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Author
Abramson, Charles

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From Flatworms to Humans: Demonstration of Learning Principles Using Activities Developed by the Laboratory of Comparative Psychology and Behavioral Biology – Additional Exercises

Charles I. Abramson

The Comparative Psychology and Behavioral Biology Lab, Department of Psychology, Oklahoma State University, U.S.A.

Since the mid-1990s, the Laboratory of Comparative Psychology and Behavioral Biology at Oklahoma State University has developed a number of exercises appropriate for classroom use to demonstrate principles of learning and other forms of behavior. These activities have primarily focused on the use of invertebrates such as planarians, houseflies, earthworms, and honey bees. We have also developed exercises using fish based on an inexpensive apparatus called the "Fish Stick." Other exercises to be discussed are "Salivary Conditioning in Humans," "Project Petscope," which turns local pet stores into animal behavior research centers, "Prey Preferences in Snakes," and "Correspondence in the Classroom," which helps students learn to write letters to scientists in the field of learning research. These various teaching activities are summarized, and the advantages and limitations are discussed. Additional material developed since 2011 is included. This material includes a low-cost microcontroller, history of comparative psychology projects, and additional animal exercises.

Keywords: comparative psychology, invertebrates, learning, teaching

For a number of years we have published hands-on, inquiry-based laboratory exercises for demonstrating principles of learning and welcome the opportunity to summarize the exercises in a single paper. The majority of these exercises use invertebrates such as houseflies, earthworms, planarians, and honey bees to demonstrate conditioning principles related to non-associative and associative learning. Recently, we expanded the range of exercises to include more conventional subjects such as snakes, fish, and humans. Ancillary activities, such as "Project Petscope," which converts pet stores into animal behavior research centers, and "Correspondence in the Classroom," where students learn to write letters to scientists in the area of learning, are also presented. Details associated with the activities can be found in the original publications cited in this article.

Invertebrates in the Classroom

The author first used invertebrates in the classroom in 1986 (Abramson, 1986). The rationale behind the use of invertebrates to demonstrate conditioning principles was to reverse the decline in animal-based experiences available to college students (Abramson, Wallisch, et al., 1999). The standard rat conditioning experience so common to the previous generation of students has all but disappeared and, if available at all, replaced with computer-based products that advertised a similarity between their products and a live conditioning experience.

Author Note**.** This article was previously published in a journal that is now out of print (Abramson, C. I., Hilker, A. C., Becker, B., Barber, K. R., & Miskovsky, C. (2011). Cost-effective laboratory exercises to teach principles in the comparative analysis of behavior. *Journal of Behavioral and Neuroscience Research*, *9*, 7-15.) The activities reported in this paper were supported in part by NSF grants DBI- 0552717 and DBI-0851651. We would like to thank Ms. Patricia L. Hampton for her comments on the manuscript.

Please send correspondence to Charles I. Abramson, Oklahoma State University, Department of Psychology, Stillwater, OK 74075. Email Charles.abramson@okstate.edu https://doi.org/10.46867/ijcp.2020.33.05.04

We may not be voicing the popular opinion, but, in our experience, the similarity between using an animal and a computer simulation is at best superficial. In one study, we compared a classical conditioning computer demonstration with a live earthworm conditioning demonstration. The results showed that of 63 students from an introductory psychology class and an experimental psychology class, 97% indicated that the live demonstration gave them a better feel of what it is like to conduct a classical conditioning experiment and over 77% thought that the live demonstration gave them a better understanding of conditioning. Their comments were revealing. One student stated that, "With computers you might think you know what is going on, but,when it comes time to prove it with real animals, you know what is only on the screen." Another student wrote, "It was really cool to see it work on the worms. It helped me understand the concepts in a realistic way" (Abramson et al., 1996).

In addition to teaching students about the nuances of conditioning, working with live animals engages students and encourages them to actively participate in the learning process. Students gain a better appreciation for life, the natural world around them, and the influence of animals on the local environment (Place & Abramson, 2006).

