STUDENT RESEARCH REPORT – REEU PROGRAM 2023

Developing and Implementing Engaging Educational Experiences at Cobble Hill Farm Education & Rescue Center

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Abstract

The goal of this study is two-fold (1) to explore the potential of early intervention programs to shape children's attitudes towards insects, transforming negative perceptions into positive relationships and (2) to make children more aware of agriculture and food systems using insects as educational tools. We review the impact of introducing children to insects at a young age, fostering curiosity and understanding, rather than fear. We further examine the outcomes of a program implemented at the CHARM summer camp (Cobble Hill Farm Education & Rescue Center), designed to engage students in educational activities centered around insects and their ecological importance. The program involved various activities such as insect origami, pollinator bingo, scavenger hunts, and a live insect "petting zoo," along with pre- and post-intervention surveys to assess changes in students' perceptions. Our research demonstrates that while survey methods posed challenges due to group dynamics, the program's hands-on experiences positively influenced students' understanding of insects, with notable improvements in recognizing the importance of pollinators in our ecosystems. Results highlight the need for more effective survey techniques and showcase the potential of interactive, engaging approaches to alter children's perceptions of the natural world.

1.0 Introduction

Many children have profoundly negative experiences when first interacting with insects, but with early intervention programs we can cultivate a positive relationship with insects from a young age (1). In turn, these programs can help shape a world where children embrace insects as allies, not adversaries, where curiosity overcomes fear, and where a harmonious coexistence with nature blossoms from seeds sown in early childhood. paper titled *Observed Fears and Discomforts Among Urban Students on Field Trips to Wildland Areas,* Bixler, et al. offers insight into the behaviors of children and young people when they do not have experience in nature

from an early age and how it affects their attitudes towards things in the natural world (8). Specifically, the authors "Identified the range of fears and anxieties observed by interpreters and environmental educators working with urban students in wildland settings. We interpreted their observations based on existing conceptual and theoretical work by environmental and clinical psychologists. The data provide insight into how inexperienced visitors of wildland areas perceive these environments and list negative reactions that interpreters and environmental educators should be prepared to deal with while working with urban school children."

In another account, *Teaching with Live Insects*, Fischer and Lorenz-Reaves detail how teachers implemented an activity similar to what we carried out; a program based around live insects to educate elementary level students in topics of nature and sustainability (10). Further, in *Exploring Elementary Students' Scientific Knowledge of Agriculture Using Evidence-Centered Design,* Brandt, et al. detail how agricultural literacy has been slowly falling to the wayside in favor of subjects like engineering and math, arguing that, though students need STEM subjects in order to engage in agricultural topics, students in agricultural fields are lacking in the environmental and food systems components of the agricultural discipline (3).

Building upon these curriculums, we developed a program to be implemented at the CHARM summer camp at the Cobble Hill Farm Education and Rescue Center during two different "sessions" during the summer. The first session consisted of fifth and sixth grade students part of the summer camp, while the second session consisted of students from seventh and eighth grade who were participating in a summer school program. The different circumstances by which each session's participants ended up at Cobble Hill impacted our intervention in many ways, which will be detailed in our dicussion. However, common to both sessions, our program's goal was to engage the students in fun but highly educational activities to increase their comfortability around insects and reevaluate their behavior in future encounters with insects (i.e. think twice before squashing the next insect they encounter). Through activities such as insect origami folding (2), pollinator bingo (3), scavenger hunts (4), sunflower pottings, and a live insect "petting zoo"(5), we discussed with the students important topics such as pollinators, food systems, and insect anatomy. We also conducted a survey before and after each session to determine the students' level of background with insects and related topics as well as improvement in these measures.

Engaging children in interactive and age-appropriate experiences with insects can debunk myths and misconceptions, replacing apprehension with fascination. We used the children's natural curiosity coupled with our knowledge to create a safe and supportive environment for them to learn about the intricacies of insect life.

2 Materials and Methods

2.1 Study Site and Student Demographics

The conception and implementation of our program would not have been possible without the 2023 Research and Extension Experiences for Undergraduates intern group. This cohort (four people per session) traveled from the University of Massachusetts Amherst to the CHARM Summer Program at Cobble Hill Animal Farm Education and Rescue Center in Williamstown Massachusetts on four separate occasions (three for the first session, and once for the second

one). We worked with twenty one 5th and 6th grade students during session one and six, 7th and 8th grade students during session two, all of whom attended North Adams Public Schools in North Adams, Massachusetts.

