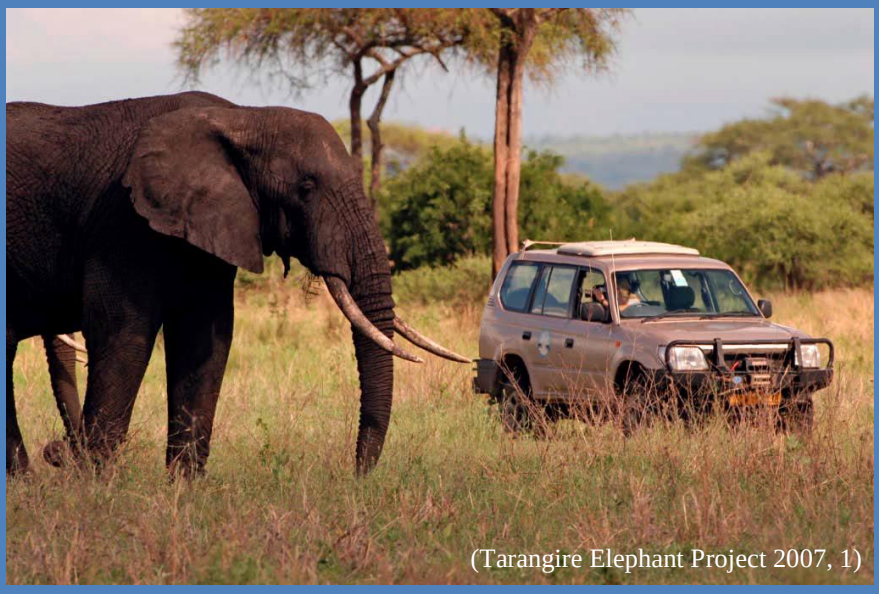

(Tarangire Elephant Project 2007, 1)

Be an Elephant Scientist

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MSTD A510 - Museum Education

Museum Education Program Plan for the Indianapolis Zoo

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Introduction

The educational theory for this project will be discovery learning. This will support the Super Science Saturday programs' intent to have kids investigate zoological situations using the scientific method. Discovery learning posits that knowledge exists outside the learner (Hein 1995), the learner constructs knowledge, and that learning is inquiry based (Discovery Learning 2014). These points all align with the rationale that guides discovery through the scientific method. First, the scientific method is a tool to make discoveries about the world and the reality that exists outside the investigator. Second, that using the method helps the investigator to construct theories around knowledge of evidence, as one uses the scientific method to study a situation and reach a conclusion. Third, that the scientific method leads one to hypothesize, observe, and investigate in order to answer questions.

This program at the Indianapolis Zoo will give participants an experience with the scientific method and discovery learning in each activity. Participants will use a process of inquiry -the scientific method- for uncovering information and knowledge about elephants and the natural world. For instance, they will examine elephants on their tour with the elephant keepers and then report what they saw, what they learned through observation; the learner examines knowledge that exists outside themselves. In addition, participants will gather new information from outside themselves during games and integrate that knowledge into their own framework of knowledge; they will use their experiences in the activities to construct their own knowledge. Furthermore, facilitators will guide this construction of knowledge through activities and questions. The participants will uncover answers to scientific questions because the activities are inquiry-based. In this way, the discovery learning theory drives the development of this program.

Program Overview

Program Name: Be an Elephant Scientist

Type of Program: Children's workshop

Proposed dates: Any Saturday morning in the Summer or Fall, 8:30-11:30 AM

Program Description: The "Be an Elephant Scientist" program is part of the Indianapolis Zoo's Saturday Science programs. The Saturday Science programs are opportunities for kids to learn more about the natural world through science. Each program has a different animal or group of animals as the subject, and this one is on African Elephants. The purpose of the program series is to have kids investigate zoological situations by utilizing the scientific method. This is a paid, 3-hour workshop program, where participants observe, question and explore areas of the Zoo. After meeting for initial meeting and instructions, the kids spend half of the time visiting the elephant habitat, getting a behind-the-scenes tour and meeting the animal keeper. The other ninety minutes are set in an indoor, private, classroom setting.

The "Be an Elephant Scientist" workshop will have three activities. The first will be "What Makes an Elephant Special?" where kids will report their observations on the unique features of African Elephants. Then, in the Migration Game, the kids will get up and move around during a role-playing, choose-your-own-adventure style game to learn about migration. The final activity will be a guided discussion that walks the kids through three scenarios facing real scientists in the field who are coming up with solutions to real problems.

Target Audience: 6-8 year olds and/or 9-12 year olds.

Anticipated Attendance: There is room for 15 kids in each age group. If there are fewer than 15 kids total, the groups will combine. Since this is a paid workshop with registration, the staff can prepare for the actual attendance size in advance.

Why should the museum present this program?:

- The Indianapolis Zoo empowers people and communities, both locally and globally, to advance animal conservation. This program teaches kids about Elephants and influences their attitudes and values about elephant conservation, and the projects that work to protect elephants and their environments (Guillain 2013, 30).
- These programs give youth a Zoo experience that allows them the opportunity to investigate animals while exploring the scientific method.

Will you need special signage? There should be a temporary sign to assist way-finding.

Describe the museum spaces that will be used for program: There is an empty classroom for use in the Hix Institute, with table and chairs available

Learning Plan

Activity 1: What makes an elephant special?

Program Title	What Makes an Elephant Special? (Activity 1)
Approx. time	20-30 minutes
Theme/Big idea	African elephants have special features that are unique in the animal world. (The Elephant TAG/SSP Steering Committee n.d., 2)
Main Message(s)	Ears, Trunks, Tusks, Feet and Skin are important physical features; Scientists observe things in order to learn and ask questions/hypothesize
Target Audience	6-8 and 9-12 year olds
Interpretation Type	Puzzle/pin-the-feature-on-the-elephant poster PowerPoint of picture examples Individual note-taking in "field notebooks"
Interpretation Objective	Kids will observe specific features of elephants during their tour Kids will relate what they observed about their assigned feature. Kids will see photos of elephant features that complement what they report. Kids will gain knowledge about what features define an elephants
General Learning Outcomes	Learning facts or information Deepening understanding
Anticipated Participant Interactions and behaviors (outcomes)	Observe assigned features during zoo keeper talk Kids can name and describe unique features of African elephants Group discussion on what they observed about that feature
Proposed metrics to measure anticipated outcomes	Interpreter will be asking questions, so could judge what details kids noticed
Interpreter's procedures or methods to bring about anticipated interactions	Assign individuals particular features for pay attention to during the tour. Have groups with the same feature talk with each other about what they observed.

