This presentation premiered at WaterSmart Innovations

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INNOVATIONS

Discovery Program: Place-based Learning Driven by Smart Phone Technology

2016 Water Smart Innovations Conference

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Designed by the University of Arizona's Arizona Project WET Program

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ARIZONA | COLLEGE OF AGRICULTURE AND LIFE SCIENCES

COOPERATIVE EXTENSION

Why the Discovery Program?

Vision: Engage people in exploration that leads to new discoveries in their communities.

Goals:

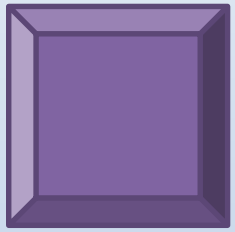
People will:

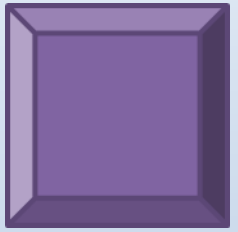
- Discover new things about the place they are visiting
- Think through questions in a systematic way
- Learn about the work of scientists
- Become more aware of place-based learning; close to home or out of town

Discovery Courses and QR Code Journeys

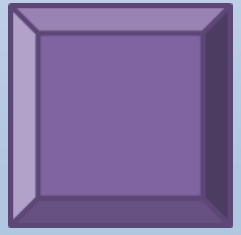
1. The Discovery Question
2. What do you need to know to answer the question?
3. What will you do to answer the question?
   a) How will you record your data?
4. What is your scientific conclusion?
   – They are asked to report their conclusions online

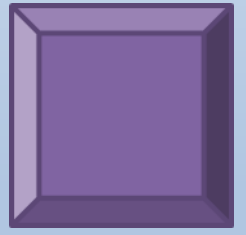
What types of birds live at Sweetwater Wetlands?

1 

 3

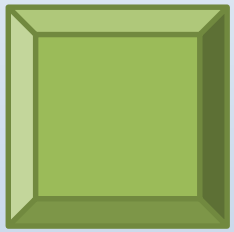
QR Codes lead you through a Discovery Process …. you might see more by taking this journey!

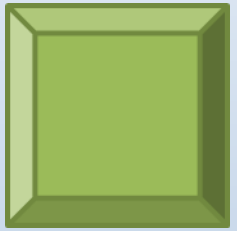
2 

 4

Ornithologist

What are the differences between the trees that live close to the water and those that live further away?

1 

 3

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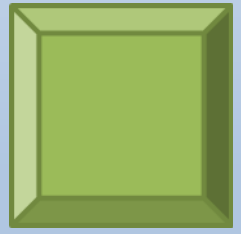
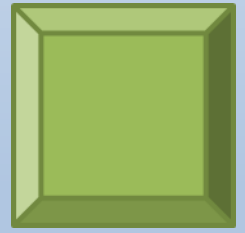
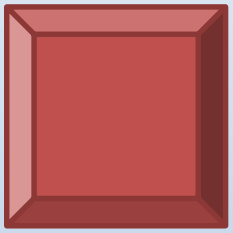
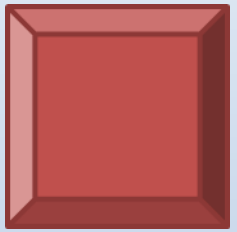
2 

 4

Desert Ecologist

What evidence is there to show that animals live at Sweetwater Wetlands?

1 

 3

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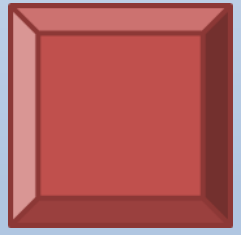
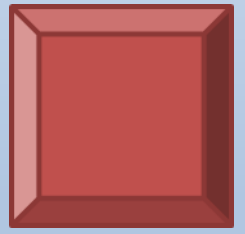
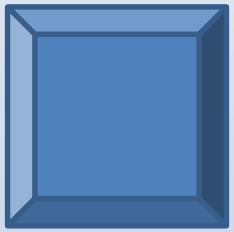
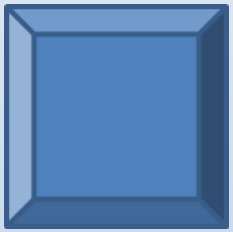
2 

 4

Biologist

How is the flow of water managed in the Sweetwater System?

1 

 3

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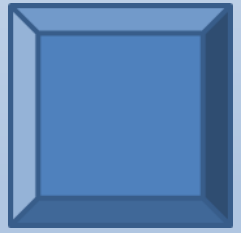
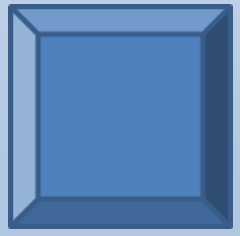
2 

 4

Hydrologist

Let’s Follow a Discovery Journey

What do you see on your Smart Phone?

