THE BEAR IN THE CLASSROOM

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Because bear research has never been considered a high priority, it was not until the late 1950s that biologists began to apply modern and innovative scientific techniques to the study of bears (Herrero 1972). With increased funding during the 1960s and 1970s, bear work expanded and many researchers began to publish the results of their studies in scientific journals. By 1982 several thousand literature citations on black and brown bears appeared in various scientific publications (Dean 1982).

A problem with bear information in scientific journals, however, is that it normally does not reach the individuals who paid for the research—the general public. Surveys of the public's knowledge about bears show that many individuals are totally unaware of such basic bear information as size or habitat needs (Burghardt et al. 1972, Mollohan and LeCount 1981).

In an effort to solve this problem, the bear biologist has attempted to educate people by writing popular articles, giving talks to interested groups, and even by producing movies about bears. All of these formats are useful for giving the public factual information about bears and should continue. By talking or writing to the public, the bear researcher accomplishes 2 goals: promoting understanding and appreciation for bears and getting data to those individuals who pay for the research. Public education is important if bear researchers expect people to continue to support future research.

Movies, talks, and popular articles, however, will not solve all the problems of bear management. Although these activities are valuable, they are normally directed to adults, who usually have developed their attitudes about bears and are often slow to accept new ideas (Kellert and Berry 1980). Children, however, have open minds about bears. If factual information can be put into a child's educational experience, knowledge and appreciation for bears and their habitats can be taught before biases against bears develop. Educating children will not only aid future bear management by creating a more understanding general public but will also help future bear research, because today's children will be the adults paying for tomorrow's research.

Bear biologists are fortunate in that it is easy to get bear information into a child's educational experience. More (1979), in a review of animal preferences in children's books, found that bears were the wild animal appearing most often and were exceeded in popularity only by horses, dogs, and cats. Children begin to encounter bears in their reading material by 7 years of age, compared to encountering deer at age 10 and wolves at age 11. Bears are also very popular in the classroom. During a series of environmental education workshops for classroom teachers in Arizona from 1976 to 1982, we found that the majortiy of teachers interviewed thought bears were an excellent teaching aid for several reasons: an abundance of information is available to teachers in children's literature and bears fascinate children because of their size, perceived intelligence, and aesthetic value. Children have not yet developed the negative attitudes toward bears as predators or animals capable of inflicting human injury and property damage that cause many adults to rate bears as an undesirable species. Therefore, through available printed materials about bears, teachers can teach children the basic life history of bears and use bears to teach basic wildlife concepts such as "what is habitat," "what is carrying capacity," and so forth. Other animals such as raccoons or squirrels might be used for the same purpose but do not hold the child's interest like bears.

Like many other states, we have been trying to get our bear research information to the general public through standard formats. Unfortunately, this material usually reached adult audiences. During the past 5 years, however, we have taken bear information gathered from Arizona's bear research projects and, working with environmental educators and classroom teachers, have developed learning activities for the classroom.

We would like to acknowledge the assistance of Bob Hernbrode, Wildlife Education Specialist, Oracle Wildlife Refuge, Oracle, Ariz., and Jean Fields, 4th-grade teacher in the Washington School District, Phoenix, for their help in developing classroom activities.

WHAT IS WILDLIFE EDUCATION?

Before you can begin educating children, or even adults, you must have a clear understanding of the differences between wildlife education and information.

As our knowledge about bears has grown, so has our desire to inform the public about what we have learned. Traditionally, the main burden of "educating" the public about our new-found knowledge has fallen on the individual biologist, agency information section, or university extension program. Unfortunately, the majority of programs developed are merely informational and not educational. We have entertained and inundated the public with facts, figures, or trivial bits of information when we should have been suppylying them with the basic concepts and relationships from which to evaluate current or future wildlife issues.

One major mistake has been to assume that the information we give the public will stay with them. A considerable amount of research has been done on how people learn and it is clear that, although people will use many learning styles, effective learning must involve the whole person.

Taking learning styles and patterns into consideration, a generalized way of looking at presentation types and their relative effectiveness can be developed (Fig. 1). The most effective programs encourage the learner to generate and ask questions and stimulate thinking and imagination. The more involved a person becomes, the longer he or she will retain the information. The greater the audience involvement, the more impact a program will have.