As mentioned in our previous publications, invertebrates have several advantages for classroom use (Abramson, 1986, 1990, 2004; Abramson et al., 1996). They are inexpensive to buy, feed, and house. Cockroaches, earthworms, and houseflies, for example, can all survive for weeks with minimal care. They can be ordered from biological supply houses such as Ward's, Carolina Biological Supply Company, and Connecticut Valley Biological Supply, or, in some cases, be procured at home! Unlike laboratory rats, invertebrates can be released into their home environment when the demonstration is finished. Students can train their own animals in a variety of apparatuses that cost dollars rather than hundreds of dollars. A Y- or T-maze for flies, planarians, and ants, for example, can be nothing more than an appropriately shaped plastic tubing connector. If a multiple unit maze is needed, it is easily constructed from more connectors. A set of Legos® also makes an excellent maze for crawling invertebrates, and a styrofoam ball placed in a cup of water makes an effective running wheel.

Invertebrates can be used in conjunction with existing demonstrations or alone to illustrate and gain an appreciation of experimental design, taxonomies of learning, inconsistencies in the definition of learning phenomena, comparative analyses of behavior, homologies, analogies, and limitations of cognitive concepts (Abramson, 1997). Although our demonstrations have been tested primarily on students in the United States, we have also successfully used them in Turkey and France.

Many of our early invertebrate learning demonstrations are available in the laboratory manual *Invertebrate Learning: A Laboratory Manual and Source Book* (Abramson, 1990). Experiments are described using habituation in protozoans and earthworms, classical conditioning in planarians, earthworms, and honey bees, and instrumental/operant conditioning of lever-pressing in the crab, leg position in locust, maze learning in ants, and discrimination learning in free-flying honey bees. Instructions on how to construct apparatuses are also available, as are variations in species and experimental design.

In the years following publication of the laboratory manual, additional conditioning exercises were published for the earthworm, housefly, planarian, and honey bee (Abramson, 2004; Abramson et al., 1996; Abramson, Kirkpatrick, et al., 1999; Abramson et al., 2007). Photographs and descriptions of the procedures for many of these experiments can be found on the website http://psychology.okstate.edu/Psychology_Museum/Classroom_Experiments.html. In the housefly and honey bee experiments, harnessed flies or honey bees are classically conditioned to extend their proboscises to an odor followed by a feeding of sucrose. Defensive conditioning of earthworms was accomplished by pairing a floral odor with the odor of butanol. Butanol elicits contraction in the earthworm and after a number of odor-butanol pairings, the earthworm contracts to the floral odor. The planarian experiment demonstrates instrumental conditioning in which the planarian reverses its direction to terminate airpuffs.

Conditioned and unconditioned stimuli are easily presented. If odors are used as stimuli, an odor cartridge is prepared by using a 20 cc plastic syringe. A piece of filter paper is impregnated with an odorant, such as rose oil, and secured to the plunger of the syringe with a thumbtack. To present the odor, simply depress the syringe. If sucrose is used as an unconditioned stimulus, a piece of filter paper is dipped into sugar solution; a microsyringe or eye dropper can also be used. In the instrumental experiment described earlier in which the direction of movement of a planarian is reversed by the application of airpuff, the airpuff was administered by a plastic syringe without odor. The training apparatus was a small plastic cutting board with grooves located along its perimeter. The grooves were filled with spring water, and the planarian glided within the grooves. The entire conditioning situation cost less than $5.00 USD.

The invertebrate experiments are highly effective and use inexpensive equipment and readily available species. As with any live animal exercise, a few limitations should be mentioned. If honey bees are used, the instructor must have access to a colony and associated support material. It is also difficult to use honey bees during cold weather, and some students may be afraid of honey bees and/or allergic to insect venom. Earthworms and houseflies can be used throughout the year, but earthworms are limited in what they can do, and the media in which houseflies are reared can smell quite bad (Abramson et al., 1996). Planarians are interesting to work with but, like earthworms, are limited in what they can do. There is also the issue that some results related to classical conditioning of planarians are difficult to replicate (Nicolas et al., 2008). Other issues that an instructor should consider include unfamiliarity with the species, motivation to try the unconventional, and institutional restrictions on the use of animals in the classroom.