	Interpreter has poster with different features to attach after class discussion. Call on groups to share. Guide answers with PowerPoint photos and questions.

Materials:

- Field Notebooks (See Appendix A)
- 4-8 rolls of Scotch tape
- pencils
- colored pencils
- stickers- preferably with elephants
- "Feature Pictures" (See Appendix B)- one picture for each kid in the program
    - 4 pictures of ears
    - 4 pictures of trunks
    - 4 pictures of tusks
    - 4 pictures of skin
- "Feature Note Summaries" (See Appendix C)- each kid will need all three summary boxes
- hands-on zoo objects (items the zoo has for educational purposes that the kids can touch and pass around when learning about different features)
    - Ex: ivory tusk
- Poster board with elephant "puzzle pieces"
    - Each piece corresponds with a feature (ears, trunk, tusks, skin). Small Velcro tabs keep the pieces on the board. When all features are up, the elephant figure is complete
- PowerPoint presentation with photos of elephants.
    - Two or more photos per feature.
    - Detail shots are most useful for helping make observations, and for providing visual variety

Script/Instructions:

1. As kids arrive, hand out a field notebook to everyone. Tell them they will use the field notebooks throughout the day like scientists- to note observations and record findings
    a. early arrivers can decorate their notebook covers with colored pencils and stickers

2. Before taking kids out to see the elephants and go on the tour, hand each kid a small detail picture of the feature (ears/trunk/tusks/skin) you are assigning them to pay attention to during the tour. Have them tape it in their field notebook to remind them what they are looking for. Tell each kid to pay attention to their specific (ears/trunk/tusks/skin) feature of the elephants today and think about why that feature is important to elephants.

3. Go on tour [90 minutes] and return to classroom

4. Split kids into groups according to their feature of study (ears/trunk/tusks/skin)

5. Have groups discuss what they noticed about the feature and why it is important to elephants [5 minutes]

6. Pull up PowerPoint with a slide of a whole elephant

7. Pull out empty poster board and puzzle pieces (see Figure 1 for example). Keep puzzle pieces face down on table so that you can reveal them one by one as you discuss the features

8. Pick up the Ears puzzle piece, and ask the "Ears" group to talk about their assigned feature and share what they observed. Repeat the answers and correct false statements if necessary. If they struggle, use the detail photos of the PowerPoint to point things out and ask questions. Give a few other answers, and place the puzzle piece on the poster board.
    a. If there are any relevant educational props of the zoo, the volunteer can walk the items around, or let the kids pass them around as the feature is being discussed. For example, when learning about tusks, the zoo's ivory could be passed around, letting kids learn even more, through touch.

9. Repeat with Trunk, then Tusks, then Skin (any order is fine as long as it matches the order of the prepared PowerPoint slides).

10. Go through the remaining pieces (eyes, tail, feet), picking up the puzzle pieces and asking the whole group what they observe. Use PowerPoint pictures to prompt answers.

11. When you have finished speaking with all the groups, all the puzzle pieces will be up on the poster board to make a complete elephant image.

12. Congratulate the kids on their observations. Announce that they are working like scientists. Elephant scientists OBSERVE the animals- what they look like, how they behave, where they go, what they do, etc. With all that information, they can notice

patterns, see problems and come up with a guess or HYPOTHESIS of how to solve that problem.

13. Hand out charts with summary of feature facts (see Appendix C). Have kids tape these charts in their field notebooks as reference.

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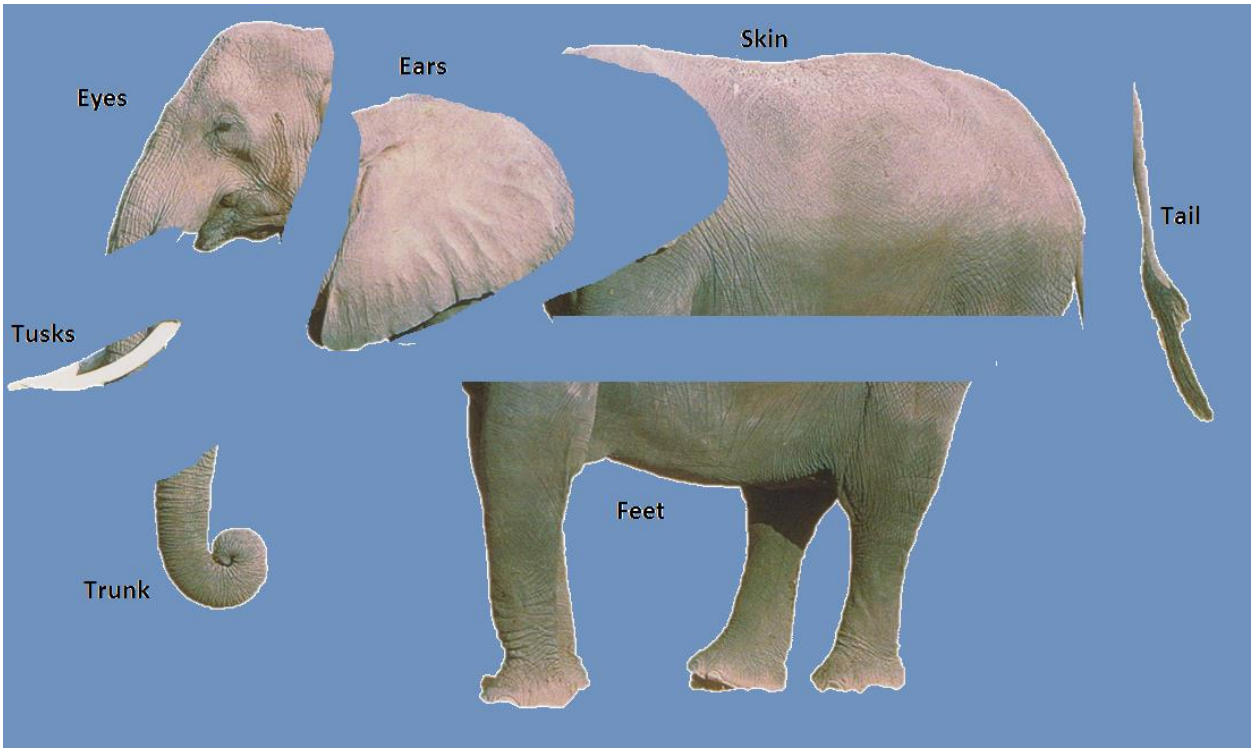
Figure 1: Poster board& puzzle pieces