All forms of wildlife, from bears to blackbirds, exist in an intricate web of environmental interdependence that should be the real subject of any educational wildlife program. Specific species data and facts should be used to illustrate or reinforce 1 or more basic ecological concepts. Two excellent sources of basic conceptual frameworks for wildlife are Hernbrode (1979) and WREEC (1983). If these basic "facts of life" are not taught, the general public will continue to be uninformed and even more susceptible to the emotional, illogical, and misleading claims of the wildlife charlatan. If, however, the public knows basic concepts, they can better process and evaluate new information. By teaching basic wildlife concepts, the long-term awareness of all wildlife, including bears, increases.

Developing a sound educational program also requires being knowledgeable about the makeup of the

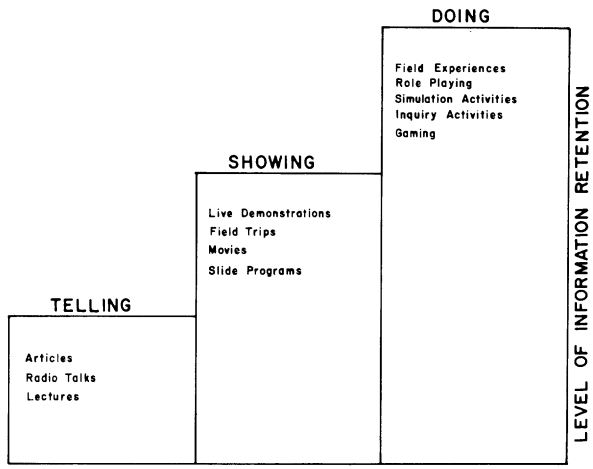

Fig. 1. Hierarchical graph of program types and educational effectiveness.

audience. Audience age, sex, income, and interest should all affect the program structure. One of the most common errors biologists make is taking programs designed for adults and watering them down to fit younger audiences. Children are not small adults. They are much different and can be reached in many more ways than adults.

Finally, the wildlife biologist should not try to develop wildlife education programs alone. A biologist may have gathered an impressive amount of information on bears but probably has little or no training in teaching methods. Good wildlife education programs are developed cooperatively by biologists and professional educators. With this cooperative approach, the biological information will be delivered in a sound educational format, have an impact, and stay with the audience.

THE APPROACH

Arizona's bear research program began in 1973. Since then the results of various phases of this work have been reported in professional journals, popular magazines, through personal appearances, and with a 16 mm movie. In 1977, work also began on educational classroom activities that would make this information accessible to and appreciated by school-aged children. Individuals from several disciplines were involved: a bear biologist to supply the facts about bears, a wildlife educator to put those facts into teachable concepts and activities, and a classroom teacher to test these activities on children (Fig. 2). Feedback throughout the system was provided to refine the activities for various grade levels. Each

individual involved had specific duties based on his or her expertise.

The Biologist

The research biologist is responsible for providing factual data about bears. The biologist, however, should give the wildlife educator an opportunity to go into the field with him whenever possible. By working with the educator, the biologist can get a better idea of what information the wildlife educator needs and the wildlife educator can gain a better overall knowledge of bears and bear research.

The research biologist is also responsible for checking the accuracy of the bear data through each phase of its development into a classroom activity. After the data have been developed into an activity by the wildlife educator, the biologist should review the activity to see that all information presented is factual. After the activity has been tested in the classroom, teacher comments should also be returned to the wildlife educator and biologist for review.

Any bear data that the teacher altered should be rechecked by the biologist. With this system of data checks the biologist can be assured that the final classroom activity will contain accurate bear information.

Wildlife Educator

The wildlife educator is a liaison between the biologist and classroom teacher. This person must be well versed in the basic concepts of wildlife, wildlife management, and educational theory. Initially, the educator must work directly with the biologists to evaluate and select appropriate data to illustrate the wildlife concepts. The wildlife educator will then develop, or work with the classroom teacher to develop, specific draft activities. The wildlife educator should also arrange opportunities for the biologists to talk with teachers so they can better appreciate teacher needs and problems.

Ideally, the wildlife educator and biologist will work for the same agency or institution. This arrangement helps the wildlife educator become familiar with the biologist's work and data. The wildlife educator may also come from an outside group such as a State Department of Education, local school district, or even be a classroom teacher.

