B. Zoo Education Department Study Permission

September 23, 2004

Ron Berger
Austin A. Winther, Ph.D
Robinson Elementary Education Office B-3
Rowan University
201 Mullica Hill Road
Glassboro, NJ 08028

Dear Mr. Berger:

Thank you for your interest conducting research on the Philadelphia Zoo's school programs. The Philadelphia Zoo, America's first Zoo, is dedicated to its mission of conservation, science, education and recreation. We strive to achieve the highest professional standards in all aspects of our business by creating high-quality, innovative and accessible programs that meet the needs and expectations of each audience.

We are granting permission for you to survey teachers participating in Zoo Classes. These teachers are either paying clients or recruited through The Philadelphia Zoo's Earth Savers program, which provides Zoo Classes and fieldtrips for free to schools who cannot afford to them. Your research, a component of summative evaluation for our Zoo Classes and Earth Savers programs, will help us assess the following:

- Participating teachers' needs and expectations for booking programs
- The role or importance of integrating or meeting state education standards
- Our success in delivering informative, entertaining and interactive educational programs
- Our success in meeting or exceeding teachers' expectations of quality
- Our success in meeting or exceeding teachers' expectations for educational standards and curriculum integration

I look forward to working with you directly on this project. You will also receive on-site supervision from Dr. Melissa Chessler, the Zoo's Evaluation and Research Specialist.

Sincerely,

Lynn Parrucci
Director of Education-Group Programs
Phone: 215-243-5243
Email: parrucci.lynn@phillyzoo.org

Appendix C. Zoo Education Department Survey Permission

September 23, 2004

Ron Berger
Austin A. Winther, Ph.D
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Rowan University
201 Mullica Hill Road
Glassboro, NJ 08028

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Sincerely,

Lynn Parrucci
Director of Education-Group Programs
Phone: 215-243-5243
Email: parrucci.lynn@phillyzoo.org

Appendix D. IRB Approval

Rowan University
INSTITUTIONAL REVIEW BOARD
HUMAN RESEARCH REVIEW APPLICATION

Step 1: Is the proposed research subject to IRB review? All research involving human participants conducted by Rowan University faculty and staff is subject to IRB review. Some, but not all, student-conducted studies that involve human participants are considered research and are subject to IRB review. Check the accompanying instructions for more information. Then check with your class instructor for guidance as to whether you must submit your research protocol for IRB review. If you determine that your research meets the above criteria and is not subject to IRB review, STOP. You do not need to apply. If you or your instructor has any doubts, apply for an IRB review.

Step 2: If you have determined that the proposed research is subject to IRB review, complete the identifying information below.

Project Title: School teacher perceptions of a non-formal education program at a large metropolitan zoo

Researcher: Ronald S. Berger
Department: Elementary Education
Mailing Address: 38 Oakland Terrace Bala Cynwyd, PA 19004
Location: Rowan University
E-Mail: berger00 ( Co-Investigator/s: N/A
Telephone: (610) 668-3891 Home (484) 620-0247 Cell
Faculty Sponsor: Dr. Austin Winther
Department: Elementary Education Location: Rowan University
E-Mail: winther@rowan.edu Telephone: 856.256.4500 x3 805
Approved For Use by Rowan IRB: 7/04

INSTRUCTIONS: Check all appropriate boxes, answer all questions completely, include attachments, and obtain appropriate signatures. Submit an original and two copies of the completed application to the Office of the. Associate Provost for Research Expediter(s):

Be sure to make a copy for your files.
FOR IRB USE ONLY:
Protocol Number: IRB- 2004 - 186
Received: Nov 30 2004 Reviewed:_____
Exemption: ___Yes ___No
Category (ies): _____
Approved: Approved 12/03/04
Complete / Approve


## *Completion Certificate*

This is to certify that

**Ron Berger**

has completed the **Human Participants Protection Education for Research Teams** online course, sponsored by the National Institutes of Health (NIH), on 10/05/2004.