(Modified from Barnes 2007, title page)

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Below are the points to cover about each feature. Ask kids what they noticed about the features and then "Why is that important?", or "Why do you think that helps them survive in their environment?" Try to draw out answers and observations, but can mention some facts as "Did you know that___?" statements

Activity 2: Migration Game

Program Title	Migration Discussion and Game (Activity 2)
Approx. Time	35-40 minutes
Theme/Big idea	Elephants must migrate to survive; they to move around to find food and water, and there are many dangers
Main Message(s)	Elephants are intelligent animals that display complex behaviors (The Elephant TAG/SSP Steering Committee n.d.,4). Elephants are under enormous pressure in the wild, which threatens their survival (The Elephant TAG/SSP Steering Committee n.d., 11). Elephants need help from humans (aka conservation)
Target Audience	6-8 and 9-12 year olds
Interpretation Type	Role-playing game
Interpretation Objective	Kids will play on the same team/herd and make decisions together Kids will learn about the dangers elephants face in the wild. (Kids will understand the importance of matriarchs as memory-keepers?)
General Learning Outcomes	Having fun Deepening understanding
Anticipated Participant Interactions and behaviors (outcomes)	Kids can name some of the dangers elephants face during migration Kids feel concern for elephants facing danger and needing conservation help
Proposed metrics to measure anticipated outcomes	At the end, will have group discussion about what happened and why. Will get kids to contribute answers to a chart listing the natural and human-related dangers to elephants.
Interpreter's procedures or methods to bring about anticipated interactions	Act as facilitator (or 'dungeon master' if you think of Dungeons & Dragons), reading the scenarios to the kids and asking for their decision If kids get discouraged, give clues and hinting questions

Q&A Materials:

1. Field notebooks
2. there is a page with the questions and a place to fill in the correct answer
3. YouTube video queued up with sound (https://www.youtube.com/watch?v=3tHiZVyeLx8)
4. GPS mapping image (see below)- either on PowerPoint, or a printed handout to pass around
    - A small image of the map is in the field notebooks, but it is not printed large enough to be able to read the details.

Introduction /Q&A script

❖ Staff asks the questions below and listens to kids' answers, guiding conversation and confirming/giving answers.
    - For the older kids, this could be reframed as a series of multiple-choice questions, like a gameshow. With younger kids, it would be better to gather their answers in a group conversation, instead of adding "wrong answer" options in the mix, which might get confused with the correct answers.

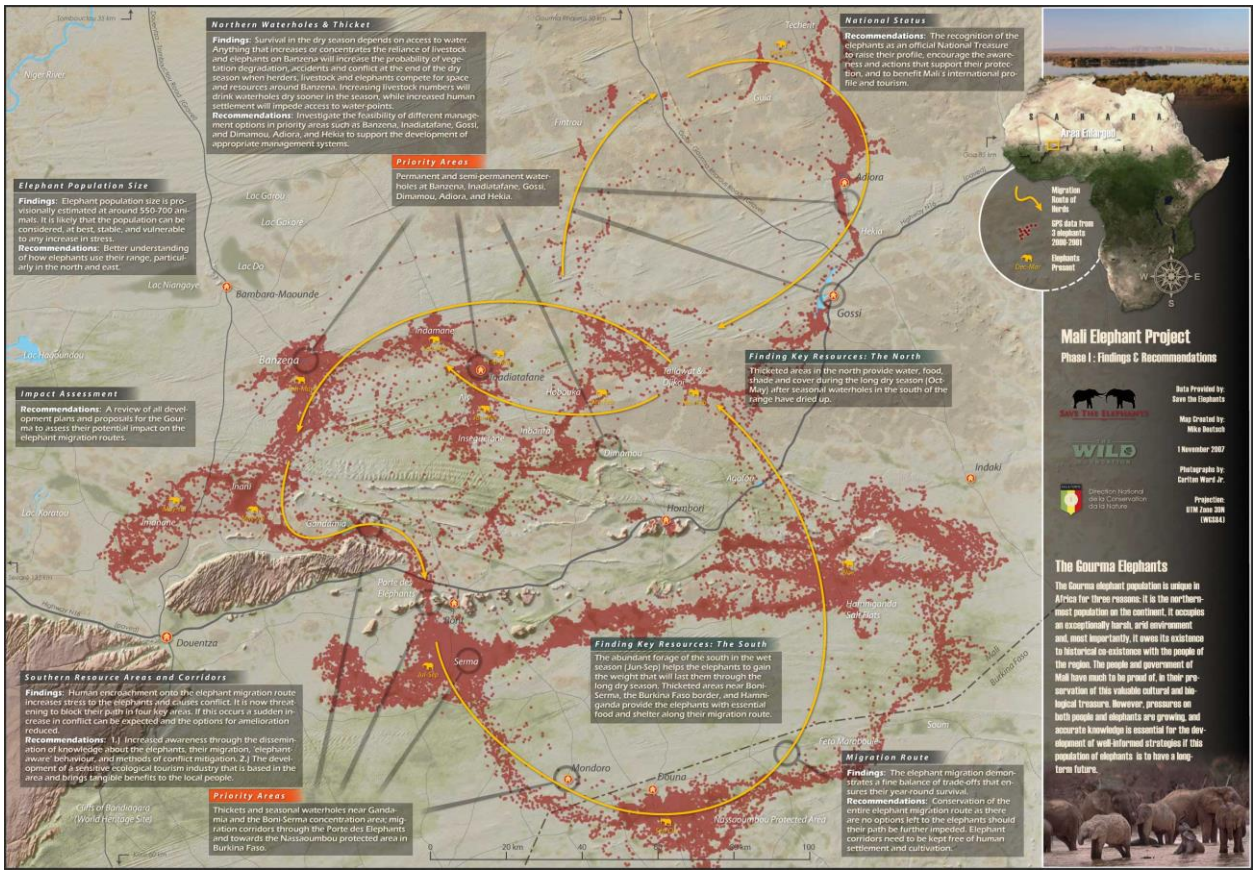
❖ When the correct answer is revealed, the kids can write this down by the question in their field notebooks.

