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Recommended Citation

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Exploring the relationship between education
and attitudes about animals: A case study of the
honeybee.

BY

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A thesis submitted in fulfillment of the requirements of the
degree of

Master's of Science in Animal Studies

AT

Humane Society University

2015

Introduction

Bees and men have been acquainted with each other during the whole of human history (Preston, 2006, p. 8). Because of its immensely long history in association with man, the bee has been more carefully observed, more celebrated, more storied and mythologized, and more feared than most other animals (Preston, 2006, p. 8). It is notable that small creatures can have power disproportionate to their size. Mosquitoes can make grown men run, as can spiders and bees (Lauck, 1998, p. 232).

Whenever we confront a living creature, in actuality or by reflection, that living creature is accompanied by an inseparable image of the essence of that being. That essence is made up of, or influenced by, our preexisting individual, cultural, and societal conditioning. Thus, the actual biological and behavioral traits of the living creature become transformed into an idea or construct that may not reflect the empirical reality of that living creature.

Insect enemies, or pests, are, in reality, nothing more than small creatures with an appetite or form of which we disapprove or find displeasing. Maybe they cost us money or bring discomfort or inconvenience. Or perhaps this pest simply is undesirable because it is not considered valuable? Is it possible that our attitude, and social construction of the honeybee as a pest, colors what we see when we look at the honeybee?

Beekeepers view bees as interesting, cute, fascinating, lots of fun, great family project, and working hard to pollinate, as well as contributing good, healthful honey for family and friends (Harman, 2011, p. 65). During an informal discussion with family, the author was told

that “bees are bugs that fly and sting and should be swatted.” But unprovoked, honeybees usually go about their business unnoticed (Hubbell, 1988, p. 76). People usually commit the first offensive move by swinging at the insects (Hubbell, 1988, p. 77). Instead of swinging we could step back and take a closer look at the behavior of the honeybee. Perhaps a better measure of this insect comes into view when we explore the honeybees’ factory-like world that some might describe as a complex, even political society (Kluger, 2014, p. 4).

The psychological connections between humans and insects are tantalizing and complex. Through evolutionary associations, individual experiences, and cultural representations, insects have deeply infested our minds. They frighten us at times, but insects can also mesmerize and enchant us. Whatever the case, few of us are ambivalent in the presence of wasps, cockroaches, spiders, maggots, crickets or butterflies. They arouse terror, nausea, fascination – but rarely, if ever, indifference (Lockwood, 2013, inner front flap of book cover).

The honeybee is no exception, so one is left to wonder: Will an exploration of the natural history of the honeybee affect attitudes about the honeybee? Exploring the natural history of the honeybee may not create a fondness for the insect but one might discover along the way that the honeybee is a creature worth getting to know.

Literature Review

Overview

Animals have occupied a central place in the physical and emotional lives of children across cultures, as is evident in a gamut of animal-related products, places, and hobbies that are of interest to children such as books, stickers, toys and games (Pattnaik, 2004, p. 95). As adults, attitudes toward animals are, for the most part, not a conscious part of American's day-to-day thinking but reflect customary relationships and practices (Kendall, Lobao and Sharp, 2006, p. 401). When adults do think about invertebrates, they are mostly associated with fear, antipathy, and aversion (Ballouard, et al, 2013, p. 95). Adults also tend to avoid invertebrates because they are small and behaviorally and morphologically unfamiliar to them (Prokop, Prokop and Tunnicliffe, 2008, p. 445).

Even though they constitute 99% of all species on earth, invertebrates are not sufficiently understood or highly valued by people (Mather and Anderson, 2007, p. 119). Outside the field of entomology and the big business of agriculture, the popular culture's jaded view of bees focuses on their ability to sting us. This can lead to action in regard to animals that is performed by rote and subject to little introspection, i.e., honeybee seen simply as pest (Kendall, Lobao and Sharp, 2006, p. 404). As a result, it is not uncommon to see a child stomping insects on a sidewalk (Rule and Zhbanova, 2012, p. 223).

The fact that bees can sting plugs them into an unimaginative track in mainstream society where other creatures with the potential to harm us also reside (Lauck, 1998, p. 171). In her

book *Bugs in the System: Insects and Their Impact on Human Affairs*, author May Berenbaum suggests:

The vast majority of people consider it a high priority to minimize the extent of their interactions with the insect world. Homes are sealed, sprayed, and kept meticulously clean so as to reduce the probability that they will be invaded by insects. Similarly, bodies are bathed, hair is shampooed, and clothing regularly washed in order to eliminate any unwanted contact with six-legged life forms. In the overwhelmingly vast majority of daily conversations, insects are conspicuous in their absence. On those rare conversations in which insects feature prominently, they are generally carried out in guarded tones, often with a touch of embarrassment. After all, no one likes to admit, even as close personal friends, to being stung, bitten, infested, invaded, or otherwise bested by the loathsome insects that manage to get around the safeguards (Berenbaum, 1995, p. xi).

Attitudes Toward Animals

It has long been known that humans find some animals more appealing than others. Pandas, lions, and other “charismatic megafauna” are considered pleasing while snakes, spiders, and most other invertebrates are not (Stokes, 2007, p. 361). It should come as no surprise then that the great majority of Americans reveal little appreciation of “lower” life-forms but tend to restrict their appreciation to larger vertebrates (Kellert and Wilson, 1993, p. 64).

Attitudes toward animals are significant. Children who throw stones at birds and children who feed birds are both responding to what may be an innate tendency to focus their attention on living things. The choice of behavior used to engage the animal in the interaction is different and it is a learned behavior (Kellert and Wilson, 1993, p. 175). For example, when toddlers are shown snakes and spiders on computer screens, they react with interest, particularly to the fluid way the snake moves. What they don't show is any fear. But show the same toddler a picture of an adult screaming at the sight of a snake, and they quickly learn to feel the same fear (Kluger, 2014, pp. 108-109).

It is difficult to study attitudes about animals and animal well-being. Most Americans do not question their customary relationships in the use of animals nor seek out information about animals' quality of life (Kendall, Lobao and Sharp, 2006, p. 401).

Nearly 67% of an urban public sample considered that the general attitudes they hold about animals were not too important or only somewhat important compared to the other concerns in their life. Relatively high levels of ambivalence were apparent within individuals with regard to their attitudes toward animals. One might expect this to give rise to cognitive dissonance, so that individuals are constrained to resolve this issue one way or the other. That this does not happen is probably attributable to the relative unimportance of their animal values among the urban public (Hills, 1993, p. 124).

Whether people want to think about it or not, it is important to engender greater appreciation and concern among the general public toward the spineless kingdom. Invertebrates

perform vital services such as pollination, seed dispersal, and nutrient recycling (Black, Shepard and Allen, 2001, p. 42). In order to accomplish this appreciation and concern, it will be necessary to achieve a better understanding of the basis for hostile attitudes toward invertebrates, especially arthropods (Kellert, 1993, p. 851). Possible factors associated with the motivational basis for hostile attitudes toward invertebrates include: an innate learning disposition, the association of many invertebrates with disease and agricultural damage, differences in ecological scale between humans and invertebrates, the multiplicity of invertebrates, the apparent lack of a sense of identity and consciousness among invertebrates, the presumption of mindlessness among invertebrates, and the radical autonomy of invertebrates from human control (Kellert, 1993, p. 845).