The Fish Stick

The rationale behind the development of the fish stick was to create an inexpensive operant conditioning situation for a popular vertebrate that can be used in place of rats. One of the limitations of using invertebrates is that there are few traditional lever-press operant-conditioning situations suitable for the classroom. Readers interested in the evolution of operant conditioning devices for honey bees and blow flies should consult Sokolowski and Abramson (2010a) and Sokolowski and Abramson (2010b), respectively.

The fish stick is a simple hand held device for conditioning fish in the classroom or at home as an independent or class project. One end of a 30-cm-long plastic tube contains an LED and vibrator for discriminative stimuli and a feeding nipple in which a reinforcer or unconditioned stimulus consisting of Gerber Green Peas baby food flows to the fish. The other end of the feeding nipple is located inside of the plastic tube and connected with aquarium tubing to a 20 cc plastic syringe filled with the baby food. To administer the baby food, the experimenter depresses the syringe thus releasing a small amount of food at the appropriate time. Push buttons on top of the device turn on the LED or vibrator as needed. The device can be constructed for approximately $15.00 USD. To keep the cost down, the device is unautomated. Students observe the fish hitting the nipple and at the appropriate time administer the baby food by depressing the syringe. Background information, a detailed parts list, illustrations, construction schematic, circuit diagram, and sample data are available (Miskovsky et al., 2010). A YouTube video is available (https://youtu.be/FsonPCR6EZg).

We have used the fish stick for demonstrating principles of operant conditioning including shaping, discrimination learning, and the effects of reinforcement schedules. Classical conditioning of approach behavior and of general activity can also be explored using the fish stick. Studies of habituation related to the initial presentation of the device can also be carried out. For some instructors, the lack of automation may be a disadvantage. In our experience, this was not the case. Students have an opportunity to experience the need for automation and are challenged to design an automated version. (Sokolowski et al., 2010).

Salivary Conditioning in Humans

The rationale behind human salivary conditioning was to expand the range of conditioning demonstrations from invertebrates and fish to humans. After several pairings of a conditioned stimulus with lemon powder applied to the tongue, the student begins to salivate to the conditioned stimulus. This demonstration was not unique to us and has been reported several times (Cogan & Cogan, 1984; Gibb, 1983; Weinstein, 1987).

What is unique with our demonstration are two refinements. First, we present conditioned stimuli using a PowerPoint file. This allows the user maximum flexibility in selecting conditioned stimuli. We have used color, shape, sound (including the Pavlovian bell), and their combinations. One unique conditioned stimulus we have successfully used is to present a conditioned stimulus PowerPoint slide with the equation "7-1 = 6" paired with lemon powder. After several pairings, a conditioned-stimulus-only test trial is presented with the equation "4+2 =?" Students will salivate even though the number 6 is not presented.

In addition to flexibility in the range of conditioned stimuli, our use of PowerPoint allows the instructor to accurately select timing intervals associated with conditioned stimulus duration, interstimulus interval, and intertrial interval, and students have a practical example of what these intervals are and their importance. PowerPoint can also be used to demonstrate more advanced features of conditioning including blocking, discrimination, higher order conditioning, overshadowing, and temporal conditioning. Control groups such as unpaired, conditioned stimulus only, and unconditioned stimulus only can easily be incorporated.

The second unique feature of our version is the way salivation is measured. Rather than relying solely on self-report measures, students collect saliva from underneath the tongue using a pipette. The saliva from the pipette is dispensed it into a small dish for weighing. Prior to conducting the demonstration, the instructor should make sure that no student will experience an adverse reaction to sugar. Details of the demonstration can be found in Abramson et al. (2011).