Q&A [10 minutes]:

- Q: Elephants are large animals. How much do you think an elephant in the wild eats every day?
    - A: 300 pounds of grass, bark, leaves
- Q: And they need to drink water to survive. How much do you think and elephant drinks every day?
    - A: 40 gallons a day
- Q: Since elephants live together, the whole herd eats and drinks a lot. At the zoo, the keepers bring food and water to the elephants, but what about in the wild? How do elephants find enough to eat and drink?
    - A: Elephants don't sleep much (about 4 hours a day) because they need to spend a lot of time looking for food. They usually find a watering hole (where rainwater collects, like a pond) to drink from and eat the plants around the watering hole.
- Q: But there a lot of elephants eating and drinking a lot, so they eventually have eaten all the food around the watering hole. So now what? What do they do to survive?
    - A: They walk to a new watering hole with more grass and plants to eat. When they finish the food there, they walk to a new place. They don't live in one place, and don't have a "home" spot like humans. They migrate.
        - Migration: moving from one region or habitat to another for food

- A: They travel in a large circle, from one watering hole to another in a loop

- Q: Elephants migrate long distances. How far do you think they can travel in a day? How far do you think they travel while migrating for the whole year?
  - A: Can travel up to 90 miles a day (Marsh 2010, 5)
  - A: Some elephants that live and migrate around deserts "travel between 280 and 435 miles every year. Travelling 435 miles is like walking from Washington D.C to New York City and back every year!" (Marsh 2010, 14)
- How do we know this?
  - "Scientists are able to find out how far an elephant travels by attaching a GPS tracking collar around its neck. The elephant is given medicine to make it fall asleep so that the scientists can safely attach the collar. When the elephant wakes up, it joins the herd and goes back on its way" (Marsh 2010, 15)
  - watch video of a scientist putting a GPS/satellite collar on an elephant [2:39 min]: https://www.youtube.com/watch?v=3tHiZVyeLx8
  - Show map of GPS tracking (below). It maps the locations of threeelephants with GPS collars for the year 2000. The red dots are the elephants' location, and the yellow arrows show the general direction of their migration route.



Migration Game:

[15-20 minutes]

Now, we're going to play a game to see what it's like for elephant herds to migrate

Game Materials:

- 14 paper plates, "scenario spots"
    - decorate the back of the plate like an elephant footprint if possible, and include a number (1-14), so that it is visible without moving the plate
- 14 scenario cards
- 20-40 beads
    - Each group starts with 20 elephants (and there may be multiple groups), which the beads (or other small objects) represent
- 2-4 tickets
    - each group starts with 2 "Ask a Matriarch" tickets (or elephant figurines, as long as they are physical objects they can hand in) which they can turn in for help making decisions.

Game Preparation:

- You don't have to move chairs or tables. You will have the kids move around the room, but the "scenario spots" will be spread all over the room.

- Set up paper plates face down around the room to represent places where they will make a choice. The back of the plate (facing up) looks like a footprint and has a number (1-15).

- They should generally go in numerical order, starting with 1, and going clockwise around the room in an approximate circle. See appendix D for placement and flow ideas

- Collect your scenario cards (see below)

Game Instructions:

1. Gather the kids into groups. Depending on the number of kids attending, there could be 1-2 groups. Tell them their group is now an elephant herd.

2. Tell them that they are elephants migrating for a year. During this time, they will face many dangers. They will arrive at different situations (the plates) where they need to make decisions to protect the herd.
    a. They are starting with 20 elephants, and may lose some along the way, but they need to make it back to the beginning with at least 10 elephants in order to finish.

The facilitator has a pile of beads to represent the number of elephants in the herd, and will take beads away if the herd loses an elephant.

b. They have 2 chances to "Ask the matriarch". If they have trouble making a decision, they can turn in one of their representative tickets/elephant figurines and ask the "matriarch" (facilitator or volunteer, someone who know the best answers) for a clue.

3. The kids read the scenario number for the plate they are standing at, and you will consult your notes and read them the scenario for that number.

4. Give them their two options. They will make a decision together, and vote by raising their arms "trunks" for each choice. Majority vote makes the decision.

5. They hear the "consequence" of their choice and move to the plate corresponding to their choice.

Scenario cards:

The kids will read the number on the plate they choose, and the facilitator would then consult her notes and read the scenario in the second column. She then gives the kids their options from the third column. They vote by show of hands/"trunks", make a decision together and then tell the facilitator what they choose. She then reads the answers from fourth column, tells them where to go next, and explains the importance of the scenario with the fact in the final column.

#	Scenario	Options	Results	Fact
ex#	Situation premise	option #a	Result of choosing #a. Go to #_.	*Fact to mention to kids
		option #b	Result of choosing #b. Go to #_.	
1	You find food and start eating, but it tastes SPICY	Do you leave the food and look someplace else? You probably want some water to wash away that hot taste from your tongue!	You leave the farm and the chili plants and go to find a watering hole. Go to #3	* elephants don't like chili or plants that are spicy
		Do you keep eating even though it hurts your tongue?	You keep eating the chili plants and hurt your tongue and get an upset stomach	

			that makes you walk slowly. Go to #2	
2	You smell lions.	Do you stop and make the adults circle around the young elephants?	The adults protect the young elephants and use their tusks and trunks to keep the lions away. Go to #4	* when lions and other predators are nearby, the adult elephants call to each other and circle around the young elephants like a wall to protect them
		Do you run away? The little elephants are slower but they may be fast enough.	Most of you get away, but the lions stopped chasing you after they caught a baby elephant and ate it. [minus 1 elephant] Look to your matriarch for what to do next. Go to #3	
3	Your Matriarch remembers that there is watering hole nearby	Do you follow her and try to find the watering hole?	You arrive at a place where there should be a watering hole, but there is only a little water and food because a farmer's livestock (animals raised to sell or use) are there to eat and drink too. Eat and drink what you find. This will be a short stop. Go to #4	*Livestock eat and drink food and water from places where elephants traditionally stop during migration. They compete for the same resources *"an elephant matriarch never forgets. That powerful memory leads her herd to food and water in times of drought; their survival depends on it." (96 Elephants 2014)
		Do you keep walking? Maybe you will find a new place with water. After all, why should you trust her memory?	You don't find any new water, and now you're thirsty, but you hear something ahead. Maybe it's water? Go to #2	