In his book *The Animal Mind: What they're thinking and feeling, and how to understand them*, author Jeffrey Kluger says that people may admire some animals but pity them as well because of their ignorance, their inconsequence, and their brief, savage lives (Kluger, 2014, p. 4). He also suggests that we have certain uses in mind for animals and that they don't much mind because they don't much notice, and to the extent that they do, their suffering is as crude and fleeting as their entire lives (Kluger, 2014, p. 4). Take the honeybee, for example. Beekeepers have found a clever way to exploit the bees' drive to fill their nests with honey. By housing their colonies in hives that provide vastly more nesting space than is needed by bees living in nature, beekeepers induce their colonies to amass astonishing amounts of honey, sometimes more than 220 pounds of honey per hive in a summer (Seeley, 2010, p. 31). Beekeepers have focused on devising housing arrangements for bees that serve human purposes and have largely ignored what the bees' themselves seek in a home. For example, hives are located at ground level, which

is convenient for humans but dangerous for bees. Honeybee colonies living low to the ground are easily found and attacked by destructive predators, such as bears (Seeley, 2010, p. 44).

Future improvements in the welfare of animals depend crucially on the attitudes and beliefs of society (Paul and Serpell, 1993, p. 335).

Creating More Positive Attitudes Toward Animals Through Education

Existing knowledge and social agreements about meaning not only limit how new experiences are interpreted, but also influence what is perceived in any situation (Hewson, 1992, p. 7). Beliefs are personal, subjective, often unprovable and illogical. They dictate what we think is possible. What we see may depend upon what we believe can be seen. Shifts occur only after people come to believe that something is possible (Wise, 2002, p. 22). In an attempt to create these shifts about honeybees, for example, the author will discuss a practice concerning honeybees that some would describe as democracy. In his book *Honeybee Democracy*, author Thomas Seeley describes important similarities between the direct democracies of honeybees and human beings:

1. The control of the group's actions is distributed among many of its members rather than concentrated in a few leaders.
2. By virtue of having numerous individuals examining a problem and presenting possible solutions to it, both a bee swarm and town meeting are much more capable than any solitary bee or single person in coming up with a broad range of alternative

options. And the broader this range of options, the more likely it will include the one best option.

3. In both bee swarms and town meetings, the way the group selects its course of future action is by staging an open competition among the proposed alternatives (Seeley, 2010, pp. 74-75).

It has consistently been shown that species is an important determinant of belief in animal mind, and it seems that the greater the similarity between a particular species and humans, the more likely people are to attribute mental capacities to the species (Morris, Knight and Lesley, 2012, p. 213). For this reason, and again, in an attempt to create these shifts about honeybees, honeybee democracy will be an important topic.

A preconceived idea or prejudice is called a preconception. If we are placed in an environment where we are encouraged to recognize, confront and challenge our preconceptions and then work toward resolving them, we are headed in the direction of conceptual change. During conceptual change, a learner moves from an explicit discovery of his own existing knowledge and views, through a set of targeted challenges and opportunities, to a new level of understanding that is reinforced through application and extension of ideas and skills. Ultimately, the learner comes up with his own, new ideas to question and test. Conceptual change is like repairing misconceptions. Because learning involves changing a person's conceptions in addition to adding new knowledge to what is already there (Hewson, 1992, p. 8) perhaps an exploration of the natural history of the honeybee will affect attitudes toward the honeybee.

Furthermore, the purpose of conceptual change teaching of science is not to force students to surrender their alternative concepts to the teacher's or scientist's conceptions but, rather, to help students both form the habit of challenging one idea with another, and develop appropriate strategies for having alternative conceptions compete with one another for acceptance (Hewson, 1992, p. 9). Based on prior conceptions and attitudes toward animals, this research will attempt to determine if an exploration of the natural history of the honeybee will affect attitudes about honeybees.

Prokop and Tunnicliffe (2008, p. 89) suggest that attitudes to less popular animals, like the honeybee, can be highly resistant to change so "it's a relief to know that we don't have to create the desire to like insects; we need only offer ways to explore them" (Lauck, 1998, p. 277). In their study, Prokop and Tunnicliff administered a questionnaire about two unpopular animals, bats and spiders, to a group of school children aged 10 - 16. This study revealed that the school children lacked knowledge of basic facts of these less popular animals and were unable to correctly reject alternative conceptions or myths about both of them. Furthermore, because many unpopular animals are emblazoned with various myths, a correlation existed between alternative conceptions or myths and attitudes toward the unpopular animals. More alternative conceptions resulted in more negative attitudes (Prokop and Tunnicliffe, 2008, p. 87). Because alternative conceptions about unpopular animals showed a significant relationship with children's negativistic attitudes toward these animals, the authors suggest that designing projects focused on less popular animals, and one that encompasses biological facts about those animals, may contribute to a positive attitude development toward such animals, particularly in older

children, a group whose attitudes toward animals in general decrease (Prokop and Tunnicliffe, 2008, p. 94).

Because of Prokop and Tunnicliffe's research, it is important to conduct research that challenges alternative conceptions and questions attitudes toward animals, particularly invertebrates since they are often labeled as unpopular. Will an exploration of the natural history of the honeybee affect attitudes about honeybees? As adults we often realize that our attitudes and behaviors toward animals have been learned for the most part. We may have learned early on as a child that some lives are lesser than others. How many people believe that a spider web can be torn down, a mouse trapped, a frog dissected or a honeybee swatted? Generally, a new conception is unlikely to displace an old one unless the old one encounters difficulties, and a new intelligible and initially plausible conception is available that resolves these difficulties. That is, the individual must first view an existing conception with some dissatisfaction before he will seriously consider a new one (Posner, et al, 1982, p. 220). In the case of honeybees, there is much information about their natural behaviors that could affect attitudes and even support the notion that honeybees are sentient creatures. For example, Kluger (2014, p. 28) states that no matter how sophisticated the prides and pods of large, comparatively intelligent animals become, there is nothing like the social systems insects build, particularly bees and ants. And if the notion that honeybees are sentient creatures (belief in animal mind) can be supported then this belief in animal mind may also correlate positively with concern for animal welfare (Morris, Knight and Lesley, 2012, p. 211).

Empirical Studies

There are several studies that focus on the education of children about animals. An early study, conducted by Fitzgerald in 1981, examined the relationship between humane education and attitudes toward animals. In this study, a variety of school based interventions were presented to sixteen fifth and sixth grade classrooms. Each classroom received one of four interventions: 1. a teacher presented four humane education lessons over a two-month period (once every two weeks); 2. one intensive humane education lesson taught by a teacher in a single class session; 3. reading humane education material without any direct instruction; and 4. The control group, where the children did not receive any humane education. All classrooms were pre- and posttested using the Fireman Tests. This is a test whereby children are asked to select, from a list of inanimate possessions and pets, which they would attempt to rescue from a burning home. This study revealed that those children who had undergone one intensive humane education lesson taught by a teacher in a single class session displayed more humane attitudes toward animals than the three other conditions studied. Fitzgerald concluded that one focused classroom presentation could have a positive impact on children's humane attitudes (Ascione, 1992, p. 178).

In 1987, Hein conducted research on the effectiveness of a school based humane education program. His study consisted of a second grade class where a single humane education program was presented and third, fourth and fifth grades, where three humane education programs were presented. All presentations consisted of fewer than three hours of total instruction. Compared to a no-intervention control group, Hein found that classrooms receiving humane education in the second, third, and fourth grades demonstrated significant

increases in humane attitudes (Ascione, 1992, p. 179). No effects were obtained for fifth graders. Hein cautions that the second grade scores of an increase in humane attitudes toward animals could have been the result of large increases in humane attitudes for a small number of children and that more humane attitudes for the third and fourth graders were restricted to those items that had been specifically taught during the humane education presentation (Ascione, 1992, p. 179). As a result of his research, Hein recommended that substantially more intensive humane education be presented to children in order to effect significant changes in their attitudes (Ascione, 1992, p. 179).