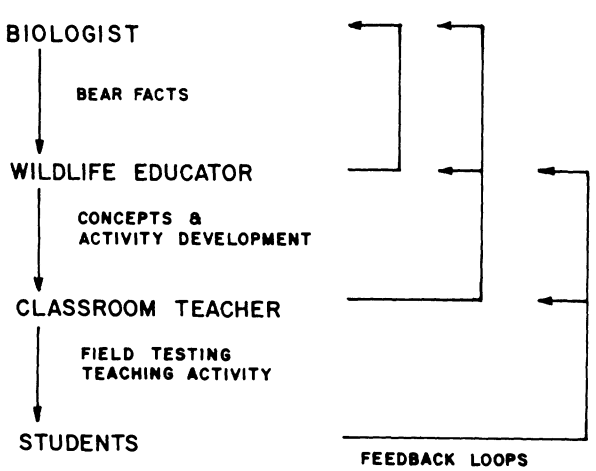

Fig. 2. Mechanism for developing bear activities for classroom use.

Classroom Teacher

The classroom teacher will initially work with the wildlife educator to develop activities or make suggestions. The classroom teacher ultimately decides the appropriateness and value of the activities developed. The teacher will also test the draft activities with students in classroom situations and will best be able to suggest changes in activity format. The teacher can also indicate to the wildlife educator what background data about bears would be useful.

After testing an activity, the classroom teacher can work with the wildlife educator to create and implement the final product. Other important teacher responsibilies are to convince teachers to try the activity and encourage and direct students who want to learn more about bears. The teacher represents what the public knows about bears, so wildlife biologists and researchers can use teacher feedback to guage the average person's knowledge level as they develop additional activities.

THE FINAL PRODUCT

In our work, the Arizona Game and Fish Department bear research biologist, the Department education coordinator, and a 4th-grade teacher from the Washington School District in Phoenix developed classroom activities from bear research data.

The wildlife educator was invited to assist the bear biologist with field work whenever possible. He was involved in all phases of the work, including capture operations, habitat analysis, den investigations, and radio-tracking. During these field sessions, the biologist and wildlife educator had an opportunity to

discover what types of classroom activities might be generated from the bear data.

It was decided that information dealing with bear growth rates and sizes could be used. Measurements and weights were being collected on all bears handled. Some of these data had been printed in a professional publication (LeCount 1977), a popular publication (LeCount 1980), and various 35 mm slide programs presented throughout Arizona. Because of the recent educational emphasis on basics such as reading, writing, and mathematics, the team decided that activities dealing with numbers and measurements would benefit teachers and students. A check with the classroom teachers proved this assumption to be correct.

Looking at the types of bear measurements available, the wildlife educator and classroom teacher agreed that several activities could be developed. The example included in Appendix A, entitled "Bearly Born," was developed for grades 4–6. Potential curricular areas included health, science, and mathematics. After getting general guidelines and needs from the classroom teacher, the wildlife educator developed a draft version of the activity. The draft was given to the teacher for field testing, the team made revisions, and produced the final version. The biologist checked the final version for accuracy. This activity became part of a wildlife education program now being developed in the western United States. Copies of the activity are also being distributed throughout Arizona at teacher workshops sponsored by the Arizona Game and Fish Department and used as part of a bear education program at the Oracle Wildlife Refuge. Conservative estimates indicate that we can expect approximately 225,000 Arizona students to use "Bearly Born" in the next 5 years.

RECOMMENDATIONS

Our experiences in Arizona show that the school community provides a valuable way to disseminate bear information. Using this resource to its fullest extent requires cooperation between biologists and educators. This collaboration will ensure that the product will be biologically sound and useful.

The following recommendations should provide the biologist with guidelines on how to initiate a wildlife education program that will allow bear data to be used by students. Even those already involved in education activities might strengthen their educational activities. The goal is to get the best bear information possible to as many people as possible. The education of children is 1 additional way.

1. Get to know agency or institution education personnel and recruit their talents. If such personnel are not available, contact local educators. A good source of contacts is state or provincial outdoor or environmental education associations or Departments of Education.
2. Make sure the wildlife education activity encompasses 1 or 2 basic wildlife concepts while it tells a bear story.
3. Make sure the program is educational, not just informational.
4. Consider using or modifying existing activities with your bear data rather than reinventing the wheel.
5. Programs should be multidisciplinary and interdisciplinary.
6. Incorporate teacher training when possible because teachers are a vital link with an interested, informed, and potentially powerful group (school children).
7. Develop materials for all age groups but concentrate on kindergarten through 6th grade. More can be accomplished with this age group because it has the least bias against bears.
8. Programs should be approached from a systems point of view. They should directly, or at least indirectly, demonstrate the interrelatedness of all aspects of the environment.
9. Problem-oriented activities should be challenging but not impossible to solve. They should also incorporate various points of view (e.g., economical, cultural, social, ecological, ethical, or political).
10. Above all, develop activities that directly involve participants in the learning process. Remember: I hear and I forget; I see and remember; I do and I understand.