2.2 Session Break-down

Session one took place on July 5th, 6th, and 7th, while the second session took place on August 9th. Each day of Session one at CHARM was structured in largely the same way; we would arrive at 10:15 AM and set up our materials. Then we would implement our curriculum from 10:30 AM to 12 PM. The pre-intervention survey was conducted each morning at 10:30 AM. We would break for lunch at 12PM and come back at 12:30 PM, at which point we would continue with our activities until 1:30 PM for departure. On the third day of session one, the post-intervention survey was conducted. During the pre-lunch segments, we had predetermined groups of students. We were to work with a different group of students each of the three days, but we were informed when we arrived on the third day that we would have the same students as day one, which prompted us to improvise some activities to avoid repetition. The afternoon segments of the first session were "elective" blocks where the students were allowed to choose the activity they would participate in.

For the second session, we arrived at 10:15 AM and set up until 10:30 AM to begin activities. The morning session ran from 10:30 AM to 12 PM with the pre-intervention survey to begin at 10:30 AM. Lunch ran from 12 PM to 12:30 PM. After we returned from lunch, we started our curriculum over because we had a new group of students. The afternoon session ran from 12:30 PM, when the pre-intervention survey was conducted, to 1:30 PM. Thereafter, the post intervention survey was conducted.

2.3 Description of Educational Curriculum and Post-Intervention Surveys

Prior to the first session, we formulated questions to assess what degree of exposure the students previously had to insects, and these were administered at the beginning of each day, for both sessions. Further, to evaluate the efficacy of our curriculum, we formulated a post-intervention survey conducted at the end of each session.

We began the first of three days of our program's first session with introductions and icebreaker questions that led into a discussion about insect behavior, basic anatomy, and the role of pollinators in the environment. During the initial discussion, we attempted to weave the initial survey questions into the conversation in an organic and relaxed manner. Students were asked to indicate a response to the question by raising their hand. We then went into the barn where we had our live insect 'petting zoo' set up, and the students experienced handling Madagascar Hissing cockroaches and Death Feigning beetles, which were borrowed with permission from the UMass Amherst Fernald Club, along with pinned collections of beetles, bees, and butterflies, also borrowed from the Fernald Club. We used the "petting zoo" segment of our curriculum to discuss more about insect anatomy and behavior. The students then broke for lunch. This format remained unchanged throughout the subsequent mornings of the first session. When the students returned from lunch on the first day, we began some arts and crafts activities. We engaged the students in a sunflower potting tutorial, using dwarf sunflower varieties that were previously seeded at the College of Natural Sciences Greenhouses at UMass

Amherst, and an insect origami folding lesson, using origami paper and free-source directions of various basic insect origami folding patterns obtained from the internet. Over the course of the afternoon, we answered questions that came up from the students and engaged the students in dialogue relating to insects.

On the second day of the first session, in the afternoon, we engaged the students in a different activity than the previous day, a scavenger hunt using bug catching nets to aid in observation and identification of insects around the Cobble Hill farm property. During this time, we again engaged the students in dialogue about insects and answered the many questions that were asked.

The final afternoon of the first session at CHARM was an incredibly hot day. Instead of sticking with the plan of playing some physical games such as 'tag' and hide and seek (which had been modified to relate to insects), we engaged the children indoors. We utilized barn space at the Cobble Hill Farm to play modified versions of knockout and four square; knockout is a game played with two basketballs and a basketball hoop. The players line up single file and try to make shots in the hoop, with the second shooter trying to eliminate the person in front of them by scoring a basket before the initial shooter can score their ball. Foursquare is a game played on a large square usually divided into four squares of equal size and the goal of this game is to make it to the fourth square and maintain position by bouncing the ball in an opponent's square and the ball subsequently bouncing twice or going out of bounds. To add an educational component to these games, the students had to name a unique insect or answer an insect-related question in order to play. At the end of the final day, we implemented the post-curriculum survey evaluation, which consisted of students answering questions by raising their hands.

For the second session,in an effort to simplify the process of implementing both the pre- and post-intervention surveys, we compiled the questions into a short, paper handout that the students were asked to fill out.