In a later study conducted in 1992, Ascione decided to do just that when he assessed the impact of a year-long humane education program on children's attitudes toward animals. Using a pre- and posttest design, Ascione measured attitudes toward the humane treatment of animals and empathy toward humans. This research was focused on the development of humane attitudes in school-aged children and the effects of intervention effects designed to enhance such attitudes (Ascione, 1992, p. 177). The study population consisted of 813 first, second, fourth, and fifth grade students, grouped by classroom, from two Northern Utah school districts. The students comprised thirty-two classrooms. Sixteen classrooms were randomly assigned to an experimental group and sixteen classrooms were randomly assigned to the control group. Each set of sixteen classrooms contained an equal amount of first, second, fourth, and fifth grade classrooms. A minimum of forty hours of humane education during one school year based on grade was presented by each classroom's teacher. All teachers indicated that they had no prior experience with the humane education curriculum guides that were to be used during the humane education presentations.

Ascione found that the humane education program enhanced the animal related attitudes of the children differentially, depending on grade level (Ascione, 1992, p. 187). Qualitative analysis suggested that greater enhancement of humane attitudes occurred for first grade experimental classrooms over first grade control classrooms. Second grade classrooms revealed no differences in enhanced attitudes. Similar to the first grade classroom findings, fourth grade experimental classrooms demonstrated a greater enhancement of humane attitudes over their control group counterpart. No difference was found for the fifth grade classrooms. One very important result of this study is that there was a clear generalization effect from animal-related attitudes to human-related empathy for fourth grade children in the experimental classrooms. This result lends support to the idea that children's compassion toward animals is related to their empathy toward humans (Ascione, 1992, p. 188).

In a follow up study, Ascione and Weber were able to locate and retest 80% of Ascione's original fourth grade study population and administer questionnaires one year after the end of his initial study. They found that the original fourth grade experimental group, now in fifth grade, had greater humane attitudes than the control group at not only the initial Year 1 posttesting but also at the Year 2 follow up (Ascione and Weber, 1996, p. 191). This study provided evidence that instruction for only one year led to maintenance of effects one year later. Humane education in the classroom can be an effective way to increase children's sensitivity toward other living beings (Ascione and Weber, 1996, p. 188). At both Year 1 and Year 2 posttesting, the enhancement of attitudes toward animals generalized to human-directed empathy. This was the first empirical study demonstrating that a humane education intervention can enhance children's attitudes toward animals, that intervention effects are maintained at least one year later, and that

there is generalization from humane attitudes to human-directed empathy (Ascione and Weber, 1996, p. 192).

In the Ascione study, humane attitudes were taught to the children by their familiar classroom teacher. It is possible that the information was conveyed more effectively than would be possible with an unfamiliar instructor or researcher (Ascione and Weber, 1996, pp. 192-193). One implication of that research for the current author is that every participant exploring the natural history of the honeybee and their attitude toward honeybees is familiar with the author conducting the exploration. One limitation of Ascione's research is that increased societal awareness of the importance of humane attitudes over a period of time of one year may have played a role in the maintenance of effects (Ascione and Weber, 1996, p. 193).

A 2009 study by Arbour, Signal and Taylor evaluated the efficacy of a specifically designed literature based humane education program in terms of changes it might lead to in both the treatment of animals and human-directed empathy. Thirty-seven fourth grade students (twenty-three in the experimental group and fourteen in the control group) from two separate classes within a representative state-run school were given a two part pre –and posttest questionnaire. One part contained basic demographic questions while the second part consisted of self-report measures of both humane behavior toward animals and self-report measures designed to assess human-directed empathetic tendencies. The experimental group received two one-hour humane education lessons per week for four consecutive weeks.

Comparisons with an age-matched control group indicated that the four-week humane education program resulted in an increase in measures of empathy and treatment of animals,

although only the increase in empathy levels was significant (Arbour, Signal and Taylor, 2009, p. 136). Furthermore, although both empathy and treatment of animal's scores increased following the intervention, only the empathy increase in boys was actually significant. Why this is so is unclear but the authors suspect it might be due to the fact that males tend to have lower empathy levels than females, therefore, they had more room to move (Arbour, Signal and Taylor, 2009, p. 144). The authors also determined that a literature based humane education program may be an effective way to increase both appropriate attitudes toward animals and human-directed empathy (Arbour, Signal and Taylor, 2009, p. 144). Although this study goes some way to suggest that brief, literature-only interventions can have a measurable effect on empathy levels and attitudes toward animals, it was beyond the scope of the study to investigate the long-term effect of such interventions (Arbour, Signal and Taylor, 2009, p. 146).

A ten week-long animal welfare education program that covered ten one-hour animal welfare topics served as the intervention for the six-year-old children in the experimental group in a 2010 study by Aguirre and Orihuela. Separated by morning vs. afternoon "shifts," 276 students in six rural public schools in the State of Morelos, Mexico, comprised the study population. The animal welfare course incorporated a variety of teaching techniques that included: role playing, decision making, creative writing and research activities ranging in topics from animal well-being, choosing a pet, homeless animals, handling and caring of farm animals, myths and legends regarding dangerous animals or animals with bad reputations and problems and solutions that relate to how animals should be treated. One week before the animal welfare program began, a pre-test evaluation was given to all students (both experimental and control group) to determine the degree of initial animal welfare knowledge. Twelve weeks later, which was one week after the end of the ten week intervention, a post-test (utilizing the same

questionnaire as the pre-test), was given to all students.

The results of the pre-test were similar between the experimental and control groups. Nevertheless, the number of correct answers in the experimental group during the posttest reflected more children's knowledge of animal welfare than the control group (Aguirre and Orihuela, 2010, p. 29). The authors actually commented that "the increase in animal welfare knowledge between the pre-test and posttest of the experimental group for the animal welfare questions was remarkable" (Aguirre and Orihuela, 2010, p. 29). These results contribute to the growing literature on the relationship between children and animals, demonstrating that a ten hour course during one semester applied to six-year-old children can increase concepts about animal welfare, and that first grade children living in moderate economic conditions can assimilate animal welfare concepts (Aguirre and Orihuela, 2010, p. 30). Furthermore, these results indicate that children can be persuaded towards animal welfare.

A 2012 study conducted by Rule and Zhbanova used a humane education program to enlighten twenty-six first and second grade children in the natural history of eight generally disliked animals (bat, skunk, snake, mouse, spider, centipede, cockroach, and mosquito), their characteristics and behaviors, in an effort to help the children recognize their adaptations and contributions to the environment. There were sixteen students in a control group. Six weekly hour-long lessons were given to the experimental group which introduced appealing images of the disliked animals, along with facts and poems that presented their lifestyles. The authors hoped this knowledge would lead to greater appreciation and respect for these generally disliked creatures. Identical pretest and posttest questionnaires were administered to both the experimental and control group, exactly three months apart.