This course included the following:

- key historical events and current issues that impact guidelines and legislation on human participant protection in research.
- ethical principles and guidelines that should assist in resolving the ethical issues inherent in the conduct of research with human participants.
- the use of key ethical principles and federal regulations to protect human participants at various stages in the research process.
- a description of guidelines for the protection of special populations in research.
- a definition of informed consent and components necessary for a valid consent.
- a description of the role of the IRB in the research process.
- the roles, responsibilities, and interactions of federal agencies, institutions, and researchers in conducting research with human participants.

National Institutes of Health
http://www.nih.gov

# Appendix F. SPSS Descriptive and Frequencies

**Descriptive Statistics**

| | N | Missing | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|---|
| VAR00001 | 216 | 0 | 2.00 | 5.00 | 4.3194 | .75006 |
| VAR00002 | 214 | 2 | 1.00 | 5.00 | 4.1589 | .87371 |
| VAR00003 | 214 | 2 | 1.00 | 5.00 | 3.7150 | 1.04727 |
| VAR00004 | 212 | 4 | 3.00 | 5.00 | 4.6887 | .49381 |
| VAR00005 | 214 | 2 | 2.00 | 5.00 | 4.6355 | .60347 |
| VAR00006 | 212 | 4 | 2.00 | 5.00 | 4.5425 | .64807 |
| VAR00007 | 215 | 1 | 3.00 | 5.00 | 4.7023 | .46839 |
| VAR00008 | 213 | 3 | 2.00 | 5.00 | 4.5681 | .58383 |
| VAR00009 | 214 | 2 | 1.00 | 5.00 | 4.7383 | .50045 |
| VAR00010 | 182 | 34 | 2.00 | 5.00 | 4.1374 | .78510 |
| VAR00011 | 212 | 4 | 2.00 | 5.00 | 4.5943 | .57232 |
| VAR00012 | 210 | 6 | 3.00 | 5.00 | 4.6762 | .49871 |
| VAR00013 | 214 | 2 | 1.00 | 5.00 | 4.6542 | .58306 |
| VAR00014 | 212 | 4 | 2.00 | 5.00 | 3.9623 | .81368 |
| VAR00015 | 208 | 8 | 2.00 | 5.00 | 3.9231 | .79482 |
| VAR00016 | 208 | 8 | 1.00 | 5.00 | 4.1058 | .90001 |

**Frequency Tables**

**VAR00001**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 2.00 | 5 | 2.3 | 2.3 | 2.3 |
| | 3.00 | 22 | 10.2 | 10.2 | 12.5 |
| | 4.00 | 88 | 40.7 | 40.7 | 53.2 |
| | 5.00 | 101 | 46.8 | 46.8 | 100.0 |
| | Total | 216 | 100.0 | 100.0 | |

**VAR00002**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 1.00 | 1 | .5 | .5 | .5 |
| | 2.00 | 11 | 5.1 | 5.1 | 5.6 |
| | 3.00 | 28 | 13.0 | 13.1 | 18.7 |
| | 4.00 | 87 | 40.3 | 40.7 | 59.3 |
| | 5.00 | 87 | 40.3 | 40.7 | 100.0 |
| | Total | 214 | 99.1 | 100.0 | |
| Missing | System | 2 | .9 | | |
| Total | | 216 | 100.0 | | |

**VAR00003**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 1.00 | 8 | 3.7 | 3.7 | 3.7 |
| | 2.00 | 17 | 7.9 | 7.9 | 11.7 |
| | 3.00 | 57 | 26.4 | 26.6 | 38.3 |
| | 4.00 | 78 | 36.1 | 36.4 | 74.8 |
| | 5.00 | 54 | 25.0 | 25.2 | 100.0 |
| | Total | 214 | 99.1 | 100.0 | |
| Missing | System | 2 | .9 | | |
| Total | | 216 | 100.0 | | |