The curriculum for the second CHARM session was modified based on feedback and observations during the first session, mainly as it pertained to activities that were enjoyed most by the students. As part of the morning routine, we did introductions and an icebreaker game that we tailored to involve insects. The activity we chose as an ice breaker is called 'A Great Wind Blows', where students would circle up, similar to musical chairs, but there will be a person in the middle of the circle. The person in the middle will begin by saying "A great wind blows for…" and follow that with something that applies to insects, such as "A great wind blows for anybody who has ever been stung by a bee". Accordingly, the people who this statement applies to will then rush to find an unoccupied seat in the circle . We followed the icebreaker activity with the implementation of the pre-survey, which the students filled out while we sat in the garden at the farm. Following the survey, we started a discussion on insect behavior and basic anatomy which continued as we walked to the barn to conduct the live insect 'petting zoo'. After this, the students broke for lunch.

After lunch, we received a different group of students, instead of the same group that we had worked with earlier that day. To accommodate the newcomers, we restarted the curriculum by introducing ourselves, then engaged in the same icebreaker activity as before. Naturally, we were forced to implement the pre-survey once more, and then we went into the

barn for the 'petting zoo'. Following the live insect experience, we conducted the post-survey in the same manner as the paper pre-survey. After the completion of the post-survey, we packed up and returned to UMass.

All data and figures were processed in Microsoft Excell (Microsoft Office Suite, v.xY), formal statistical analyses, including comparisons of proportions from the pre- and post-intervention results, were performed in Statistica (TIBCO Software Inc., v.14.0.1).

3.0 Results

The pre- and post-intervention surveys for the first session at CHARM were implemented during a discussion period where the students were asked to raise their hand to indicate a response. Below, we report the answers to each question asked. Questions 1-5 were asked during both the pre- and post-surveys. Questions 6-9 were asked exclusively as part of the post-survey.

Question 1 - Do you like, dislike, or feel neutral about insects?

For the first session, and prior to the intervention, 52% of students (n=21) reported that they "like" insects, and after the intervention, 73% of students (n=11) reported that they "like" insects (Fig. 1). There were no significant ($p > 0.05$) values to be reported.

For the second session, and prior to the intervention, 17% of students (n=6) reported that they like insects, 33% reported that they dislike insects, and 50% reported that they felt neutral about insects. After the intervention, 17% of students (n=6) reported that they like insects, 67% reported that they dislike insects, while 17% reported that they felt neutral towards insects (Fig. 1).