Prey Preferences in Snakes

The previous exercises illustrated in this paper involve some aspect of learning. In this classroom exercise, prey preferences in snakes are studied to illustrate the relationship between predator and prey and the importance of sign stimuli in attraction. The exercise is also useful for teaching students the importance of gathering and analyzing quantitative data.

Snakes, like invertebrates, have much to recommend them for classroom investigation. They are easily captured in the field or obtained from the same biological supply houses used to purchase invertebrates. Snakes can be handled easily and are relatively inexpensive to house and maintain. Snakes can be housed, for example, in plastic containers. Much information is also available on their natural history and behavior.

Snakes rely on chemical cues to such an extent that the tongue is protruded to gather such cues. Prey preferences are easily observed and measured by recording changes in tongue flick rates. The greater the preference, the more tongue flicks. If greatly excited by the presence of a chemical stimulus, the snake may attack the source of the stimulus. The exercise can be done with a single species but is more interesting when several different species are used. Garter snakes, water snakes, rat snakes, kingsnakes, ringneck snakes, hognose snakes, and redbelly snakes can all be used.

The exercise takes advantage of the fact that snakes consume a wide range of vertebrates and invertebrate prey. Prey extracts are prepared and presented to the subject on cotton swabs. The experiment begins by placing a snake in a test chamber. The chamber can be a glass aquarium or plastic storage container. After a 15-min adaptation period, the tip of the cotton swab is saturated with the prey extract and placed within 2 cm of the snout. The extract is presented for one minute, and the number of tongue flicks is recorded. Various prey extracts can be presented to the same snake.

This exercise has been used for several years without incident. The vast majority of our students enjoyed working with the snakes. There are some students, however, who are afraid of snakes in much the same way that the occasional student is afraid of insects. In such cases, we encouraged the student to try the exercise. Often, such encouragement works – especially when the instructor works individually with the student. If encouragement and individual attention do not work, the student can assist in data collection and making extracts or simply not participate.

It should be kept in mind that snakes bite, constrict, and can release pungent secretions. Therefore, when handling snakes, students should wear protective gloves. To reduce the possibility of a student being bitten, the instructor, rather than the student, can transfer the snakes from the home container to the test chambers. The student will never touch the snake yet can observe behavior, present stimuli, and record data. If a single species is used, the garter snake makes an excellent choice because of its wide availability. When the demonstration is over, the snakes are returned to the laboratory colony. We do not release them into the wild because of personal preference – we enjoy working with them. Although we have not done so, if the snakes must be removed from a university setting, a pet store might take the animals as a donation or perhaps purchase them.

Details of the procedure, extract formulations, discussion questions, and suggested snake species and their prey are available in Place and Abramson (2006). For readers interested in modifying the demonstration for studies of snake learning, suggestions are available in Abramson and Place (2008).

Project Petscope

Project Petscope turns pet stores into animal behavior research centers (Abramson, Huss, et al., 1999; Abramson, Wallisch, et al., 1999). The rationale behind the development of this project was to provide animal behavior experiences to students not located near zoos. Pet stores carry a range of species appropriate for comparative studies, are ideal for ethological studies of various species including humans, and do not drain departmental resources.

For the Petscope project to be effective, it is essential that a good working relationship exists between the instructor and the pet store owner/manager. Permission must be sought before students begin any project, and issues related to the possibility of students handling some of the animals be addressed. Other issues to be worked out include creating observation stations in front of the animal enclosures, establishing observation times that do not interfere with normal business operations, availability of first aid, the extent to which pet store staff can assist students, and the possibility of students manipulating the animals' environment either by feeding or adding enrichment devices. Obtaining a list from the pet store of animals that students can work with will help the instructor design projects.

There are many projects that can be conducted at pet stores. One exercise is to have students create "Petscope cards." These cards are similar to the old Time-Life animal cards so familiar to an earlier generation. The cards contain both a library research component and an observational component. Once the instructor decides on the species, students obtain information on that species including classification (class, order, family, genus, and species), behavior, related species, range, physiology, and anatomy. A useful addition is to include local professors and other individuals who have worked with the species. This part of the card would include citations and research summaries.