**VAR00004**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 3.00 | 3 | 1.4 | 1.4 | 1.4 |
| | 4.00 | 60 | 27.8 | 28.3 | 29.7 |
| | 5.00 | 149 | 69.0 | 70.3 | 100.0 |
| | Total | 212 | 98.1 | 100.0 | |
| Missing | System | 4 | 1.9 | | |
| Total | | 216 | 100.0 | | |

**VAR00005**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 2.00 | 3 | 1.4 | 1.4 | 1.4 |
| | 3.00 | 5 | 2.3 | 2.3 | 3.7 |
| | 4.00 | 59 | 27.3 | 27.6 | 31.3 |
| | 5.00 | 147 | 68.1 | 68.7 | 100.0 |
| | Total | 214 | 99.1 | 100.0 | |
| Missing | System | 2 | .9 | | |
| Total | | 216 | 100.0 | | |

**VAR00006**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 2.00 | 2 | .9 | .9 | .9 |
| | 3.00 | 12 | 5.6 | 5.7 | 6.6 |
| | 4.00 | 67 | 31.0 | 31.6 | 38.2 |
| | 5.00 | 131 | 60.6 | 61.8 | 100.0 |
| | Total | 212 | 98.1 | 100.0 | |
| Missing | System | 4 | 1.9 | | |
| Total | | 216 | 100.0 | | |

**VAR00007**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 3.00 | 1 | .5 | .5 | .5 |
| | 4.00 | 62 | 28.7 | 28.8 | 29.3 |
| | 5.00 | 152 | 70.4 | 70.7 | 100.0 |
| | Total | 215 | 99.5 | 100.0 | |
| Missing | System | 1 | .5 | | |
| Total | | 216 | 100.0 | | |

**VAR00008**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 2.00 | 1 | .5 | .5 | .5 |
| | 3.00 | 7 | 3.2 | 3.3 | 3.8 |
| | 4.00 | 75 | 34.7 | 35.2 | 39.0 |
| | 5.00 | 130 | 60.2 | 61.0 | 100.0 |
| | Total | 213 | 98.6 | 100.0 | |
| Missing | System | 3 | 1.4 | | |
| Total | | 216 | 100.0 | | |

**VAR00009**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 1.00 | 1 | .5 | .5 | .5 |
| | 4.00 | 52 | 24.1 | 24.3 | 24.8 |
| | 5.00 | 161 | 74.5 | 75.2 | 100.0 |
| | Total | 214 | 99.1 | 100.0 | |
| Missing | System | 2 | .9 | | |
| Total | | 216 | 100.0 | | |

**VAR00010**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 2.00 | 1 | .5 | .5 | .5 |
| | 3.00 | 42 | 19.4 | 23.1 | 23.6 |
| | 4.00 | 70 | 32.4 | 38.5 | 62.1 |
| | 5.00 | 69 | 31.9 | 37.9 | 100.0 |
| | Total | 182 | 84.3 | 100.0 | |
| Missing | System | 34 | 15.7 | | |
| Total | | 216 | 100.0 | | |

**VAR00011**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 2.00 | 1 | .5 | .5 | .5 |
| | 3.00 | 6 | 2.8 | 2.8 | 3.3 |
| | 4.00 | 71 | 32.9 | 33.5 | 36.8 |
| | 5.00 | 134 | 62.0 | 63.2 | 100.0 |
| | Total | 212 | 98.1 | 100.0 | |
| Missing | System | 4 | 1.9 | | |
| Total | | 216 | 100.0 | | |

**VAR00012**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 3.00 | 3 | 1.4 | 1.4 | 1.4 |
| | 4.00 | 62 | 28.7 | 29.5 | 31.0 |
| | 5.00 | 145 | 67.1 | 69.0 | 100.0 |
| | Total | 210 | 97.2 | 100.0 | |
| Missing | System | 6 | 2.8 | | |
| Total | | 216 | 100.0 | | |