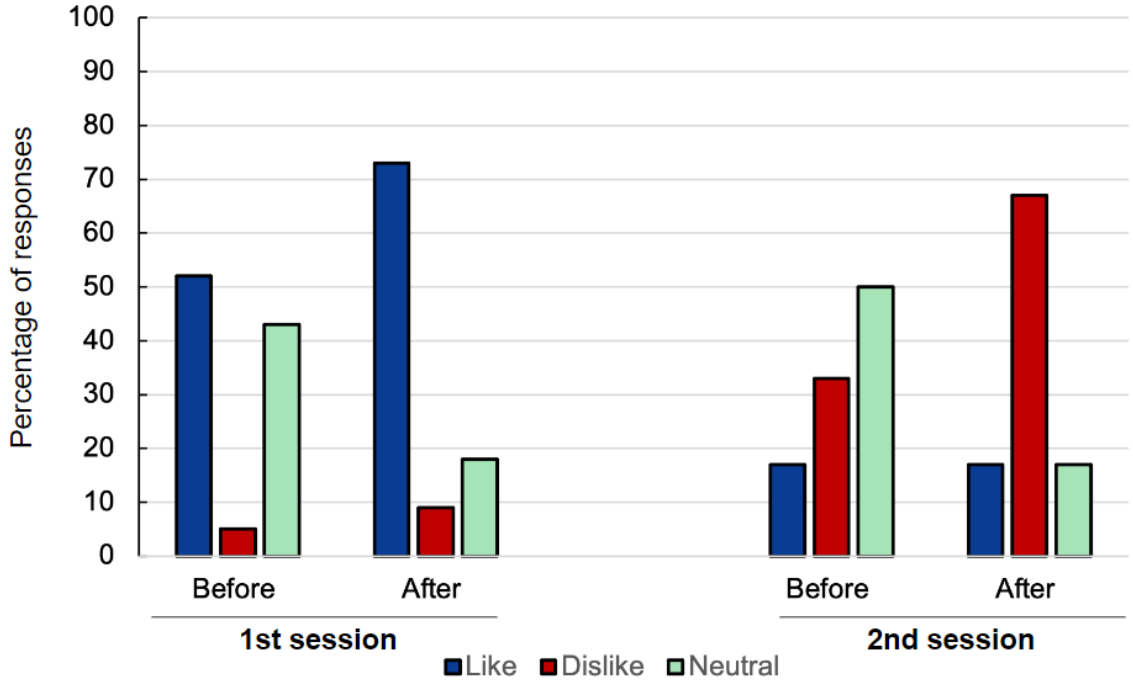

Figure 1 - Do you like, dislike, or feel neutral about insects? Description…

Question 2 - Do you think insects are mostly helpful or harmful to humans?

For the first session, and prior to the intervention, 100% of students (*n*=8) reported that they thought insects were mostly helpful to human life, while after the intervention, 92% of students (*n*=12) reported that they thought insects were mostly helpful to humans (Fig. 2). There were no significant ($p > 0.05$) values to be reported.

For the second session, and prior to the intervention, 67% of students (*n*=6) reported that they thought insects were helpful to humans, while 33% reported that they thought insects were harmful to humans. After the intervention, 60% of students (*n*=5) reported they thought insects were helpful to humans, and 40% reported that insects were harmful. One student was unsure (Fig. 2).

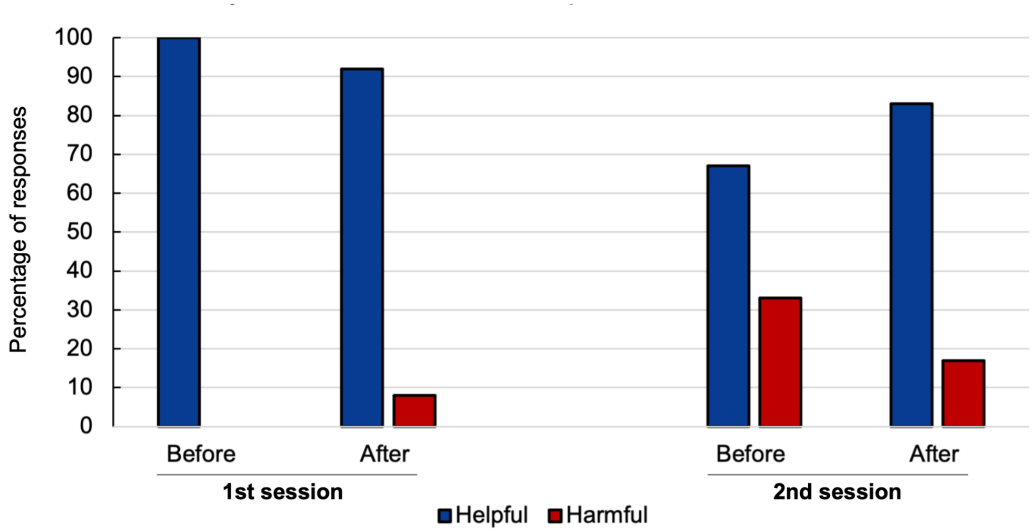

Figure 2 - Do you think insects are mostly helpful or harmful to humans?

Question 3 - How comfortable do you feel handling insects?

For question three, students were given a choice of three options; option 1, I like handling and picking up insects as long as they don't bite me; option 2, I like to see insects from up close and maybe even touch them indirectly (e.g. a stick); option 3, I do not feel comfortable at all approaching insects! For the first session, and prior to the intervention, 29% of students (*n*=17) reported that they like handling insects, 59% of students (*n*=17) reported that they like to see insects up close and indirectly touch them, and 12% of students (n=17) reported that they do not feel comfortable around insects at all. After the intervention, 36% of students (*n*=11) responded that they like handling insects, 55% of students (*n*=11) reported that they like to see insects from up close and maybe even touch them indirectly (e.g. a stick), and 9% of students reported that they were not comfortable handling insects at all (Fig. 3). There were no significant ($p > 0.05$) effects to be reported.

For the second session, and prior to the intervention, 17% of students (*n*=6) reported that they like handling insects, 50% reported they like to view insects from a distance, and 33% reported they do not feel comfortable around insects at all. After the intervention, 17% of students (*n*=6) reported that they like handling insects, 50% reported they like to view insects from a distance, and 33% reported they do not feel comfortable around insects at all (Fig. 3).