The first four lessons presented to the students in the experimental group began with the researcher telling students the names of two animals about to be studied and asking students to tell what they knew about the animals. The researchers then introduced posters of the two animals under study that featured ten facts about the creatures' lifestyle. Researchers read this information out loud to the students, who were then asked to discuss the details of what they had just heard and to make inferences regarding the creature on the poster. Discussion of the animals' lifestyles ensued with connections being made to students' previous knowledge of the creatures. The fifth lesson began with a couple of demonstration puppet plays where a disliked animal conversed with a human puppet. The human puppet listed some reasons as to why he did not like the animal. The disliked animal puppet offered explanations as to how these characteristics and behaviors helped the animal to survive or adapt to its environment. Following the play, small groups of students were formed. Each group had to write an original play featuring their choice of one of the eight disliked animals. Each group was required to tell facts about that animal in their dialog. During the sixth and final lesson, student took turns presenting their plays to the class. Class members remarked on the strength of each dramatization (Rule and Zhbanova, 2012, p. 225).

During both the pre-test and posttest, both groups of students were asked to rate their liking for the eight targeted disliked animals. Four generally-appreciated animals (dog, cat, goldfish, and butterfly) not discussed during the intervention were interspersed in the questionnaires and also rated. Results showed significant differences for the experimental group for all animals considered together and for the targeted animals as a group. The control group did not exhibit these differences (Rule and Zhbanova, 2012, p. 228).

Overall, for the experimental group, the mean of combined ratings of all animals increased significantly, this being also true for the targeted animals considered as a group. In contrast, the control group exhibited a trend of disliking the animals more on the posttest, although this change did not reach a level of statistical significance. For both the experimental group and the control group, ratings of the non-targeted animals (dog, cat, goldfish, and butterfly) did not change significantly from pretest to posttest when considered individually or as a whole group. These animals, rated by students but not addressed in the intervention lessons, served as a type of control showing that the movement seen on the targeted animals was caused by the lesson intervention. Therefore, this study provides empirical evidence that learning about the natural history of an animal can change primary students' liking for the animals (Rule and Zhbanova, 2012, p. 228).

The authors state that the cockroach, spider, centipede and mosquito received the lowest initial ratings on the pretest. It should be noted that on the posttest, the experimental group showed an increased liking for all of the targeted animals except mosquitoes, which revealed only a slight change in increased liking. The authors express the fact that the cockroach, spider, centipede and mosquito are small, biologically distant from humans or typical human pets, and considered dangerous because of bites or possible spread of disease (Rule and Zhbanova, 2012, p. 229).

The implication for this author's current study is that the honeybee can be considered dangerous because it stings. But although "small, possibly dangerous biting animals" scored lowest on ratings, their likeness scores did reveal an increase after the intervention. Humane

education, although perhaps playing a small role in the case of the honeybee, may still have a role in increasing attitudes toward honeybees. Incremental change is still change. Rule and Zhanova (2012, p. 224) indicate that in elementary classrooms, humane education lessons can have a positive effect, even on attitudes regarding unpopular animals.

In his 2002 study, Shepardson examined children's ideas about insects and ways in which their ideas about them change from kindergarten to fifth grade. Shepardson interviewed twenty children from the same school in the Midwest from each of six grade levels (kindergarten to fifth grade) for a total of 120 children. Before each interview, each participant was asked to draw two pictures of insects. After each drawing was shown to the author, the child was asked why the drawing was a representation of an insect. Then each child was asked about their experience with the insect represented by the drawing. After the discussion of the drawings, each child was shown 13 drawings depicting various insects and non-insects and asked if said drawings represented an insect or not. Two corresponding piles were made and then the children were asked some questions that probed why each drawing was placed in either the insect or non insect pile. The children were given the opportunity to remove drawings and place them in a different pile. They were then asked to explain a general rule as to why such drawings were in the pile labeled insects. Then they were asked to formulate a general rule about what an insect is but for a child in a grade one year below the participant's current grade level.

Shepardson collected data through the use of children's drawings and explanations of insects, semi-structured interviews about experiences with insects, and discussions of what makes an organism an insect. He found that in first through fourth grade students, themes of insects as harmful emerged because human-insect interactions were referred to in terms of direct

harm to humans like a bite or sting (Shepardson, 2002, p. 634). Some third and fourth graders referred to insects in terms of agricultural or horticultural detriments, for example, eating plants and flowers, as well as to direct harm to humans (Shepardson, 2002, p. 634). As a group, the children tended to emphasize the negative aspects of insects, for example, stinging and eating flowers, but failed to recognize the beneficial aspects of insects (Shepardson, 2002, p. 639).

The author points to the fact that that ideas about insects reflected understandings based on physical characteristics of size and shape, arthropod characteristics, insect characteristics, human-insect interactions, life habits of insects, feeding habits of insects, and means of locomotion. He also acknowledged the fact that the children's learning about insects was partly influenced by the personal ideas and understandings they had previously constructed about the insects.

Research has shown that children's pre-instructional alternative conceptions influence and guide their school science learning (Shepardson, 2002, p. 627). Shepardson found that alternative conceptions influence learning so it was important to know about the prior assumptions that participants held so that he would know what learning experiences might challenge the participant's ideas and understanding about insects. "Curriculum development and instructional design must not only consider the conceptual structure of the subject, but also take into account the learner's ideas" (Shepardson, 2002, p. 628).

Study Design

Overview

This study explored the connection between education about animals, specifically honeybees, and attitudes toward animals. While encouraging study participants to share, discuss and examine prior assumptions and alternative conceptions, this exploratory study attempted to specifically answer the question: Will an exploration of the natural history of the honeybee affect attitudes toward honeybees?

As Shepardson concluded, by including instructional activities that reflect the progression of prior ideas and that move toward a factual, ecological understanding of insects, conceptual understanding of insects and their biological thinking may be enhanced (Shepardson, 2002, p. 628). It is unlikely that very many people will develop affection or an affinity for invertebrates but it is plausible that a more compelling depiction of their extraordinary contributions to human welfare and survival will do much to improve the public attitude toward these organisms (Black, Shepard and Allen, 2001, p. 47). Using conceptual change educational strategies as the foundation, this study explored the possibilities.

Data Collection and Intervention

Interviews

Nine research participants, all part of the author's group of friends and acquaintances, agreed to take part in the study. Of the nine participants, five are female and four are male. All

nine live in Northern Virginia, are between the ages of thirty-six and fifty-four, and are of middle-income status. All interviews were conducted in the living room of the author's house, a place where all nine participants had been on at least one prior occasion. None of the participants were beekeepers or employed in the agricultural industry nor had any indicated that they had given much thought to the natural history of honeybees.

The author asked each participant if the interview, in its entirety, could be recorded. All nine participants agreed to recordation of the interview. A battery operated tape recorder was used to record all interviews. The interviews had a flexible format where participants could fully explore the natural history of the honeybee and their attitudes toward honeybees. For this reason, not all information in the intervention section on honeybees was covered with each participant. The author introduced educational pieces on honeybees, based on four interview questions, during each interview but had to expand, shorten or skip some information based on participant's willingness to discuss each educational piece. The four interview questions were as follows:

1. What has been your experience with honeybees?
2. Do you like or dislike honeybees?
3. What do you know about honeybees?
4. Do honeybees have mental abilities?

The author took field notes during each interview that reflected the general impression of the participant during the interview. For example, if a participant started to become very

animated during the telling of a particular encounter with a honeybee, the author noted that instance. The field notes were used to simply gauge participant's reactions to various questions and answers.

After each interview, the author transcribed the recorded interviews verbatim. In order to protect participant's identities, each transcribed interview was assigned the identifier of Honeybee # 1, Honeybee # 2, Honeybee # 3, etc. The author assigned each participant with their Honeybee number prior to the interview. The name that was associated with the Honeybee number was on a hand written sheet of paper and locked in a file drawer. The author assigned each page of field notes with the corresponding Honeybee number as well, again to protect participant's identities.