**VAR00013**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 1.00 | 1 | .5 | .5 | .5 |
| | 3.00 | 6 | 2.8 | 2.8 | 3.3 |
| | 4.00 | 58 | 26.9 | 27.1 | 30.4 |
| | 5.00 | 149 | 69.0 | 69.6 | 100.0 |
| | Total | 214 | 99.1 | 100.0 | |
| Missing | System | 2 | .9 | | |
| Total | | 216 | 100.0 | | |

**VAR00014**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 2.00 | 1 | .5 | .5 | .5 |
| | 3.00 | 71 | 32.9 | 33.5 | 34.0 |
| | 4.00 | 75 | 34.7 | 35.4 | 69.3 |
| | 5.00 | 65 | 30.1 | 30.7 | 100.0 |
| | Total | 212 | 98.1 | 100.0 | |
| Missing | System | 4 | 1.9 | | |
| Total | | 216 | 100.0 | | |

**VAR00015**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 2.00 | 1 | .5 | .5 | .5 |
| | 3.00 | 71 | 32.9 | 34.1 | 34.6 |
| | 4.00 | 79 | 36.6 | 38.0 | 72.6 |
| | 5.00 | 57 | 26.4 | 27.4 | 100.0 |
| | Total | 208 | 96.3 | 100.0 | |
| Missing | System | 8 | 3.7 | | |
| Total | | 216 | 100.0 | | |

**VAR00016**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 1.00 | 3 | 1.4 | 1.4 | 1.4 |
| | 2.00 | 1 | .5 | .5 | 1.9 |
| | 3.00 | 53 | 24.5 | 25.5 | 27.4 |
| | 4.00 | 65 | 30.1 | 31.3 | 58.7 |
| | 5.00 | 86 | 39.8 | 41.3 | 100.0 |
| | Total | 208 | 96.3 | 100.0 | |
| Missing | System | 8 | 3.7 | | |
| Total | | 216 | 100.0 | | |

# Appendix G. Participants' Comments and Recommendations

**Participant Comments for what they like most about the program**

Interactive class for the students

Allowed students to actively participate

Students were able to pet the animals and learn about them.

To have students be involved in the lesson and actually see them was excellent.

The live animals

The live animals were great

The lesson was great! The students could touch

The hands on skulls were very interesting to connect by the categories of herbivore, carnivore, omnivore. The live animals were a real treat.

Students could touch the animals and skins.

Teacher was very patient and answered student's questions.

Presenter had great group control and answered all questions quickly and sincerely.

The interaction

Seeing the live animals.

Students enjoyed the program, were involved, and learned things that supplemented learning in the classroom.

Lesson was perfect for 2nd graders! It was on their level and very educational.

Live animals and participation by children. Teacher was excellent!

Interaction made it a more enjoyable learning experience. Students were delighted to see and touch the live animals, even the roaches!

The hands-on experience (sent thank you letters)

Jenn was great. Due to delays at the gate and confusion over the location of our lesson, we had to combine groups. She involved all the students, and they loved the presentation.

Gave the students the opportunity to see live animals that many had seen only in pictures.

Program was very well planned. It was an excellent learning experience for all of us! Thank you for a wonderful day.

Students were very involved.

We enjoyed seeing and learning about the different reptiles. We esp. liked the legless lizard, and trying to guess what it was.

The presenter involved students in the lesson. They enjoyed seeing the animals and the things to touch!

Interactive, geared to student level.

It was wonderful! Jim took his time, was patient, clear, and knowledgeable. He was very interesting and engaged the students. Lesson was well prepared.

Kristen was excellent with the children and she was very well-informed. She answered the children's questions and interacted well with them. Impressed that we were able to be accommodated in Peacock pavilion.

Liked entire program

Instructor had a wide range of knowledge and was able to answer question very well. She did a great job of relating to them and involving them in the program.

The information

Hands-on, interactive, right length for 3rd grade attention span

Hands-on, and the information I learned as an educator

Compare/contrast human habitat and needs to various animal habitats and needs

Informative. Instructor was knowledgeable and students were involved (hands-on). Enjoyable trip!

Student participation, hands-on.