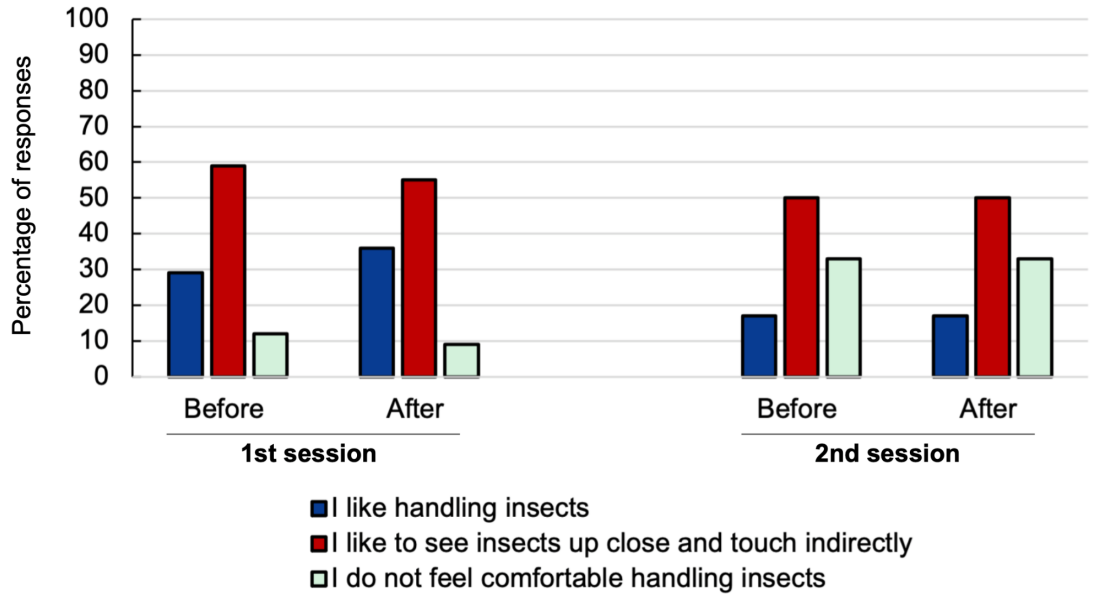

Figure 3 - How comfortable do you feel handling insects?

Question 4 - Who believes insects play an important role in our ecosystem? For the 1st and 2nd sessions, no significant differences ($p > 0.05$) in the before and after surveys were documented. For the first session, on both the pre (n=21) and post (n=12) surveys, 100% of students reported that insects play an important role in our ecosystem, whereas for the second session only 66% of students reported that they believe insects play an important role in our ecosystem. (Fig. 4).

For the second session, and prior to the intervention, 83% of students (n=6) reported that they do believe insects play an important role in our ecosystem and 17% reported that they believe insects do not play an important role in our ecosystem. After the intervention, 67% of students (n=6) reported they believe insects play an important role in our ecosystem, while 33% of students reported that they do not believe insects play an important role (Fig. 4).