Recruitment of Research Participants

The author contacted numerous friends and acquaintances via telephone to discuss and determine if they wanted to take part in the research. The author briefly described their participation as taking part in a study that explored the relationship between education and attitudes toward animals with a specific focus on the natural history of the honeybee. Potential participants were told that the interviews would take place in the author's home. A minimum or maximum interview length was not discussed. Potential participants were informed that they would be interviewed individually and tape recorded. Finally, potential participants had to be available during the week of November 3 – November 10, 2014 for the initial interview. The

idea of a follow-up interview to be conducted fourteen weeks later was also discussed. The author successfully recruited nine research participants.

Author's Relationship with Research Participants

Honeybee # 1: This participant had been a friend of the author for twelve years.

Honeybee # 2: This participant had been a friend of the author for fourteen years.

Honeybee # 3: This participant had been an acquaintance of the author for six years.

Honeybee # 4: This participant had been a friend of the author for eleven years.

Honeybee # 5: This participant had been a friend of the author's family for six years.

Honeybee # 6: This participant had been a friend of the author for fourteen years.

Honeybee # 7: This participant had been a friend of the author for thirteen years.

Honeybee # 8: This participant had been an acquaintance of the author for four years.

Honeybee # 9: This participant had been a friend of the author for eleven years.

Intervention

The author conducted a single session interview with each participant on an individual basis. Although participants may have come to the research having a possible awareness of humane attitudes toward animals, our exploration of the natural history of the honeybee was the primary means of intervention to assess if an exploration affected attitudes toward honeybees.

Each interview began with the author asking the participant the first interview question: What has been your experience with honeybees? This question was asked first so that the participant could offer prior assumptions and ideas, whether based on facts or alternative conceptions or a mixture of both, that offered clues as to how the honeybee had been constructed by the participant. Specific educational pieces discussed during the first interview question were:

- Honeybees are vegetarians, wasps are meat eaters. These meat eating wasps are probably the visitors at your backyard buffet (Harman, 2011, p. 65).
- About 80% of reported bee stings actually come from yellow jackets (Harman, 2011, p. 65).
- Unprovoked, honeybees usually go about their business unnoticed. People usually commit the first offensive move by swinging at the insects (Hubbell, 1988, pp. 76-77).

The second interview question then asked: Do you like or dislike the honeybee? This question assessed the current attitude of the participant toward the honeybee. It was also a way for the author to understand if the participant's current attitude was based on prior assumptions or alternative conceptions.

The third question asked during the interview was: What do you know about honeybees? This question allowed the participant to think about what information and experiences have affected their current attitude toward the honeybee and to begin to assimilate new information. During this question the following educational pieces were discussed:

- Many people believe that a beehive exists to support its queen – that social insects like bees are motivated by blind, cult-like devotion to a charismatic leader. But the queen serves the hive, chasing some blind imperative to lay egg after egg, thousands a day, until the end of her productive life, at which point she is set upon and stung or ripped to death. The worker bees forage for supplies to keep the queen alive, but their first job is to care for the young. So really, they are tending to the future (Nordhaus, 2011, p. 4).
- The hive is maintained by complex interactions among the queen, her female workers, and the male drones. Quite frankly, the queen is nothing more than an egg-laying machine. However, she is strong, her presence in the hive sends signals to the rest of the workers that the colony is healthy. The workers clean the hive, guard the entrance, build cells, find pollen and nectar, store honey, raise brood, and even maintain temperature control through the changing seasons. The male drones have but one function: to mate with the queen. Because there is not enough room and food to feed the drones through the winter, the workers dispose of any drones remaining at the end of autumn (Horn, 2005, p. 8)
- Honeybees are responsible for pollinating 60% of the world's food supply and 90% of all flowering plants. Without them, the human race would face starvation (Eade, 2013, pp. 1-2). In the United States alone, 100 crop species rely upon bee pollination to some degree, making up one-third of the American food supply. That's one of every three bites of your food, at every meal, every day (Eade, 2013, p. 3).
- A worker honeybee can navigate to and from flowers blooming more than six miles from the hive (Seeley, 2010, p. 175).

- Honeybees possess far and away the most complex and sophisticated system of communication in the animal world, after human language. The waggle dance is used to communicate about food, how far away it is, in what direction, and how good it is. It also tells where to find water to cool the colony or certain waxy materials or new places to locate a hive about to swarm (Wise, 2002, p. 77).
- James and Carol Gould best explain how the bees learn direction: “When the waggle run in a dance is pointed up (the dances are performed on vertical sheets of comb), the feeding station is always in line with the sun; when the food source is directly away from the sun as viewed from the hive, the dances point down; when the food is located 80 degrees to the left of the sun, the dance points 80 degrees to the left of the vertical. A bee attending a dance need only determine the orientation and duration of the waggle run in order to know the distance and direction of the food. These dances provide much-needed communication between the forager bees and the recruiter bees (Horn, 2005, p. 192).
- James Gould says that the dance language of bees is definitely symbolic communication, that is, it is language. And it accomplishes what human language does – it describes something removed in time and space (Lauck, 1998, p. 172).

The final question asked of each participant was: Do honeybees have mental abilities? This is where participants had the opportunity to reflect on their initial assumptions and constructions, as well as their initial attitude toward the honeybee, think about the discussion of the natural history of the honeybee during the interview, and to then discuss their current attitude toward honeybees. During this question the following educational pieces were discussed:

- Honeybees swarm. To swarm means to split a parent colony into two and fly away off with the old queen to take up new quarters. Scout bees from the swarming hive have the responsibility of finding a new nest site. Scouts come largely, if not entirely, from the ranks of a colony's foragers. Having certain genes also predisposes a bee to serve as a nest-site scout (Seeley, 2010, p. 94-95). Scouts "dance" to report on possible new nest sites. A scout's dance provides information not only about a site's location but also about its quality. The lively dancers indicate a nest-site of the first quality; second-rate homes are announced by lackluster dances (Seeley, 2010, p. 122).
- Honeybee democracy: A swarm is able to be so thorough in choosing its home because its democratic organization enables it to harness the power of many individuals working together to perform collectively the two fundamental parts of the decision-making process: acquiring information about the alternatives and processing this information to make a choice (Seeley, 2010, p. 101).

Data Analysis

The author's research was aimed at developing a theory of how an exploration of the natural history of the honeybee affected attitudes about honeybees. Grounded theory was used to analyze the interviews and to develop a model that contained major themes about attitudes toward honeybees. Themes emerged throughout the interviews.

The words from the interviews provided the input for the analysis process that was used to make sense of the data and to reconstruct the perspective of the participant that was

interviewed. The analysis consisted of two parts, namely fragmenting and connecting. During this part of the analysis, the author identified themes that emerged throughout each interview. The goal was to discern those themes in the interviews, producing definitions for each theme which had arisen from the data. By focusing on the major elements that described each theme and discovering patterns and connections within themes, the author attempted to find and share a deep and meaningful understanding of the nature of an exploration of the natural history of the honeybee and to analyze if this exploration affected attitudes toward honeybees. Making a difference in the lives of animals is predicated on our ability to explore and interpret information about how society sees them and the attitudes held toward them.

Follow-up Interviews

Fourteen weeks after the initial interview, the author contacted all nine original research participants and asked each person if he/she would be available for a follow-up interview. The author described the follow-up interview as an opportunity for both the author and the participant to determine if that participant's attitude toward the honeybee persisted over the intervening fourteen week period. The author explained to each participant that the follow-up interview would be tape recorded and conducted in the living room of the author's house, the same place where their initial interview took place. Four of the original research participants agreed to a follow-up interview.