Liked variety of animals and the enthusiasm of the instructor, as well as her knowledge. It provided for a great program.

Students got an up close look-a valuable experience

Children could truly be a part of the learning experience.

Like the hands-on experience that involved the students to better understand concepts as well as their interest level.

Hands-on experience, touching the animals
Educational trip, not reward. Printed materials given were for grade 3 and up too difficult for my students independently. Program itself was very good.
Live animal demonstration very exciting for my students. The program was well run & availability of program was wonderful. My students really enjoyed themselves.
She was very interested in getting the children to understand and learn about animal classification.
It is a good program! Keep up the good work, thanks for offering it to our kids.
Live animals and information on them. Add more animals to discussion either through pictures or conversation even live ones since the kids like them the best. Maybe think about taking the lesson into part of the zoo for continued discussion.

Not possible as fun reward. Where would the others go?

Liked "student involvement" most
Liked "student involvement, great visuals for students, very animated and interesting presenter. Presenter very knowledgeable!
Hands-on opportunity, clear rules, good management, knowledgeable teacher. R: Ask students more questions, give clues so they can guess adaptations. (She listed some examples.)

Liked: the live animals, R: nothing - it was great! Thanks!

Student participation, Instructor was excellent with children, very lively, articulate. R: nothing

Children were actively involved in the lesson. Lesson was hands-on. R: Everything was fine.

Liked that it is interactive

Great explanations, good warmth and contact with kids, R: nothing.
Hands-on interaction with animals, Content very good and made understandable for children. R: Lesson on animals native to PA.

The way everyone show my class respect
Patient instructor took time with questions. R: Pictures of habitats students can pass around to view. Types of sounds heard in habitats.
Interactive style -hands-on application of observation skills. Personal encouragement given by educator to all students. Good emphasis of explanation and scan observation, focal observations. Good challenge & follow scientific research skills and procedures
The room was appropriate for students where they could see hear and participate. The read-on activities were grade level. R: was fine, thank you! Please send info to school so we know how to prepare our students.

Liked students as volunteers. Noted: Carnivores closed

Enhanced our classroom curriculum. Provided lots of factual information in a fun way.

Liked that it is interactive, lots of participation.

The instructor was very good!!

The involvement of the students and the use of live animals.
Like the hands-on experience, the children love being involved in presentations. The presenter did an excellent and interesting presentation
Our instructor in Reptile Rage was very informed and treated my student's age appropriately, made them feel so interested and intelligent!
Animated, expressive, well informed instructor - dispelled myths...setting forth foundations for research projects. - extremely interactive...questions truly challenged and informed the class as well as the teacher.

The animals were great for the kids but the information that the man gave us was great too.

We loved it! The instructor was great!

Up close view, feel of animals

No crowd in winter, great, quick lesson.

Up close view, feel of animals

Student involvement was connected to our voyager literacy program.

The animals the children got to see up close.

Just the fact that the children were excited and interested in everything they saw.
Students loved seeing the animals close up, especially loved touching them. I thought that showing each animal as an example of HIPPO was excellent.

Students were actively involved and the zoo educator allowed enough time for student questions.
Hands on activities where the kids were involved and actually got to see the different primates, which made it easier for them to understand.

Live animal presentations.

Enjoying the polar bears and my class' laughter in reptile house.
(smiley)

the students love to see the animals.

Every class I have ever brought to our Zoo has learned more than they knew before about animals. They come with parents but do not learn nearly as much as they do with trained teachers.