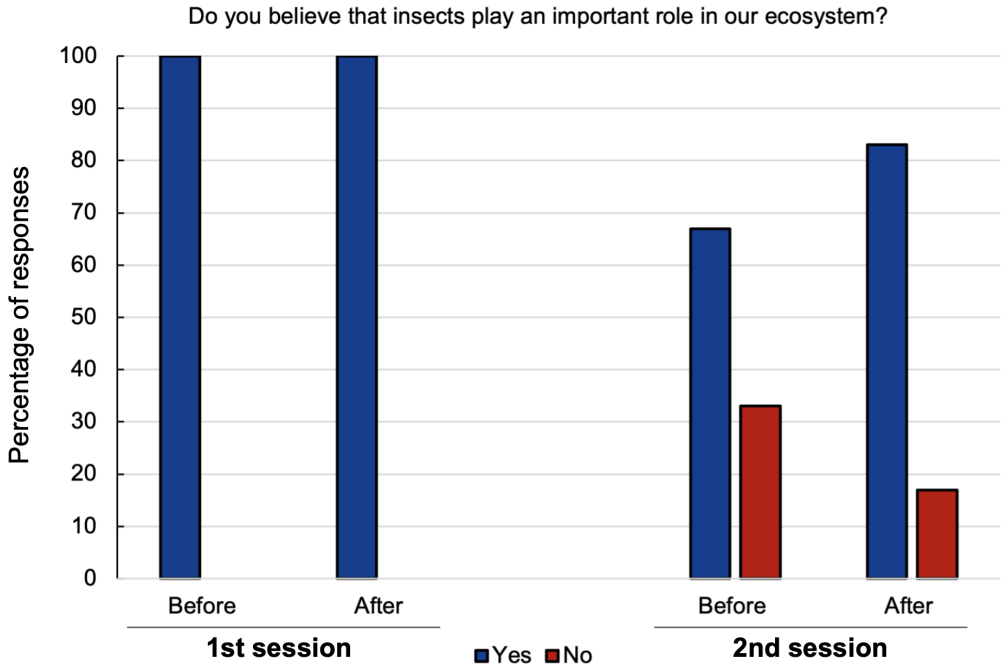

Figure 4 - Who Believes insects play an important role in our ecosystem?

Question 5 - Do you know what pollinators are?

For the first session, the students reported a significant (***p* < 0.0001**) increase in their level of awareness about pollinators and their role in ecosystems (Fig. 5). Prior to the intervention, 33% of students (*n*=21) reported that they know what pollinators are, and after the intervention, 100% of students (*n*=12) reported that they know what pollinators are (Fig. 5). However, for the second session no differences ($p > 0.05$) were noted in the before and after surveys.

For the second session, and prior to the intervention, 83% of students (*n*=6) reported that they do know what pollinators are, and 17% reported that they do not. After the intervention, 67% of students (*n*=6) reported that they know what pollinators are, while 33% reported that they do not know (Fig. 5).

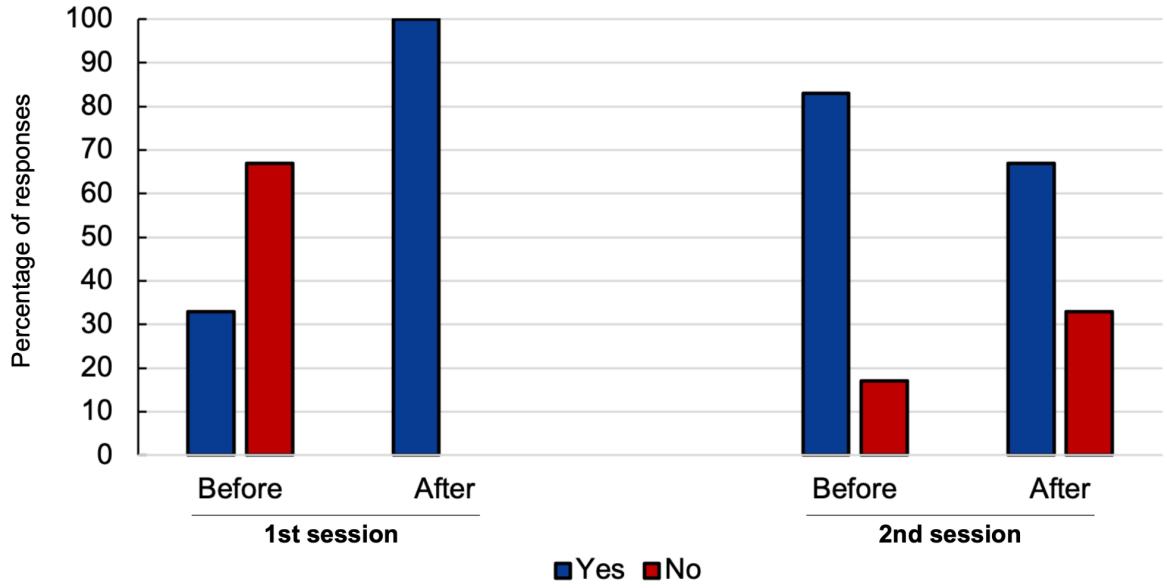

Figure 5 - Do you know what pollinators are?

Question 6 - Do you think people and insects can live together in peace?

For question six, students were given three options to choose as an answer; yes, no, and neutral. In the post survey, 60% of students (*n*=18) reported that they think insects and people can live together in peace, while 40% of students answered that they were unsure (Fig. 6). There were no significant ($p > 0.05$) values to be reported.

For the second sessions' post survey, 67% of students (*n*=6) reported that they believe people and insects can live together in peace, while 33% reported that they do not believe people and insects can live together in peace (Fig. 6).