The author conducted individual follow-up interviews with the four original research participants that agreed to the follow-up. During the initial interview each participant was asked to respond to four questions:

1. What has been your experience with honeybees?
2. Do you like or dislike honeybees?
3. What do you know about honeybees?
4. Do honeybees have mental abilities?

During the follow-up interview, the author read the original question and then read the response that the participant had given to that question during the initial interview. The reading of the four original questions, and the participant's original response to each question was read without interruption. At the beginning of the follow-up interview, the author asked each participant to listen to each question and response without asking questions or making comments. After all four question and response answers were read to the participant, the author asked the following follow-up questions to each participant:

1. Have you thought about honeybees since the initial interview?
2. Have you done any research on honeybees since the initial interview?
3. Have you done anything with the information that you learned during the initial interview and/or the information you researched on your own regarding honeybees?
4. What is your current attitude toward the honeybee?

A battery operated tape recorder was used to record all follow-up interviews. After each follow-up interview, the author transcribed the recorded follow-up interview verbatim. In order to protect follow-up participant's identities, each transcribed follow-up interview was assigned the identifier of their original corresponding Honeybee number.

This study investigated the connection between education about animals and attitudes toward animals, specifically, whether an exploration of the natural history of the honeybee affected participant's attitudes toward honeybees. The follow-up interview was used to determine if the shift in attitudes toward the honeybee persisted over a fourteen week period.

Timeline

The author conducted the nine in depth initial interviews with research participants from November 3 – November 10, 2014. The results, based on grounded theory, were written up by the author within three months of the last interview. The follow-up interviews were conducted with four of the original research participants fourteen weeks after the last initial interview and were written up within one week of the last follow-up interview.

Findings/Analysis

Study participants were encouraged to share, discuss and examine prior assumptions and alternative conceptions about the honeybee. This study investigated the connection between education about animals and attitudes toward animals, specifically, whether an exploration of the natural history of the honeybee would affect participant's attitudes toward honeybees. The author conducted single session interviews with nine participants. Each participant was interviewed on an individual basis. In order to protect identities, each participant was assigned the identifier of Honeybee # 1, Honeybee # 2, Honeybee # 3, etc.

Before Intervention

The following sections of analysis reflect data gathered during a flexible format where participants could fully explore the natural history of the honeybee and their attitudes toward honeybees. During this section, participants were asked general questions about the honeybee. Although participants were not asked to specifically reflect on their prior assumptions and ideas about the honeybee, this is the part in the research whereby the author found out, based on the answers to the general questions about honeybees, how the honeybee had been constructed by each of the research participants.

Past Experience with Honeybees

Six participants revealed a fear of the honeybee. They described the honeybee as part of a general category. As Honeybee # 1 stated, “The honeybee is just one bug on a long, big list of biting insects that want to sting if you get too close.” Honeybee # 2’s description of the honeybee best describes a common reaction among participants. “You have to swat at the honeybee to protect your body and to distract it for just enough time in order to get away.” Furthermore, Honeybee # 9 stated a fear of the honeybee and rationalized this fear of the honeybee using this explanation:

Unlike the honeybee, the bumble bee is big, fat, and round which makes it slow. You can see it coming from a mile away. The honeybee is slick, quick and a hard worker which makes it easier for it to sneak up on you and sting before you know what hit you.

It should be noted that of the six participants who declared a fear of honeybees, only one had actually ever been stung by a honeybee and that was, as Honeybee # 6 reflected, “while I was a child running barefoot outside in the summer in a yard full of clover and honeybees.”

Like or Dislike of Honeybees

Four participants stated a general dislike of honeybees, and an even greater dislike of them when encountered outside, because they believed that honeybees are attracted to and want to eat their food at a picnic. Honeybee # 3 suggested:

As a child I watched my older siblings swat at honeybees that came too close to things like an ice cream cone or an open can of soda. I learned from an early age that honeybees will come after these types of things. I teach my children to dislike and to run away from honeybees.

Four participants were indifferent toward honeybees. The remaining participant, Honeybee # 5, offered a recent experience which sums up his view of the honeybee:

I like honeybees! I saw one on a cold morning last week. It was on the sidewalk and he wasn't moving around too much. I picked it up with my hands and set it to the side so that it could be safe. And two summers ago, I was sitting outside while eating lunch. A swarm of honeybees, it had to be about ten thousand of them I'm guessing, flew right

over me. I could hear them coming. It sounded like a freight train overhead. They flew right over me and kept going. It was really a neat experience.

Knowledge of Honeybees

Eight participants stated, what most termed an obvious fact, that honeybees make and store honey. Three participants believed that they had read or heard that honeybees are on the decline. Only two participants discussed honeybees as pollinators. Seven participants were aware that there is a queen bee in the hive but none of them knew that the workers in the hive are female. They all assumed that the workers are male. Only one participant used the term drone and correctly identified it as being male. One participant was aware of the division of labor within the hive and correctly described the queen as the only honeybee that produces eggs for the hive. One participant wondered if honeybees occur naturally in the environment, and if they do, what use are they to anyone. Honeybee # 7 mentioned:

Years ago I had a neighbor that had these wooden box type things with drawers that you could open and use to empty the honey. If honeybees exist in the wild, who can find and get their honey for us to use?

After Intervention

After the participants shared their initial ideas and attitudes about honeybees, the author introduced them to information about the natural history of the honeybee. The sections below

describe the participant's responses after this information was shared. This section, and those that follow, reflect data analysis where participants were encouraged to think about what information and experiences have affected their current attitude toward the honeybee, asked to support their attitude, and to begin to assimilate new information. Rather than asking participants to assimilate this new information, participants were given the new information and then asked to comment on it. At this point the participants were also asked to reflect on their initial assumptions and constructions, as well as their initial attitude toward the honeybee, think about the discussion of the natural history of the honeybee during the interview, and to then discuss their current attitude toward honeybees. It should be noted that these instructions were not given all at once to each participant but were given in stages throughout the interview.

Honeybees and Mental Abilities

After a discussion regarding the waggle dance, two participants stated that they do not believe that honeybees have mental abilities and did not want to continue to discuss the topic. A third participant empathically rejected the idea. Honeybee # 2 said:

No way! Honeybees do not have mental abilities. Only human life has true sentience. Only humans have evolved to where there is sophisticated awareness. I saw something on PBS years ago, I think it was a cartoon, and I recall something to do with Dr. Seuss. The show expressed the idea that honeybees teach each other where to go to find the best flowers for nectar. Although this makes honeybees interesting and intriguing, I do not think that this demonstrates mental abilities.

A fourth participant, Honeybee # 6 commented, “I think that the waggle dance represents something more than instinct but it might just be a mechanism that they use. I would say that honeybees don’t have mental abilities.” The remaining five participants, after long pauses and some head scratching, revealed that they suspect that honeybees do have mental abilities or, at the very least, some sort of control center. Participants did seem to be pondering their ideas about honeybees and perhaps this new information was causing them to challenge their own prior assumptions. This might account for the long pauses and “head scratches.”