4	You hear bees buzzing	Do you run away? You don't want to get stung	You get away without getting stung. One danger avoided. Go to #5	* elephants flee from bees. The bee stings are painful to their sensitive skin
		Do ignore them?	You get stung and it HURTS! Look for water and a dust bath to make your skin feel better. Go to #6	
5	You find food and start eating, but some of the plants taste HOT!	Do you stop eating and leave? This does not taste good and hurts your mouth	You leave the ginger plants and keep moving. Maybe you can find better food somewhere else. Go to #7	* elephants don't like ginger or plants that are spicy
		Do you keep eating? It's food and you're hungry.	Your mouth hurts too much after a few bites and you leave to find water. Go to #6	
6	You are very thirsty and need water.	Do you go to the nearest watering hole that your matriarch remembers? It's been a long time since she was there and none of the other elephants have been there before.	Your matriarch remembered the place, but when you arrive at the watering hole, you find that it is empty, because a farmer has brought his cattle to the watering hole and they drank it up Go to #7	*Elephants compete with human's livestock for water *Matriarchs have good memory, and as the oldest elephants in the herd they have more memories and experiences than the other members of the herd
		Do you keep heading to the watering hole everyone has been to before? It's farther away, but you have been there before and you don't trust the matriarch's memory	You are still thirsty and haven't reached the waterhole yet, but you smell plants and stop for some food so you will have some energy to get to the watering	

			hole. Go to #5	
7	You hear trucks coming. What could it mean?	Do you run away? You remember one time humans in trucks killed a member of your herd.	You run, but the poachers kill 2 of your herd. [minus 2 elephants] You have to get out of this place. Go to #9	* Poachers kill elephants for their tusks. This killing is one of the reasons elephants are endangered animals. Plus, they usually kill the elephants with large tusks, which are the oldest, like the matriarchs who have important memories of where to find food and water, so the death of a matriarch endangers the whole herd. Elephants have good memory and grieve over the deaths of herd members. Some elephants that have had herd members wounded or killed by humans become aggressive towards all humans
		Do you keep eating? Maybe it's tourists to take your picture.	It is poachers! They kill 5 of your herd. [minus 5 elephants] You have to get out of here, away from humans. Go to #8	
8	You find a patch of green, delicious maize/corn, but when you start eating 10 humans come and throw stones and make lots of noise	Do you walk away? The loud noises are frightening, and you remember what happened the last time you ran into humans	You walk away without getting hurt, but you are still hungry. Go to #10	* elephants will eat food from farms, and the farmers try many ways to scare away the elephants, sometimes by throwing stones, shouting, setting off loud firecrackers and making noise. This can scare or hurt the elephant and when they are upset like this they may hurt the humans.
		Do you try to scare the humans? You are bigger than they are, and you could charge towards them. Maybe then, they would run away and let you eat in peace.	You charge towards the humans and they run away. Lucky for you, none of them have a gun with them today or they might try to shoot you in defense. They still make noise so you leave to find food somewhere else Go to #9	

9	You are walking the traditional path to the next watering hole, but this year there are buildings and humans in the way.	Do you walk far around the buildings? It will make your journey longer, but you don't want to bump into any humans	You try to get back to your path but not walk near the human buildings. Everyone is tired and thirsty though, so you are walking slowly. Go to #10	* As humans expand the areas of development, they intersect traditional migration pathways and run into elephant encounters
		Do you walk near the buildings? There might be food, and you don't want to add to much more distance to your journey	You are walking near the buildings when a bunch of humans run out, making noise and being frightening. You run away before anyone gets hurt, but you might come back after dark. Go to #8	
10	You are relaxing at a watering hole when you hear another elephant making the DANGER! alarm	Do you run away? The elephant must have seen, smelt, or heard something dangerous like a lion or hyenas.	You all get away without anyone getting hurt. You meet up with another elephant herd later, they must have been the ones to sound the alarm, and everyone is glad to see each other. Go to #11	*Elephants communicate with vocalizations. They can recognize when the vocalizations come from someone outside their herd
		Do you ignore the sound? After all, it doesn't sound like anyone from your herd.	One of your herd members doesn't show up at the watering hole and you don't know what happened to her. [minus 1 elephant] There must have been something dangerous out there like a predator or	

			poacher. Go to #12	
11	It's finally raining! The rainy season has started.	Do you start to move South where the rain is filling old watering holes and making new food grow?	You head back to where the old watering holes are refilling. Go to #14	* Mali "elephants begin their migration south as soon as the first rain begins. They know by instinct that it's time to migrate" (Marsh 2010, 18)
		Do stay where you are? Why should rain matter?	You stay where you are until the food and water are gone, then head south, but the food around the watering holes on the way South have already been eaten. You had better hurry to where there is food and water. Go to #13	
12	It is an especially hot this month and there has not been any rain in weeks. You are very thirsty during this drought. What would your matriarch do? [If they still have an "ask the matriarch" __card, they can choose 12a]	Do you have your wise old matriarch? She is old and long, long ago there was another drought, and she remembers where they found water when she was a young elephant.	Your matriarch leads you to water. Thankfully, she was not one of the elephants whom the poachers killed. Go to #14	*"As poachers target the older matriarchs for their large tusks, a generation of young, orphaned African elephants is growing up without guidance. The consequences can be deadly. During Tanzania's drought of 1993, matriarchs that endured a similar event decades earlier knew where to lead their herds for food and water. Groups with matriarchs too young to remember the previous drought lost more than half of their calves that year." (96 Elephants 2014)
		Is your matriarch a young-ish elephant? She does not remember another time there was a drought like this, and doesn't know any special watering holes to look for. You will just have to keep walking.	You eventually make it to some water, but not before 3 elephants died. [minus 3 elephants]. You recover at the watering hole. Go to #13.	