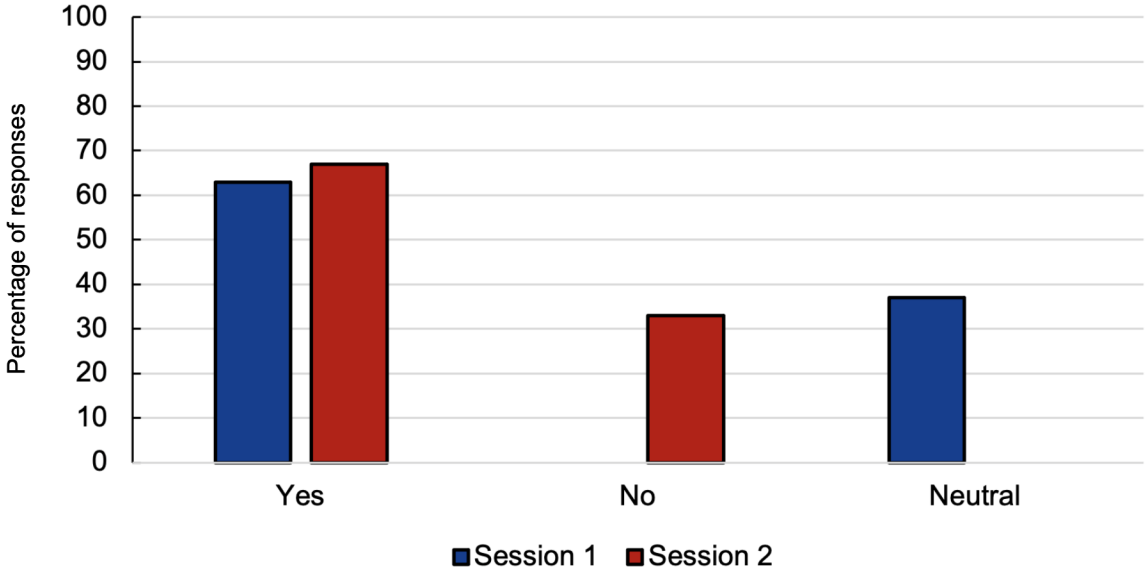

Figure 6 - Do you think people and insects can live together in peace?

Question 7 - Are you curious to learn more about insects?

For question seven, students were given three options to choose as an answer; yes, no, and neutral. In the post survey, 38% of students (*n*=18) said yes, while 63% said they were unsure. Ten students did not respond (Fig. 7). There were no significant ($p > 0.05$) values to be reported.

For the second session's post survey, 50% of students (*n*=6) reported that they were curious to learn more, while 50% reported that they were not (Fig. 7).

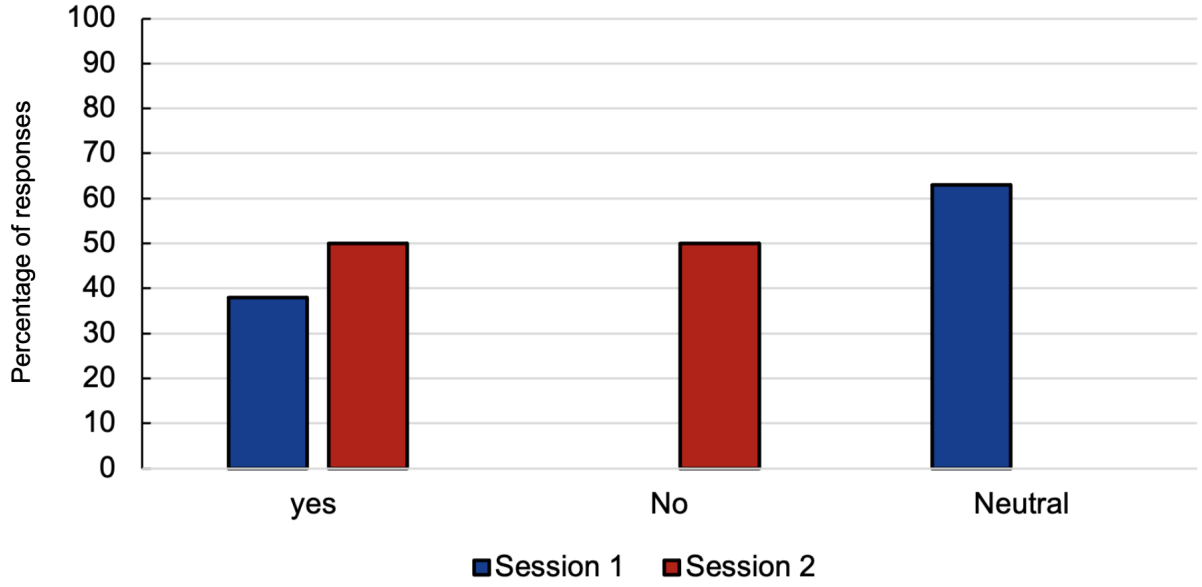

Figure 7 - Are you curious to learn more about insects?