A Free Winter Trip

Educator was terrific and involved children, made it exciting for students

Animals, Addressing of PA standards, addressing misconceptions

Live Animals

Personable educator, kept class engaged

Students were able to touch animals and ask questions

Props and student involvement. Small group of students is a huge benefit

Class participation/students were used to demonstrate

Very well done, teachers were pleased, students responded

Live Animals are always a welcome addition to curriculum and the Zoo provides the only real source of exotic animals

Live Animals

Material organized and well-prepared. Children loved participating in the lesson and using hands-on materials

Zoo Educator was very energetic and knowledgeable about the animals

Interactive and informative

Students are interested in learning about animals. Hands on learning experience for students

interactive nature of program. Animals were a huge hit with the children

The information for the children and having the children participate in the program

The Different Animals

facilitator actively engaged students and was age/grade appropriate for the audience

Erin was good at keeping the students on task and paying attention

Marcy's manners with both animals and children. The review of what we've covered and extension beyond

Most of the children are not exposed to the information about rodents, snakes, owls and spiders. The program satisfies this lack of knowledge. The children also learn how useful these creatures are

My students were totally engaged. The questioning was totally appropriate for my special education students. I especially liked the "hands on" lesson where my students were completely Engaged. Excellent, well informed and timed perfectly.

Zoo instructors were very energetic and informative. They engaged the children attention and excitement. It was a wonderful assembly program.

It gave the students the opportunity to see live animals that many of them had only seen in pictures. We read a story about orangutans, I made sure the students saw them and they were thrilled.

The zoo educator's lesson was perfect for second graders! It was on their level and very educational!

The teacher was very patient and answered the students' questions

We enjoyed seeing different reptiles and learning about them. We especially like the lizard without legs (and trying to tell if was a snake or a lizard from what we knew)

It was interactive, geared to student level

The instructor obviously had a wide range of knowledge and was able to answer my students' questions very well. She did a great job of relating to them and involving them in the program.

student participation/hands on

Enjoying the polar bears and my class' laughter in the reptile house

This program allowed my students to actively participate in the lesson

Used real animals. Used children in audience, kept children's attention

I particularly liked the choice of animals and most of all the zoo came to us.

Excellent "child centered" information and delivery of information

The hands-on experience my students got during the lesson

The children enjoy seeing and hearing about the animals. We would like to thank the zoo and the instructor for this wonderful opportunity

The students enjoy learning about the characteristics of different types of animals. The information was entertaining and provided some scientific background knowledge that some students are missing!

Students love animals

I liked seeing the animals and learning about them

Very entertaining and informative, Presenters kept the show rolling so the students would not be bored
I'm glad the program was able to come to us. As an inner city school with a limited budget, field trips are a luxury. Bringing the animals here so the kids could learn more about animals and their surroundings was great

Good kid friendly explanations of vertebrates, great animals!

The kids loved the animals

It gave my students an opportunity to see animals they would never see in daily life. They loved it!

The owl...and how the instructors involved the students with the different animals
The hands on experience Miss Kim offered my children. This is the only time the children could see or touch and animal not behind glass or bars

Touching, seeing and hearing animals
The live animals. But perhaps more zoo like such as the snake. We have class rabbits and ducks, and the ferret has become a common pet.

Informative and really interesting material. Students enjoyed the climate of seeing and learning onsite!

Live Animals

Live Animals

Explanation of animals eyes- hunt or hide
I was pleased to see that amphibians were included in the animal classification lesson along with mammals,
birds and reptiles

The program was great way to bring new experiences to our children

The use of animals to incorporate the lesson themes
I allowed my students to experience a quality science lesson with a different teacher than they are use to and it reinforced what they have been taught in school- BUT BETTER!!! I don't arrange this trip as a reward but as part of the whole experience, whet
The program was wonderful. Faith was an excellent presenter. She included the children's participation, questions and answers

The animals and students active participation

Good lesson- well paced and patient educator

We enjoyed the hands on opportunities

The lesson was wonderful!

The wild colors education lesson! The zoo educator was very informative and age appropriate

The hands on activities were great!