A discussion regarding honeybee democracy clearly demonstrated a shift in attitudes. As Honeybee # 2 stated, “Wow! Honeybee democracy is just like our system of democracy. This is amazing. Hearing about this makes me have respect for honeybees. I’ll think twice about my reaction the next time I see a honeybee.” The author discussed this shift in attitude with Honeybee # 2 in an attempt to determine what had brought about this change in attitude. Upon reflection, this participant decided to alter an earlier statement made regarding the mental abilities of the honeybee as illustrated in the following insight:

I was aware that honeybees did stuff with pollination but didn’t know that they pollinate one of every three bites of my food at every meal every day. We need them and we need lots of them to continue to pollinate. I was not aware of their importance with regard to our food supply. It is intriguing to hear about the way that honeybees choose a new hive. Honeybee democracy makes them seem, well, sophisticated. Honeybee democracy! Wow. It is amazing. To be honest, honeybee democracy made me think about the

respect that I have for primates. I feel that primates are the closest animal to us. I would never eat, harm or, quite frankly, swat at a primate because they are similar to me. After learning about honeybee democracy, I'm beginning to see similarities between us and honeybees and to make connections, sort of, between us and them. Hearing myself speak of "us" and "them" sounds like I'm putting honeybees down. I have to rethink this.

Before the educational pieces were presented to Honeybee # 8, this participant expressed a fondness for animals in general, discussing her volunteering efforts at the local animal shelter that housed dogs, cats, rabbits, hamsters, guinea pigs and gerbils, but used the word "indifferent" to describe her current attitude toward the honeybee. After the intervention, this participant described the honeybee as being similar to us. Honeybee # 8 said:

As humans we are able to speak to communicate. Honeybees are also able to communicate but in a different way. I don't think that our way of communicating with one another is the hallmark of anything. Honeybee democracy is neat and fascinating. It is another form of communication, like the waggle dance. It's not words but it is communication.

Furthermore, the topic of honeybee democracy appeared to make the honeybee lose its "yuck" factor. Recall that before the educational pieces on honeybees, Honeybee # 3 offered:

As a child I watched my older siblings swat at honeybees that came too close to things like an ice cream cone or an open can of soda. I learned from an early age that honeybees

will come after these types of things. I teach my children to dislike and to run away from honeybees.

But after the intervention, Honeybee # 3 expressed this sentiment:

I didn't know that honeybees are like us. It's not like humans are the best but we are the smartest. If honeybees can have what sounds like democracy, they can be like me and you. I never thought of an animal, except for maybe a dog, being like anything close to human. I think that maybe I should teach my children to not bother the honeybee and to just leave them alone to do their own thing. I actually can appreciate the honeybee now instead of having a negative, get away from me, reaction.

The author discussed this shift in attitude with Honeybee # 3 in an attempt to determine what had brought about this change in attitude. Upon reflection, Honeybee # 3 provided the following insight:

The information I heard about the waggle dance and honeybee democracy is really interesting. I never knew such cool stuff about honeybees. I would say that just knowing about honeybees and what they do during the course of their life, again, hearing about honeybee democracy, makes me find them interesting. I think that bees, bugs, insects and things like them are a part of life that people in general just aren't interested in knowing or hearing about. This means that they are overlooked and they are something that people don't learn about at all. When it comes to teaching children about animals in

general, my six year old learns about how animals look and what they might eat but nothing about pollination, the waggle dance and honeybee democracy. I think this will be neat to share with my children so that they will know more, and useful, things about the honeybee. Honeybees are cool and I think that the stories about what they are capable of doing will make my children want to look them up on their iPad's. They will probably want to learn more and ask questions. I guess like my children, I like neat things.

Honeybees and Pain and/or Suffering

Four participants stated that based on the information shared about the waggle dance and honeybee democracy, honeybees probably have the capacity to feel pain. Four participants did not believe that honeybees can feel pain. The remaining participant, Honeybee # 8 shared, "This small insect is very intricate, both individually and as a member of the hive. It would be impossible for us to ever figure out if they are able to experience pain." With regard to suffering, as defined by the author as the state of undergoing distress or hardship, after much thought, eight participants stated their belief that honeybees do not experience suffering. But one participant, Honeybee # 9, shared, "I think that they can feel pain but maybe not suffering. I'm not certain if they can anticipate so I'm unsure as to whether or not they can suffer."

Impact of New Information on Attitudes Toward Honeybees

At the beginning of the interview, recall that Honeybee # 1 had a long, big list of biting insects that want to sting if you get too close. After an exploration of the natural history of the honeybee, Honeybee # 1 stated that this new information about the honeybee was going to be shared with her children. It was Honeybee # 1's belief that previous encounters with the honeybee had gone wrong because of a learned reaction on the part of the human. Honeybee # 1 also stated that future encounters need to be reevaluated in light of this new information. Toward the end of the interview Honeybee # 1 even asked, "Are humans the honeybee's biggest predator?" This concern for honeybees was also mentioned by Honeybee # 6:

If honeybees make honey and store it in the hive as food, and beekeepers take the honey, leaving some behind for the honeybees, what would happen to the honeybees if a novice beekeeper took too much honey and the honeybees ended up starving? I also have a concern about the wooden boxes where the honeybees live. Bears might have access to those boxes. They could destroy them in search of honey. It seems that we owe it to the honeybee to at least protect their home.

Two participants suggested that instead of running away from honeybees we should thank them for pollinating. Honeybee # 3 and Honeybee # 7 said, "We need the honeybee but honeybees don't need us." This comment is reminiscent of what Edward O. Wilson offered in an article about the importance of invertebrates.

The truth is that we need invertebrates but they don't need us. If invertebrates were to disappear, I doubt that the human species could last more than a few months. As dead vegetation piled up and dried out, narrowing and closing the channels of the nutrient

cycles, other complex forms of vegetation would die off, and with them the last remnants of the vertebrates (Wilson, 1987, p. 345).

Perhaps the greatest impact between an exploration of the natural history of the honeybee and attitude toward honeybees was felt by Honeybee # 8:

I don't think that a lot of people care about the honeybee because I think that a lot of people don't think about the honeybee. We had a great discussion about them and if I can see that the honeybee communicates and lives its life in a way that it was made to do so, and although it is a being that is different from the way that I experience life, I don't need to identify with the honeybee as being similar in all facets to me in order to know that the honeybee is a being worth living in this world. People should learn more about the honeybee. If we don't understand them then we are able to swat them or simply push them aside. When we were talking about the way that beekeepers can exploit the honeybee by building bigger hives than they need, knowing that the honeybee will then store honey in that bigger hive which allows the beekeeper to then take all that extra honey, practices like this will start to come into question. And people don't want to think about practices like this because it is very easy to not think about them and to just push it all away.

Follow-up Interview Findings

Fourteen weeks after the initial interview, the author conducted individual follow-up interviews with four of the original participants. The follow-up interview provided an

opportunity for both the author and the participants to determine if the participants shift in attitudes toward the honeybee persisted over the fourteen week period.

Honeybee # 1

At the beginning of the initial interview, recall that Honeybee # 1 had a long, big list of biting insects that want to sting if you get too close. After an exploration of the natural history of the honeybee, Honeybee # 1 stated that this new information about the honeybee was going to be shared with her children. It was Honeybee # 1's belief that previous encounters with the honeybee had gone wrong because of a learned reaction on the part of the human. Honeybee # 1 also stated that future encounters need to be reevaluated in light of this new information. Toward the end of the interview Honeybee # 1 even asked, "Are humans the honeybee's biggest predator?" During the follow-up interview, Honeybee # 1 told the author that she had continued to reflect on the honeybee. In the follow-up interview, Honeybee # 1 said the following:

I think that they are kind of like us. They have their own society. They have their own language. They have their own way that they communicate with each other. Honeybees scout for a new home and have this dynamic in the hive where they know their job and what needs to be done. I've realized that honeybees go about their day like me. They work hard doing their thing. They improve my life in the process of what they do concerning their efforts in pollination. Kids are generally afraid of bees but I don't think that they have any idea that we need them for pollinating so much of what we eat. I think that there should be education in elementary school on honeybees. That would help out on changing attitudes toward them. Do attitudes toward animals start with parents or does it start with

children? If children were taught something in school and then they took that information home to their family, it would be interesting to know if that education would not only change the children but their family as well.