13	One of the young male elephants is growing up and being a pain, being bossy and aggressive. Your matriarch decides he is old enough to live on his own or with other males and send him away. [minus 1 elephant]	How many elephants do you have in your herd? If you have enough to finish, you could keep walking to the start	You keep walking back to your Southern watering holes, happier now that everyone is behaving Go to #14	*When male elephants grow up, they leave the herd *Sometimes small herds join together, so they can have a big enough family, and take advantage of a wise matriarch
		How many elephants do you have? If you need more elephants in order to finish, wait for another small herd to join you.	You wait to meet up with another herd. Luckily, they are small, with a wise matriarch and they are happy to have you join them (wait a turn, then proceed to #14)	
14	You hear trucks coming. You remember what happened when the poachers came.	Do you run away? You remember one time humans in trucks killed a member of your herd	Before you can all run away, the trucks arrive. You are lucky. These are not poachers, but tourists. They take your picture, and you can go about your business, eating and drinking at the watering hole. The end.	*Tourists come to see elephants, which is good for the people who live near elephants. These are good encounters with humans. * Elephants have good memory and grieve over the deaths of herd members. Some elephants that have had herd members wounded or killed by humans become aggressive towards all humans
		Do you keep eating? Maybe they aren't poachers.	You are lucky. These are not poachers, but tourists. They take your picture, and you can go about your business, eating and drinking at the watering hole. The end.	

Conclusion:

[8-10 minutes]

Conclusion Materials:

- Field notebook
- Materials for facilitator to make a chart (either a large piece of paper and a marker, or chalk and a chalkboard, or whiteboard and a marker, whatever is available)

Conclusion Instructions:

- End with a discussion of what happened and why. This gives the facilitator a chance to reinforce some of the decisions and consequences.
- Together, make a list of elephants' natural dangers and the dangers from humans. This is an embedded assessment activity. Kids call out dangers, and facilitator writes them down in the appropriate column. They can replicate this chart in their field notebooks
- Discuss dangers elephants face during migration, and the decisions the matriarch has to make.

Activity 3: How do you get an elephant to change its mind?

Program Title	How do you get an elephant to change its mind? (Activity 3)
Approx. time	20-25 minutes
Theme/Big idea	As elephants migrate, they run into places of human development, and conflict arises between elephants and humans. Scientists use what they observe and know to make hypotheses and test solutions to problems.
Main Message(s)	Scientists use the scientific method to keep elephants away from humans and avoid human/elephant conflict, especially over eaten crops. The more we know about elephants, the better able we are to conserve them (The Elephant TAG/SSP Steering Committee. n.d., 12).
Target Audience	(6-8 and) 9-12 year olds
Interpretation Type	Tell a story/scenario and set the scene Get kids to put the clues together and hypothesize how the scientists used their **observations** to come up with ideas or **hypotheses** and then **test** those ideas.
Interpretation Objective	Kids will learn about human/elephant conflict around farms Kids will use the facts they have learned earlier to make suggestions and guesses about what the scientists in the scenario should or could do. They are practicing making **hypotheses**
General Learning Outcomes	Being able to do new things/ knowing how to make a hypothesis Deepening understanding of information from previous activities
Anticipated Participant Interactions and behaviors (outcomes)	Kids make suggestions in response to the story/scenario. They make hypotheses
Proposed metrics to measure anticipated outcomes	Interpreter will be asking questions, so could judge what details kids noticed
Interpreter's procedures or methods to bring about anticipated interactions	Read scenario and ask questions. Guide the conversation

Materials:

- PowerPoint with pictures of the scientists and their work
- large sheets of paper
- coloring pencils
- pencils

Introduction/Script

In the game we just played, there were times when elephants were bothering farmer's crops. They found all this yummy food and thought "Yes! We found some great food, let's eat here for a while". But the farmers don't like when the elephants come to the farms and eat. They eat and trample (step on) the food the farmer needs to feed his/her family. An electric fence works sometimes, but most of the farmers who live near elephants cannot afford an electric fence. So, how do you stop an elephant? They are very big, and can be dangerous if they are afraid or angry, so you can't just pick them up and carry them out of your farm. How do you keep them from going somewhere they want to go?

Brainstorm Activity [10 min]:

1. Break kids into small groups (2-5 kids per group) at tables with pencils and a large sheet of paper
2. Ask the kids to come up with some ideas of ways to keep elephants away from humans or out of crops.
3. After they have a few ideas, ask them to make a quick sketch of one and draw it on their piece of paper
4. Have each group share their idea

Wrap up with saying: Scientists right now are asking these questions and trying to figure out solutions so that the elephants don't eat from the farms and the farmers don't hurt the elephants. Let's look at some ways that scientists are trying to keep the elephants off the farms, and see if we can guess what experiments they are testing

Scenario 1:

Dr Lucy King (a real scientist) has studied elephants in Kenya. In the area she studies, there are farms in the same places where there are elephant migration paths. Elephants that pass the farms while migrating to the next watering hole often come onto the farms at night, and eat and trample the crops. The farmers are poor and want to protect their crops. How can they do this? They cannot afford electric fences that would give the elephants a shock and keep them out of the crops. Sometimes the farmers see or hear the elephants in the field and try to scare them away by throwing stones, setting off loud firecrackers or shooting guns in the air. If they are frightened or hurt, the elephants can get aggressive (angry and dangerous) and elephants and humans get hurt.

Dr. King wants to find something natural to keep the elephants away. She wants the farmers to be able to have something to make their fences keep away the elephants.

What things are elephants afraid of? Remember what you heard/learned in the game. (Possible answers include:)

- lions
- humans/poachers
- **bees**

Yes, bees! Elephants have sensitive skin and the bees' stings are very painful. Scientists like Dr. King observed that elephants run away even from the sound of bees. How do you think Dr. King used this information to help farmers build fences that scare away elephants?