Very informative/educational for students and staff
The children were able to see live specimens and perhaps some myths about reptiles were dispelled.
There was some mix up in the title of our lesson. My confirmation was for Reptile Rage, but we were told that it was for some other program. I showed Maggie

Erin did a great job tying in environmental issues. Very good techniques getting the kids attention and quiet

The patience of Leslie and with our wiggly students were great
Age appropriate, allowed questions, hands on. Small group setting. Touch animals match words to sense cards

The children were able to see and touch real live animals

I thought the fossil fuels was the most interactive
What I like most about the program is that my children were involved. The zoo educator reached
all my children on levels high, medium and low

The discussion how animals camouflaged themselves into the environment

The live animals. One from each category

Presenter was upbeat, very knowledgeable, and excellent with the students
I liked how they actually had animals for the children to see. It was very educational in a "visual" learning sense. My children will definitely remember this experience

The students were very excited to see the animals. The displaying of animals and the Q & A period

Live Animals

Great instructors. The lesson should be longer. Maybe with video

Use of live animals and opportunity for students with varied backgrounds to see animals first hand. Most children were having their first zoo experience. Zoo educator was very interactive and kept students attention

It was child friendly and called for student participation. It was a nice program. The children it.
She made sure most of the children got to participate

It was free. We were not scheduled to come. We are second grade, but it worked out
The students were able to touch the animals. The lesson was age appropriate. The children/students really enjoyed it and learned from the lesson

The live animals
I always like the fact that we have the chance to really prepare our students before coming for the zoo lesson, that we see live animals in the lessons and the teachers are always SUPER!

We enjoyed the fact that the animals shown were animals that can find in the U.S.

Animals, engaging

The questioning and detailed information provided to all was the best aspect of the program
The program was excellent- a great ending for the unit we had just finished. The live animals that were part of the lesson were a "big hit"
The entire program was great. The presenters were energetic, helpful, know how to handle kids well, informative, and caring of kids and animals

The diversity of reptiles shared
I felt that Maggie was very knowledgeable and enthusiastic. She was very good at communicating with my students on their level. She answered their questions very well

I enjoyed the entire program
I like how engaged the students were in the lesson. I liked that the lesson involved my student. My students remembered the animals and how they adapt to their environment

The program was appropriate for my students' grade level

Very interactive, good format, children prepared with prior in class room lessons

**Participant recommended program changes**

More animals - students just loved them.

I missed the songs. Last year my class sang the mammal song for at least a month after the trip.

Educator might want to answer questions even during the program.
Were not allowed to wait inside the building when we arrived 5-10 min. prior as directed on a rainy day--should have made an exception.

Teacher could mention the family of animal (i.e. mammal, reptile, bird)
Program was for 12:15 but was delayed until 12:40 and we needed to be on the bus at 1PM.
Program was shortened, but still informative and enjoyable.

Send the paperwork earlier.
The 1st class could be moved to 10:15 and the 2nd class to 11, followed by 11:45 class to relieve tension on getting here on time.

Due to admission process we were 20 minutes late for our lesson.
We could hear another class presentation outside. Traffic and making enough time at the zoo was our biggest problem.

Could be a little longer, and have a bilingual person.

Program was great, but had other problems with sales/marketing.

Getting our tickets made us lose time for the program, this should be changed.

Need animals to touch, not just look at.
It would be helpful to have someone meet the school and escort them to the classroom. It would be great for 1st time visitors.

Students were very interested in touching the animals - some other animals to touch would be beneficial. Incorporate visuals where possible to show how animals are active in the wild: e.g. hawk in flight or eating; snake crawling and swallowing prey, etc. A simple animal coloring book that reflects the animals in my lesson and simple descriptions.
There could be more "hands-on" learning if different animals were part of the lesson. Also accessing what students already know would "tighten" up the content and allow more

Local examples of terms

Put a sign on the Shelly Building please

I wouldn't change a thing

Nothing

Enjoyed everything

Keep up good work/informative and engaging/presenters well prepared

Timing-class was rushed so kids missed out on some information
Lesson plans provided state there will be opportunity to fill out lesson guide in-zoo. This was not part of the lesson when we arrived. Don't really object but lesson plans should better reflect what students will be doing.
Can you "mic" the presenter? Acoustics in ISH are weak. We had difficulty understanding the presenter at time through no fault of her own.