The observation portion of the card contains information gathered by the students. This information can include anatomical descriptions such as shape, color, length, feeding strategies, growth rate, and popularity. A sample ethogram designed to study play behavior of captive elephants is available as an example (Abramson & Carden, 1998).

Once the cards are completed, comparisons of the cards are made. Class discussions can be focused on importance and difficulty of classification and the role of evolution and ecology in shaping biological, anatomical, and behavioral processes.

Correspondence in the Classroom

Correspondence in the classroom is an activity where students interested in animal behavior write to scientists in order to increase their understanding of the field. The point of the activity is to get students to open a dialogue with an individual scientist whose work excites them. The letter-writing task can be presented to students as a structured activity in which a series of questions are asked, or it can be presented as a more involved and creative activity where students develop their own mini-survey. The letter writing task is suitable as an individual or group activity.

We suggest that a set of core questions be asked that serve as a comparison and as a stimulus for discussion. These questions include: What is your main area of focus? What do you consider your most significant contribution? Whom do you consider to be your greatest influence? What is your prediction for the field? Would you recommend that I enter this field? What are the job prospects? Details, sample survey questions, and variations are provided in Abramson and Hershey (1999).

Additional Material Published Since 2011

Since 2011, our laboratory continues to publish teaching related articles relevant to comparative psychology. The goal in creating and publishing these exercises is to increase interest in comparative psychology either as a formal course or as an independent study project. Comparative psychology continues to decline as demonstrated by few courses offered, scant and uninspiring coverage in introductory psychology textbooks, and declining student interest (Abramson, 2015a; Abramson, 2015b; Abramson, 2018). One way to combat the extinction of our field is to develop teaching activities. Our new activities are in several different areas, including the adaptation of a low-cost experimental controller, development of a mathematical model of learning, the history and philosophy of comparative psychology, "thought" papers, and learning demonstrations.

Adapting the Propeller Microcontroller For Comparative Research

The propeller (Parallax, Inc.; Rocklin, California) is a low-cost microcomputer that we have adapted to research and teaching. By using the propeller, a comparative and teaching laboratory can literally be placed in the palm of one's hand. In contrast to controllers costing thousands of dollars, a controller appropriate for teaching and research can be developed for approximately $150.00 USD. Information on the controller can be found in Varnon and Abramson (2013) and in a detailed monograph (Varnon & Abramson, 2018). Programs are also freely available that replicate the classic operant conditioning and classical conditioning teaching laboratories so familiar to a previous generation of students (http://cavarnon.com/experiment-controller).

Recording Infrasound

We have used the microcontroller to control a wide range of behavioral experiments, and programs are available to enable students to explore the classic teaching demonstrations. Most recently, we have used the controller to record infrasound from elephants (Bergren et al., 2019). Students can use the device to record infrasound at zoos as an independent project.

Mathematical Model of the Learning Process

For a number of years, our laboratory has collaborated with Dr. Igor Stepanov of the Institute for Experimental Medicine in St. Petersburg, Russia (Pavlov's institute), to develop a mathematical model of the learning process. The model is based on the application of the transfer function of the first order linear system in response to a stepwise input. Among other applications, we have used this model to detect subspecies differences in the maze performance of rodents (Stepanov & Abramson, 2008), pesticide effects in honey bees (De Stefano et al., 2014), and interpreting results of the California Verbal Learning scale in individuals suffering from Type 2 diabetes mellitus (Stepanov et al., 2011).

Most recently, we have begun to incorporate the model into our comparative psychology course. We have done this by asking students to use a product that purports to influence memory and then to use the model to determine if it actually does so (Abramson et al., 2019). The model has also been used for class demonstrations involving honey bee and human learning. Moreover, there is something to be said for having students exposed to mathematical models. Such models have much to recommend them including the ability of summarizing research findings and directing research.