- (Ask kids about how they think the scientist used what she knew about elephants' fear of bees to come up with an idea to keep the elephants out of farmer's fields.
- Get a few answers and then continue the story to reveal Dr. King's hypothesis)

Dr. King and her team of scientists had the idea to make fences with honeybee hives. (see picture, use in PowerPoint). All around the crops, they hang beehives, so if the elephants get close they will hear the buzzing of the bees and run away, or may get stung and run away. The bees make their hives in the wooden boxes, and they are hung close together, so the elephants cannot sneak past the bees. This solution has the added benefit of providing the farmers with honey and beeswax to make candles, which they sell. Plus, bees are pollinators, which means they help plants grow, so it is good for the crops too.

Beehive fence protecting a farm in Chumviyere Community

Successful beehive fence protecting a field of maize

Do you think it worked? What do you think happened?

- (Get a few answers before continuing)

The evidence the scientists collected suggests that the fences are working. They compared the number of times farms with bee fences were raided (meaning elephants came and ate) to the number of time farms without bee fences- just the traditional thorn barrier fences- were raided and the farms with bees fences had much fewer problems with elephants.

Do you think this is a good idea? Why?

- (Get a few answers before continuing)

Is there anything you can think of to make it better?

- (Get a few answers before continuing)

Scenario 2:

Caitlin O'Connell was studying elephants in Namibia when she noticed that sometimes an entire group of elephants will "freeze" and stand very still. After observing this many times, she made a hypothesis that elephants were 'listening' with their feet. Through experimentation, she discovered that they can feel vibrations through the ground, recognizing things like thunder and other herds walking a few miles away. But she also found that they can sense specific low-frequency calls from elephants, like alarm calls.

How can elephants warn each other of danger? (Possible answers include:)

- Making calls or noises with their trunks
- Making low-frequency calls that travel through the ground

How could Dr. O'Connell use this information to make something to keep elephants away from farms?

- (Ask kids about how they think the scientist used what she knew about elephants' different way to communicate to come up with an idea to keep the elephants out of farmer's fields.
- Get a few answers before continuing)

She set up fences with recordings to play "danger alarms" of recordings from elephants

- video of her testing a "danger alarm" (NOT at a farm) [0:50 min] (http://www.utopiascientific.org/Videos/EleHerdScare.html)

Do you think her fence idea worked?

- (Get a few answers before continuing)

More experimentation revealed that elephants could tell small differences in calls, and tell whether it is from a trusted elephant or not. She is now doing more work to find an alarm call that will make all elephants run away. She had to **evaluate** and **revise her hypothesis**

Is there anything you can think of to make it better?

- (Get a few answers before continuing)

Conclusion:

Keep thinking about these ideas, and how you would improve them. With what you have learned about elephants today, what other ideas can you come up with to help an elephant change its mind about eating a farmer's crops? Is there a way to use foods that elephants don't like? Sketch out some ideas in your field notebooks in the time remaining.

- (kids can answer questions and sketch new ideas on the Evaluation page of the field notebook)

Discussion

Kids will learn about elephants and science through several activities based on discovery learning. They will go home with new experiences, new knowledge, and a booklet of facts and resources. Kids can bring home the field notebooks they used in the program, which will have their notes and contain more information available for post-visit learning.

There is value to setting this program in a museum, primarily because the kids can see elephants for themselves. The program will help them frame their tour in a critical, observant lens, which they might not have when visiting the zoo independently. The program activities will also help kids make connections between the scientific method, which they use in school, and how scientists in the field use the scientific method.

There are some potential issues to consider. Overall, the program is shifted to the higher end of the age range, and although the handouts to tape in the notebook should reduce the need to be a good note-taker, some of the younger kids may struggle with the writing activities with the field notebook. It may be worthwhile to brainstorm what adjustments staff could or should make for a group of kids all 6-8 years old, in the event that there is a high attendance. Additionally, the approximate time values are only estimates, and staff can judge whether the estimates for each activity are reasonable or not. Staff should consider also replacing some of the photos in this program plan with photos from the Indianapolis Zoo, particularly if they can use photos of the most recognizable elephants at the zoo.

The potential results of attending this program are exciting. It could get kids enthusiastic about science and zoology. It could provoke a strong desire to knowledge and concern about elephant conservation to friends and family who are unaware of the current situation. Or the topic and resources in the field notebook could allow a kid to explore more on his or her own, getting them to voluntarily learn on their own, outside of the classroom.

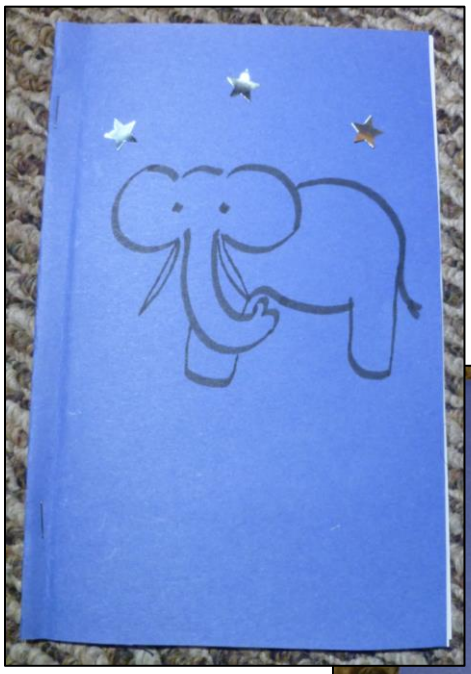
Appendices:

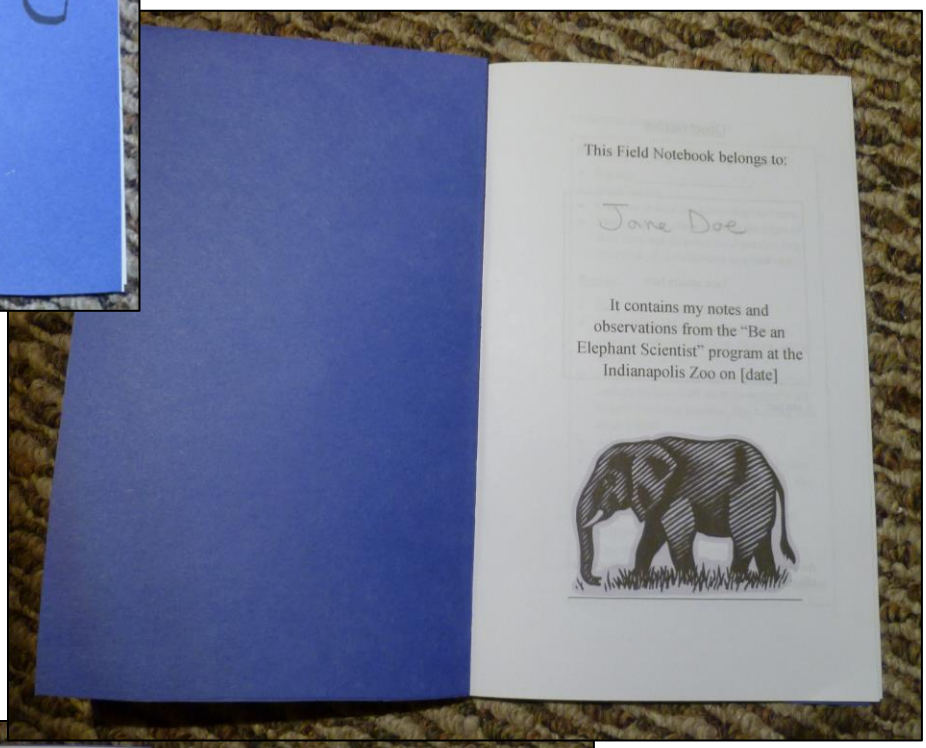
Appendix A: Field Notebook

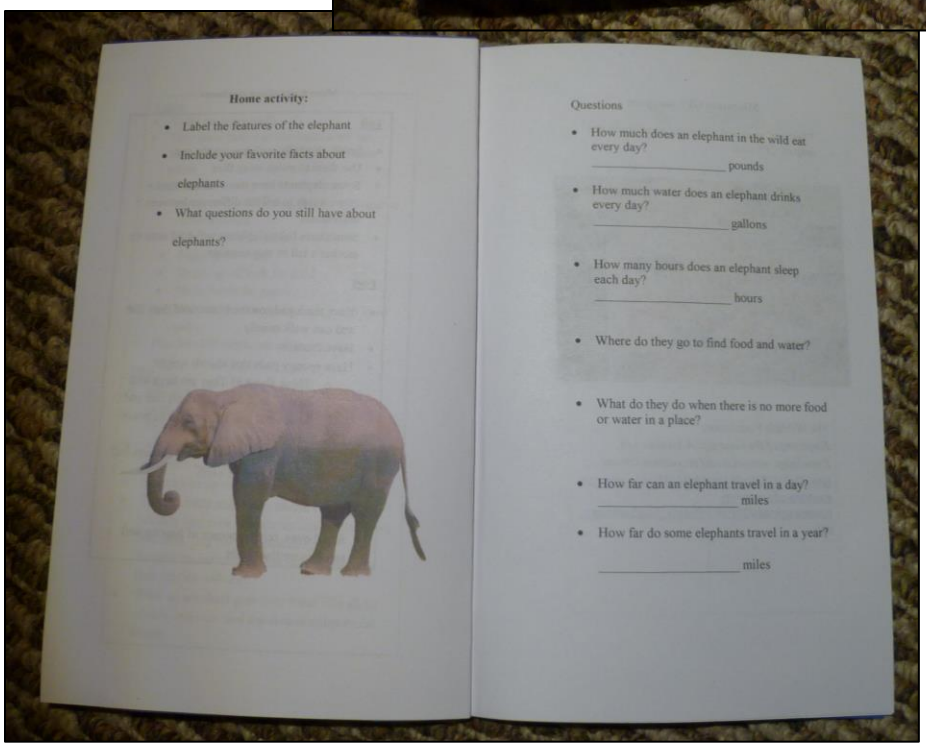
See attached file for the booklet.

- Printed and stapled booklet. Could use construction paper for a cover.
- Kids get it first thing when they arrive
- As kids arrive: hand out a field notebook to everyone. Tell them they will use the field notebooks throughout the day like scientists- to note observations and record findings. It's theirs to keep and take home. No one will be grading them or checking their notes
    - If there are early arrivers, they can decorate their cover while waiting for the others
- Before the tour: Hand each kid a small detail picture of the feature they are assigned to pay attention to, and have them **tape it in their field notebook** to remind them what they are looking at.
- During tour: can take notes in their notebook
- After Activity 1 discussion: hand out note summaries for kids to tape in their notebooks. these are summaries of the facts about each unique feature they just discussed. That way they have the information, even if they are not string note-takers
- During the Q&A of Activity 2: kids will fill in the correct answers after guessing out loud and hearing the correct answer from the facilitator
- During the conclusion discussion of migration dangers in Activity 2: kids can replicate the chart the facilitator is making in their field notebooks
- During the group brainstorming of Activity 3: kids can use the Hypothesis page to brainstorm and sketch out some ideas for keeping elephants away from crops
- During the wrap-up of Activity 3, and at home: kids can use the evaluation page to
- At home:
    - Can label elephant picture and write favorite facts about features
    - Can state their favorite part of the day

Sample field notebook below, with view of "kid-decorated" cover, the open cover page, and a view inside the notebook:




This Field Notebook belongs to:
Jane Doe
It contains my notes and observations from the "Be an Elephant Scientist" program at the Indianapolis Zoo on [date]


Home activity:
• Label the features of the elephant
• Include your favorite facts about elephants
• What questions do you still have about elephants?
Questions
• How much does an elephant in the wild eat every day?
_____ pounds
• How much water does an elephant drinks every day?
_____ gallons
• How many hours does an elephant sleep each day?
_____ hours
• Where do they go to find food and water?
• What do they do when there is no more food or water in a place?
• How far can an elephant travel in a day?
_____ miles
• How far do some elephants travel in a year?
_____ miles

Appendix D. Migration game layout and flow