Translations in other languages for bilingual students

Visit individual classrooms

More animals, exotic animals or animals they can pet

Maybe bring more animals
When the types of reptiles and characteristics are named and put up on the blackboard, I'd make pictorial version or add pictures to the words. My K's are non-readers

We also enjoyed classroom lessons
Due to the admission process (it took 15 minutes to get tickets) we were 20 minutes late to our 10:00am lesson
The day we went it was raining heavily. We were not permitted to wait inside the building when we arrived 5-10 min. prior, as directed. I think an exception could have been made on such a day.
Another class was outside and could hear their presentation. It was a good length. (our biggest problem is enough time at the zoo for we come so far + traffic)

Animals to touch, not just look at

Please bring the cats back soon!

It was great as is!

I liked it better when it is in the classroom-smaller groups of children

Sending the paperwork earlier

Her sound system made it difficult to understand what she says

Nothing-good program

This is the second program here that I've seen. They both were wonderful

Bring more animals!
Perhaps short, colorful video showing animals camouflaged in their natural settings. Seeing this might be better than just telling us about it

More exotic animals
We had several zoo programs over the years. This was adequate but not as memorable as others. We really miss the superb tree house programs.

Too much talking - a video or slide could have varied it.

Trivia games related to what children learned

Nothing- it is a very good program. It has been awhile since I have been here and I really enjoyed it
I was very surprised to see the instructor drinking from a coke bottle throughout the lesson. My students are not permitted to drink soda in school. Even if there was something else in the bottles the children will think it is soda. As professionals and ...

More live animals
We arrived at the zoo at 10:00 and could have been on time for the first lesson for our school but the line at the entrance gate was long and then each ticket had to be scanned. This procedure meant we arrived at the 10:00 lesson at 10:20. Maybe the lesson

I recommend that the program be 5 minutes shorter for the younger children

Seating not enough

Program went well

Smaller audience for better focus. Opportunity to ask direct questions...

Continue the program. It's great
The programs' content and length were just right. The time of year should be when it's a bit warmer so children can better see and enjoy the rest of the zoo

They should give directions to your destination to make sure that you go to your program on time

Either the zoo educators should be told to use a stronger voice or mike the person

Excellent program- perhaps bring more animals

The only thing that I would recommend would be making the program begin when they say they will begin. Keeping so many children occupied for 15 minutes is nerve racking

The program was great, but to wonder around in a blizzard for 11/2 hours was not fun! You need to have a completely indoor program for winter months

Longer. Students get involved... the lesson was over

Everything was O.K. was met on time by educator. Important to receive a grant and free lesson or children could not afford to. I have been coming for over 30 years

More animals for the children to touch

Maybe have a few live primates

More posters/visual aids to hit home certain points (mammals, amphibians, etc)

Allow a little more time for questions

We are not entirely clear about how to use the student work sheets in the lesson packet. We developed our own follow-up animal report. I've been bringing students for zoo lessons for many years. These trips are always among my favorite, and always stress-

Nothing- the program was great

More animal variety

I do not feel anything should be changed to the program

Everything was great. Kim, thank you for a job well-done. You were so informative, interesting and interacted wonderfully with the sixth graders. God bless you. You can tell Kim loves what she is doing. She is a great asset to the program. T.Y. Lipp

Have pictures rather than words for the 5 types of reptiles. 2.) If possible, bring out the BIG SNAKE; (Roxanne) each time

Once we got in things were fine, but we waited for almost 20 minutes for our class. We were then told our time would be "cut short" to keep on schedule. Other teachers were also taken late or sent confirmations for the wrong show. It would have been more

I think everything was perfect. Erin did a fabulous job presenting the information and explaining and showing the various animals

Provide lesson plans in addition to the program

More colorful, lively pictures especially for younger students

Can a program be designed to fit a "community" theme? all animals in the desert community.

I was hoping you would use more age appropriate vocabulary to reinforce what was taught in school

Please bring cats back soon!

A little more information for the older students.