History Projects

Our laboratory has developed a number of history related projects, such as using Google maps to visit historical sites in comparative psychology (Stevison et al., 2010) and to create historical calendars and baseball-like trading cards (Abramson et al., 2009).

One of our more popular history of comparative psychology projects is the development of a time-line highlighting the contributions of several comparative psychologists (https://comparativepsych.wixsite.com/mysite). An offshoot of this project has students develop comparative psychology stamps (Abramson & Long, 2012). These stamps are legal in the United States and QR codes direct the user to a website highlighting the contributions of the comparative psychologist of interest. The website can be found at https://comparativestamps.wixsite.com/comparativestamps. Unfortunately, the company that makes the stamps – Zazzle – no longer offers do-it-yourself postage stamps. However, the United States Postal Service has this option.

One of the most important websites that my students have helped develop is the site devoted to Dr. Charles H. Turner (1867-1923). Dr. Turner was an African American comparative and biopsychologist about whom I have extensively written (e.g., Abramson, 2009). Despite his many contributions, he is seldom discussed. The website is https://psychology.okstate.edu/museum/turner/turnerbio.html.

In addition to the creation of websites devoted to comparative psychology, our laboratory has spent time collaborating with other scientists to write articles highlighting the contributions of philosophers to comparative psychology. Our first attempt was to highlight the importance of an Aristotelean-Thomistic approach (Brown & Abramson, 2019). Another article on the contributions of Arthur Schopenhauer is under review.

Testing Of Consumer Products

Another exercise we have developed teaches students how to use principles of comparative psychology to evaluate consumer projects (Kieson & Abramson, 2015). The rationale behind this exercise is two-fold. First, we wanted to develop an exercise to show students that comparative psychology is applicable to their daily lives. Many of the exercises challenge them to compare the effectiveness of, for example, pet products. How does a student know which pet food their animal prefers? The answer is to do a comparative experiment. In the course of doing the experiment, students learn how to design a choice experiment, the importance of subject variables, data analysis, and graphing – among many other skills. One of the more interesting exercises is for students to test the effectiveness of electronic insect/rodent repellents. These repellents purport to be effective by manipulating sound and/or disruptions in magnetic fields. If the student lives in a home with a backyard, a feeding station for insects can be established and once established, the electronic repellent is activated and the results recorded. If the student lives in an apartment, insects can be collected and placed inside of a cage. Secondly, we wanted to develop an exercise that can be used for science fairs and for students in middle and high school. The goal of this exercise is for students to think comparatively.

New Learning Exercises: Human And Planarian Learning

In addition to the exercises discussed in the opening of this article, we have developed a maze exercise and a new planarian exercise for the study of learning. The maze exercise uses the wooden labyrinth to investigate, for example, gender differences in performance and, with the addition of physiological measures, changes in heart rate as the student negotiates the labyrinth (Baskin et al., 2013). We have also found that the labyrinth is an excellent tool to generate locus of control in the classroom (Riley et al., 2017).

The planarian exercise is rather unique. In contrast to the many classical conditioning/alpha conditioning/nonassociative learning demonstrations, this exercise uses shaping to train planarians to travel longer and longer distances to find water. We were able to train the animals to travel approximately 10 mm to find water. Animals not specifically trained are unable to find the water (Chicas-Mosier & Abramson, 2015).

Extrasensory Perception (ESP)

One of the more esoteric exercises we have developed is the use of comparative psychology to test telekinesis (Somers et al., 2020). While the phenomena of telekinesis is illusive at best, what is not in dispute is that it captures the imagination of students. We use this imagination to stimulate a student's interest in comparative psychology. The exercise uses a "levels" approach, in which telekinesis is used to influence the movement of single cell organisms and, if an effect is found, to move on to more multicellular organisms. If an effect is found, than genetic and biochemical tools can be used to determine the molecular basis of ESP phenomena. While, we have not found telekinesis effects, the student discussions are enthusiastic, and this enthusiasm has been used to encourage students to learn more about comparative psychology.