The following two questions were to be answered by students with an example:

Question 8 - What is one insect behavior or characteristic that surprised you the most?

Two students (*n*=18) agreed that they were surprised that Madagascar Hissing cockroaches had "spikey" legs but that the spikes did not hurt. One student answered that they were surprised to learn that cockroaches have an exoskeleton (Fig. 8). No answers were given for the second session.

Question 9 - Did you learn something interesting today that you want to tell your friends or parents about?

One student reported that they were excited to share with their parents that they held a cockroach and that the cockroaches have the ability to hiss (Fig. 9). No answers were given for the second session.

Discussion

While the results of the survey are inconsistent, we still argue that the curriculum and our implementation of it was effective in improving the attitudes of a number of the students in ways that were not necessarily reflected in the data. Prior to session one, we were instructed to not give the students any sort of 'handout' type assessments or worksheets that would resemble a school setting. This stipulation made evaluating considerably more difficult. Initially, we thought it would be a good idea to weave the questions from the pre-survey into the icebreaker discussion. However, on several occasions, students or a member of our team would unwittingly bring up a topic that was on the survey and the group would start discussing it before the question was asked formally. The issue of a compromised pre-survey was made worse by students having to raise their hands to indicate a response. Students were prone to looking around at their friends and changing their answers based on what others were saying or not saying. This created biased responses. For this reason, we elected to use a typed handout for the pre and post surveys of session two and the answers were much clearer, and the data easier to assess. However, the sample sizes for both sessions were too small to do comprehensive statistical analyses, and more specifically, six students to survey during the second session made it difficult to draw major conclusions. Further, the students that comprised the second session's cohort were particularly difficult to work with, since they were likely unwillingly elected into the after school summer program and hence, more unwilling to cooperate and provide truthful and/or thoughtful answers to our evaluations.

The only question that returned a significant result was question five of the first session, which asked students 'Do you know what pollinators are?'. During the pre-intervention survey, only 33% of students could confidently report that they knew what a pollinator was, while in the post survey, 100% of students reported that they knew what a pollinator was. This was one of the main takeaways for the students. Questions eight and nine were short answer based questions, included in the survey with the idea of giving the students space to mention anything that was not mentioned in the surveys earlier. The only responses we received were during the first session where students were excited to share that they held cockroaches and that cockroaches have "spikey looking legs that don't actually hurt when you touch them!". Session two students refused to give responses to these questions, also highlighting their unwillingness to cooperate.

The favorite activity was definitely the live insect "petting zoo" and specifically the Madagascar Hissing Cockroaches. During the course of the day at CHARM, during both sessions, we had students come over to engage with us and the cockroaches while they were supposed to be doing something else on the farm. Students that came over to see the cockroaches after they had seen them included one student who reported to like insects and five students who reported that they did not like insects, yet they were so intrigued by the live insects that they left their elected activities to spend more time with them.

One of the directors of the camp, through personal correspondence, said repeatedly that our curriculum was the highlight of the summer and that they were eager to have our group back the next year.

Conclusion

If a person were to conduct a similar program and look to gain insight into the students by surveying in a similar way, it would be imperative to utilize different methods of data collection. We posit that paper surveys, in isolation from other respondents, may be necessary for honest, thoughtful answers. To assist in this, a small incentive may be necessary to motivate otherwise unccoperative students. Although our data does not reflect a considerable impact of our curriculum (with the exception of increased knowledge on pollinators), we were able to tell, if just from the looks on those kids' faces, that our program made a difference in the way that the students thought about insects. From the anecdotal evidence of talking to the kids one on one while they folded origami, to the handwritten thank you notes we received from both campers we argue that our curriculum indeed influenced the knowledge that students have about insects and their important roles in our environment.

Acknowledgements

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