Honeybee # 6

Recall Honeybee # 6's comments: "I think that the waggle dance represents something more than instinct but it might just be a mechanism that they use. I would say that honeybees don't have mental abilities." Honeybee # 6 maintained his initial attitude toward the honeybee and their mental abilities during the fourteen week follow-up interview. During the fourteen week follow-up interview, Honeybee # 6 told the author that the original discussion on honeybees had piqued his interest in the honeybee. Honeybee # 6 shared the following information that he had researched:

Researchers found that bees have a very good sense of smell and that you can train bees to sniff out explosives. They use sugar water to train the bee to associate it with the smell of a particular explosive. They let the bee have a smell of a certain type of explosive and then they give them sugar water immediately after. The bees start to associate the smell of the explosive with something good, the sugar water. I'm not sure if they are actively using bees anywhere to do this yet, but I know that they were, four or five years ago. I think that the reason that they were doing that is that it is less expensive than training a dog and maybe they are able to do it better than a dog can do it. I'm going to continue to follow this story. I'm curious to know if honeybees can be trained to be better at finding explosives than a dog. If they can that sure would have an impact on what I think

about the mental abilities of the honeybee.

Honeybee # 8

This participant had used the word “indifferent” to describe her current attitude toward the honeybee during the general discussion of the honeybee during the initial interview. After the intervention, this participant described the honeybee as being similar to us. This participant also stated that “people should learn more about the honeybee because if we don’t understand them then we are able to swat them or simply push them aside” and, furthermore, that if “beekeepers can exploit the honeybee for their extra honey, practices like this will start to come into question. And people don’t want to think about practices like this because it is very easy to not think about them and to just push it all away.” Honeybee # 8 maintained her positive attitude toward the honeybee during the fourteen week follow-up interview. Furthermore, this participant told the author the following story:

I had the choice of helping or killing a bug a few weeks ago. Since our first interview, I’ve thought about what I said about my attitude toward the honeybee but I’ve wondered about my possible actions toward bugs in general. I thought that I would probably help a bug rather than kill a bug if I had to make the choice. A bug was flying around a pregnant woman on the shuttle bus. The woman said that she was allergic to it and asked if someone would squish it. Instead, I captured the bug in this “container” I made from a makeshift card that I had with me and then I waited until we got to our stop and then I let it go. I guess I am practicing what I preach. Maybe I can set a good example.

Honeybee # 9

Honeybee # 9 had rationalized his fear of the honeybee when he described it as “slick, quick and a hard worker which makes it easier for it to sneak up on you and sting before you know what hit you.” He also expressed the opinion that he believed that honeybees can feel pain but maybe not suffering because he felt that perhaps they could not anticipate. This participant maintained his initial attitude toward the honeybee. He continued to be fearful of honeybees and he still believed that honeybees did not suffer. Honeybee # 9 did discuss the fact that during the intervening fourteen weeks he had watched a short video on-line about planting bee friendly gardens and wildflowers. He discussed footage of the honeybees displayed during the video and described the honeybee movements as “graceful.”

Conclusion/Recommendations

We all need to be concerned with animal welfare, particularly when it comes to invertebrates. “When people do offer concern toward animals, they reveal little appreciation of “lower” life-forms but tend to restrict their appreciation to larger vertebrates” (Kellert and Wilson, 1993, p. 64). This idea came up during the interview with Honeybee # 2. Recall that Honeybee # 2 expressed the need to swat at the honeybee in order to protect himself. Also recall this participant’s belief that primates are the closest animal to us and that he would never harm, hurt or swat at a primate. After an exploration of the natural history of the honeybee, particularly some educational information regarding honeybee democracy, note that Honeybee # 2 began to see similarities between primates and honeybees and even referred to honeybees as sophisticated.

“Nearly 67% of an urban public sample considered that the general attitudes they hold about animals were not too important or only somewhat important compared to the other concerns in their life” (Hills, 1993, p. 124). This author’s research shows that it is possible to not only get people to consider their attitudes toward animals but, more importantly, to consider how their attitude impacts animals. Honeybee # 1 had initially placed the honeybee among a long list of insects that want to sting if you get too close. But after an exploration of the natural history of the honeybee, this participant shifted her attitude and believed that future encounters with the honeybee would need to be reevaluated in light of the information on honeybees. Furthermore, Honeybee # 1 demonstrated that thinking about your attitude toward the honeybee can impact your concern for the honeybee when she asked the author if humans are the honeybee’s biggest predator.

So how do we affect attitudes toward animals and gather concern for the welfare of animals, specifically attitudes toward and concern for honeybees? As this research demonstrates, one way is through an exploration of the natural history of the honeybee. This author’s research reveals a clear relationship between an exploration of the natural history of the honeybee and its implications for creating a positive attitude toward honeybees. Furthermore, this research points to the fact that a focused, single session exploration of the natural history of the honeybee led by a subject matter expert can have a positive impact on attitudes toward the honeybee. Finally, the follow-up interviews demonstrate that fourteen weeks after the initial humane education session regarding honeybees, positive attitudes toward the honeybee remained, and in some cases, progressed. This positive attitude toward the honeybee was even carried over to other

invertebrates. Recall the story of how Honeybee # 8 had to make the choice between helping or killing a bug flying near a pregnant woman on her shuttle bus and decided to capture the bug in a makeshift container for an eventual safe release.

As this research has shown, humane education can play a role in shifting attitudes toward animals, specifically attitudes toward the honeybee. Through a single session of an exploration the natural history of the honeybee, it appears that the “official” version of the construction of the honeybee as “pest” can be reconsidered and at least partially reconstructed. While allowing participants to ask questions and offering educational information on the honeybee, participant’s fears that had once paralyzed their thoughts and impeded their concern for the welfare of the honeybee were untangled. Attitudes can shift and concern can evolve for animals, even those considered undesirable, such as invertebrates.

One limitation of this study is that it involved a small group of only nine research participants. A second limitation of this study is that the author was unable to conduct a follow-up interview with all nine original research participants. A third limitation of this study is that the follow-up interviews that were conducted with four of the initial research participants covered only an intervening fourteen week period. Future studies might consider a much longer intervening period to determine if, and at what point, a shift in attitudes either reaches a constant level, progresses or even if it reverts back to its original level of disinterest or negative attitude. A fourth limitation of this study is that the author had a personal relationship with the research participants. This study demonstrated that the intervention worked because new information about bees helped people in general re-examine their attitudes but it is unknown from this study

if that would work in cases where the instructor is not known to the student. Finally, future research might look to incorporate whether there is a connection between an exploration of the natural history of the honeybee and its impact, if any, on human empathy.

“We humans belong to the living community of Earth. The wild lies all around us, and we draw it in like breath. Our lives are indivisible from the lives of insects” (Savage, 2008, p. 109). Just like the honeybee who must be part of a colony in order to survive, animal advocates and humane educators need to join together to shift attitudes and to help people to discover that the honeybee is a creature worth getting to know. Along the way, previously constructed boundaries might be merged and could even lead to thoughtful decisions with regard to ethical engagements with all animals.

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