Increasing Comparative Psychology Around The World

Another activity to increase interest in comparative psychology is to ask students how comparative psychology might be effective in developing countries. Unlike the other activities I have outlined, this activity requires students to think about comparative psychology on a global scale. Students select a country (or region), learn about that country and then determine how aspects of comparative psychology can be applied to that country (or region). For example, students will discover that many developing countries are not familiar with therapeutic horse riding programs and/or the use of service animals. They will also discover that there are few, if any, comparative psychology courses offered at the major universities in that country. For many developing countries, such an article might be the first time educators have heard about the many benefits that comparative psychology offers. For those students who put in the effort, there is the possibility of coauthoring a publication that highlights the benefits of comparative psychology in that particular country. This exercise has produced several publications in country-specific journals (Abramson & Kitching, 2018; Abramson & Radi, 2019; Stauch et al., 2019) and has led to some fruitful discussions about establishing comparative programs in countries such as Egypt and South Africa.

Videos

Our laboratory has developed several videos highlighting some of our research. One of the better videos shows a rattlesnake trained to press a lever to turn off a heat lamp. Another interesting video highlights the importance of comparative psychology. The videos are:

Operant Conditioning in Goldfish (2011)
https://youtu.be/FsonPCR6EZg

Advice from Professors in Psychology Programs: Comparative Psychology (2014)
http://www.drkit.org/psychology/

Operant Conditioning in Rattlesnakes (2015)
https://youtu.be/sT996Xz-O28

Water Searching Behavior in Planarians (2015)
https://youtu.be/OtZRAOqBdsU

What is Comparative Psychology? (2015)
https://youtu.be/klzmIGITntE

Operant Conditioning in Horses (2015)
https://youtu.be/26zKz0nbqNw

Discussion

The overriding rationale behind each of the activities is to reverse the decline in comparative psychology. They have all been classroom tested and are effective in generating student interest. For instructors with limited access to the standard laboratory rat, invertebrates make excellent subjects to demonstrate hands-on conditioning principles. Habituation, sensitization, classical conditioning, and instrumental/operant conditioning can all be demonstrated with invertebrates. The planarian instrumental conditioning activity in which animals are trained to seek out water is especially interesting for students. If invertebrates are somehow prohibitive, salivary classical conditioning in humans is a good alternative. Snakes can used to demonstrate principles of learning as well as predator-prey interactions. The labyrinth exercise is also an excellent activity in generating student interest.

If it is not possible to use animals of any type in the instructor's home institution, Project Petscope may provide an alternative. Pet stores contain many species suitable for ethological investigations including pet-human interactions. In addition to observational research, students learn about the importance of comparative investigations.

Correspondence in the classroom, while not an active animal learning exercise, is important because it can help stimulate some students to become more interested in learning and behavior. Such an interest might lead an instructor to try some of the activities summarized in this article. Since the publication of this exercise in 1999, I have received over 200 letters from students asking about comparative psychology.

Another way that we have tried to encourage students to enter comparative psychology is the "psychmobile." The psychmobile is essentially a personal truck filled with many of the exercises discussed in this paper. The psychmobile visits schools at all levels of the educational system and science events such as the EPSCoR Women in Science program. The Laboratory of Comparative Psychology and Behavioral Biology also serves as a clearing house to disseminate these exercises and offer advice on how to establish comparative psychology programs. The overriding goal is to increase interest in comparative psychology. Graduate students (and advanced undergraduates) associated with the laboratory are trained to develop their own psychmobile programs with the expectation that they will encourage other students (and faculty) to appreciate what comparative psychology has to offer.

Finally, one of the stumbling blocks in using animals in the classroom is a lack of expertise in the use of the activities. The author will gladly to assist any faculty member or student in implementing the activities discussed in this article. As mentioned above, almost all of the activities summarized in this paper have been published previously if additional details are needed.

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