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Appendix A. Bearly born.

Objective

Students will be able to identify similar survival needs of both black bears and human babies.

Method

Students illustrate, compute, and graph differences between people and black bears at various stages of maturity.

Background

There are similarities in basic survival needs of black bear cubs and human babies. Both are mammals, born from their mother's body. Although humans sometimes substitute soy or other products for mother's milk, bear cubs and most humans survive solely on mother's milk in the first months of life.

This activity is designed for students to recognize similarities between bear cubs and human babies, as well as to develop mathematics skills.

The following additional information about bear cubs and their families may be of assistance.

Age: Grades 4—7
Subjects: Mathematics, Science
Skills: analysis, comparing similarities and differences, graphing, estimation, prediction with ratio and averaging optional, discussion, drawing, generalization, media construction, reading, writing
Duration: two 30-minute periods
Group Size: any
Setting: indoors
Conceptual Framework Reference: I.A.
Key Vocabulary: similarities, differences, survival needs, omnivore

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BLACK BEAR CUBS AND THEIR FAMILIES

A baby bear is called a cub. An adult female bear is called a sow. An adult male bear is called a boar. A sow is usually impregnated by a boar in May or June. Interestingly, the fertile egg does not begin active development until around October. In this way, the mother bear's body naturally slows down the development process so that birth can take place around January 1. Contrasted with human fetal development of nine months, the mother bear is pregnant for about seven months, with the fetus actively developing only for about three months.

The sow has her cub or cubs in the shelter or den where she spends the winter months. A mother black bear usually has one or two cubs, although she may have as many as four. However, she won't have any cubs until she is four or five years of age, and then only every other year. From the time of birth, the mother's milk is the first food source for the young animals. At birth, a young cub has hair and weighs about eight ounces—about the size of a guinea pig. The bear cubs stay in the den with their mother until they are able to move around very actively. The bear cubs and their mother usually stay in the den until late April or early May. Boars and sows without cubs usually leave their dens a month earlier.

At the time the cubs leave the den with their mother, they are extremely dependent upon her. They still nurse, depending on mother's milk as a food source until the middle of summer, around six months. However, once out of the den, they quickly learn about additional food sources.

Black bears are omnivores. That means they eat plant and animal material. They tend to eat grass, nuts, berries in late summer, insects, grubs—and fish and rodents when they can catch them! Although they do not normally eat carrion, they will turn over dead and decaying animals to find and eat the protein-rich maggots.

When black bear cubs reach one year in age, female cubs weigh about 30 to 50 pounds. Males weigh about 50 to 70 pounds. A mature female bear will weigh about 150 to 185 pounds, and a male will weigh about 275 pounds.

NOTE: Your students may ask where the male, or father, bears are during the time the young cubs are growing. Male bears will kill cubs, so the mother bear keeps the cubs out of contact with males, and will fight to protect them if provoked. Under good conditions, a bear may live as long as 30 or more years.

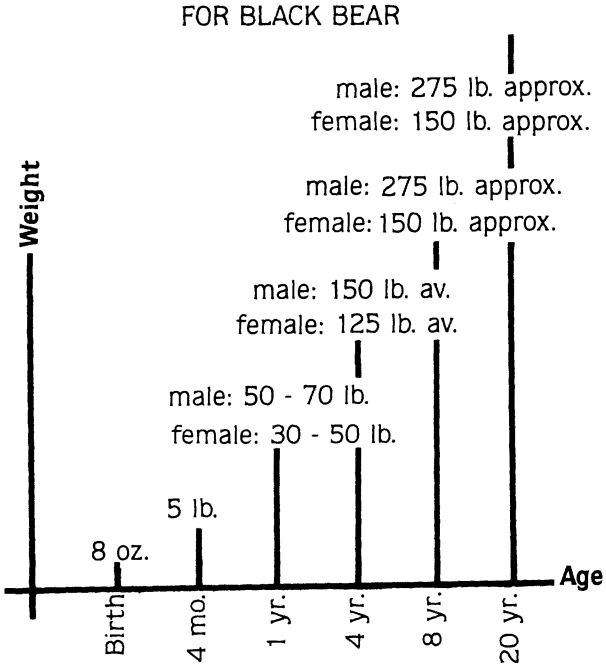
Materials

graph paper and drawing paper (Optional, for extension: yardsticks, 36 inch sewing tapes)

Procedure

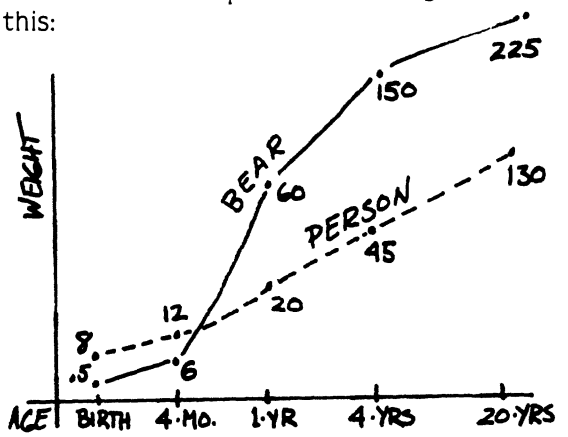
1. Begin a discussion with the students about black bears. Ask them to guess how much a cub (baby bear) might weigh when it is born. Every student can write down a guess on a piece of paper. Call for their guesses. Ask for their ideas about how long mother bears are pregnant, what baby bears eat when they are born, how much they might weigh when they are a year old, how many brothers and sisters they might have who are their same age, how much they weigh when they are full grown, and how long they live.
2. Following the discussion, post this information, or provide it as a "hand-out:"

WEIGHT AND AGE RELATIONSHIPS FOR BLACK BEAR



(Data are characteristic of black bear in the southwestern United States. There will be regional variation.)

3. Ask students to "fill in the blanks" with their own weight at the same ages as the information shows for the black bears. They will be required to estimate for years past their present age. Ask the students to:
a. graph both sets of data
b. draw a picture of the bear at each age
c. draw a picture of themselves at each age
One student's comparative data might look like this:



4. Ask the students to compute the following, and include their results with their graph and drawing:
a. How much weight did the black bear gain at each interval; that is, from birth to four months, four months to one year, etc.?
b. How much weight did you gain during the same intervals?
c. How many times more weight did the bear gain during each period?
5. In discussion, ask the students to comment on similarities and differences between bears and people. (For example, both are mammals. Describe their characteristics.) Ask students to identify clearly similarities in basic survival needs of bear cubs and babies.

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Extensions

1. Get out your measuring tape! Researchers can estimate the weight of a bear by measuring the bear's girth (the distance around a bear's chest). Given the following data, students can measure the girth of their own chests and estimate how much they would weigh if they were black bears!

22'' girth: weight of 50 pounds
30'' girth: weight of 100 pounds
35'' girth: weight of 150 pounds
39'' girth: weight of 200 pounds
45'' girth: weight of 300 pounds
52'' girth: weight of 400 pounds

Or: Have the students weigh themselves and measure their chest girth. Graph or chart their weight and girth. Graph or chart the weight and girth of black bears. Compare! Weigh and measure girth of older students, teachers, and family members. Graph or chart the results. Possible questions:

a. How much does a four-year-old bear weigh per inch of girth? Ten-year-old? Twenty-year-old?
b. How much do various age groups of children weigh per inch of girth?
c. Are bears or children heavier per inch? How about adults versus bears?

2. Calculate how fast a given bear population, if unchecked by limiting factors, can increase over a specific period of time, assuming that: a sow will have two cubs (one of each sex) in her fifth year of life; the total time frame is ten years, from July 1 to June 30; the initial bear population is one five-year-old boar and two six-year-old sows, one with two cubs. Graph or chart the results.

Evaluation

List three survival needs which are similar for bears and humans.

Use the following data to construct a graph which compares the growth of catfish from Lake Erie and the growth of catfish from the Ohio River.

AGE IN YEARS

	1	2	3	4	5	6	7	8	9
Lake Erie Catfish	69	115	160	205	244	278	305	336	366
Ohio River Catfish	56	101	161	227	285	340	386	433	482

SIZE (in mm)

a. Which catfish grew the most between the ages of four and five years?
b. How many times larger is the Ohio catfish at nine years of age than at one year of age?