I wonder . . . What is the difference between a coot and a duck?

You're an Ornithologist!

How will you go about answering the Big Question?

As you follow the path to the next ***purple*** QR code, ask yourself (and your buddies):

What do you need to know to answer the question?

Follow Directions to Next QR Code

	Walk down the sidewalk between the pond and the parking lot. 
	Find the PURPLE QR code on the sign near the benches to the left of the sidewalk. 

What do you see on your Smart Phone at Stop 2?

What do we need to know to answer the question, "What is the difference between a coot and a duck?"

What new questions did you and your friends ask about this Big Question? Here are a few that you might have thought of. Discuss these with your group.

What does a coot look like?

Open

What does a duck look like?

Open

Looking out into the water, do you see any coots? What about ducks?

While you search for your next QR code, talk with your group about:

What will you DO to answer the question?

The *Open* tabs provide interactivity and an opportunity for people to think before they are given answers.

What does a coot look like?

What does a duck look like?

The next two photos are both a type of duck called a "mallard". Why are they so different?

The first mallard is male. The second mallard is female.

Follow Directions to Next QR Code

	Continue along the sidewalk toward the east end of the pond. 
	Follow the rounded path to the trash can. 
	Turn right! 
	The QR code will be just before you reach the stone benches near the water. Remember to scan the PURPLE QR code. 

What will you do to answer the question, "What is the difference between a coot and a duck?"

What have **you** and **your group** decided to do?

A scientist does things in a systematic way so that the process can be repeated.

Here is a suggestion for how you can go about this.

Sit and observe.

Open

Look at one bird at a time.

Open

Consider looks and actions:

Open

Sit quietly for a few minutes and observe the ducks and coots. Make a plan with your group for:

How will you record your observations?

NEXT

The *Open* tabs provide interactivity and an opportunity for people to think before they are given answers.

Sit and observe.

Have a seat and look around for birds swimming in the water.

Look at one bird at a time.

Pay attention to what makes that bird different. Think about what it does and how it does it.

Consider looks and actions:

- How does it swim?
- How does it look standing?
- What do its feet look like?
- How does it move (on water and on land)?
- Does it dive under water?

How will you record your coot and duck observations?

In science, if you didn't write it down, it didn't happen! You need to take good notes to be sure your answers are correct.

Draw what you see and label your drawings.

Open

Take organized notes.

Open

Observe. Record. Repeat!

Open

Return to your question:

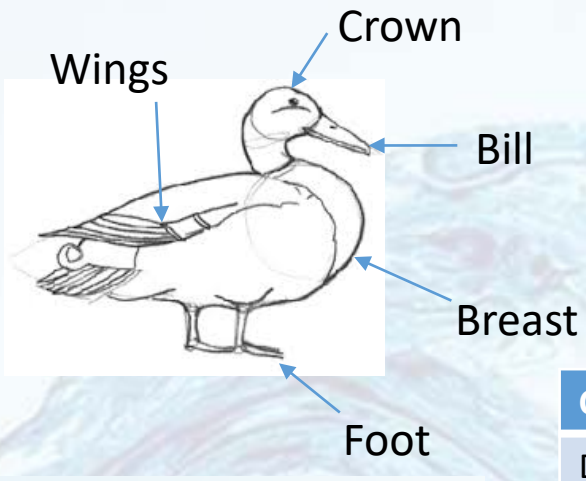
What is the difference between a coot and a duck?

Share your ideas and, as you find your last QR code, prepare to answer the question:

What is your scientific conclusion?

The *Open* tabs provide interactivity and an opportunity for people to think before they are given answers.

Draw what you see and label your drawings.



Take organized notes.

Coot	Duck
Drawing or Photo	Drawing or Photo
Description	**Description**
Swimming	Swimming
Standing	Standing
Foot	Foot
Movement	Movement
Diving or No Diving	Diving or No Diving

Observe. Record. Repeat!

Watch, draw and take notes on at least 3 more birds

Follow Directions to Next QR Code

Walk back to the main path.

Turn right onto the asphalt path.

Continue down the path until you find this bridge on your right.

Cross over the bridge and continue on the path until you find your last QR code on a bench railing.

Find your last QR code on a sign near the second set of benches.

Scientific Conclusion: What is the difference between a coot and a duck?

Now that you have a conclusion, you want to share your data! Share it with us here!

First Name

Last Name

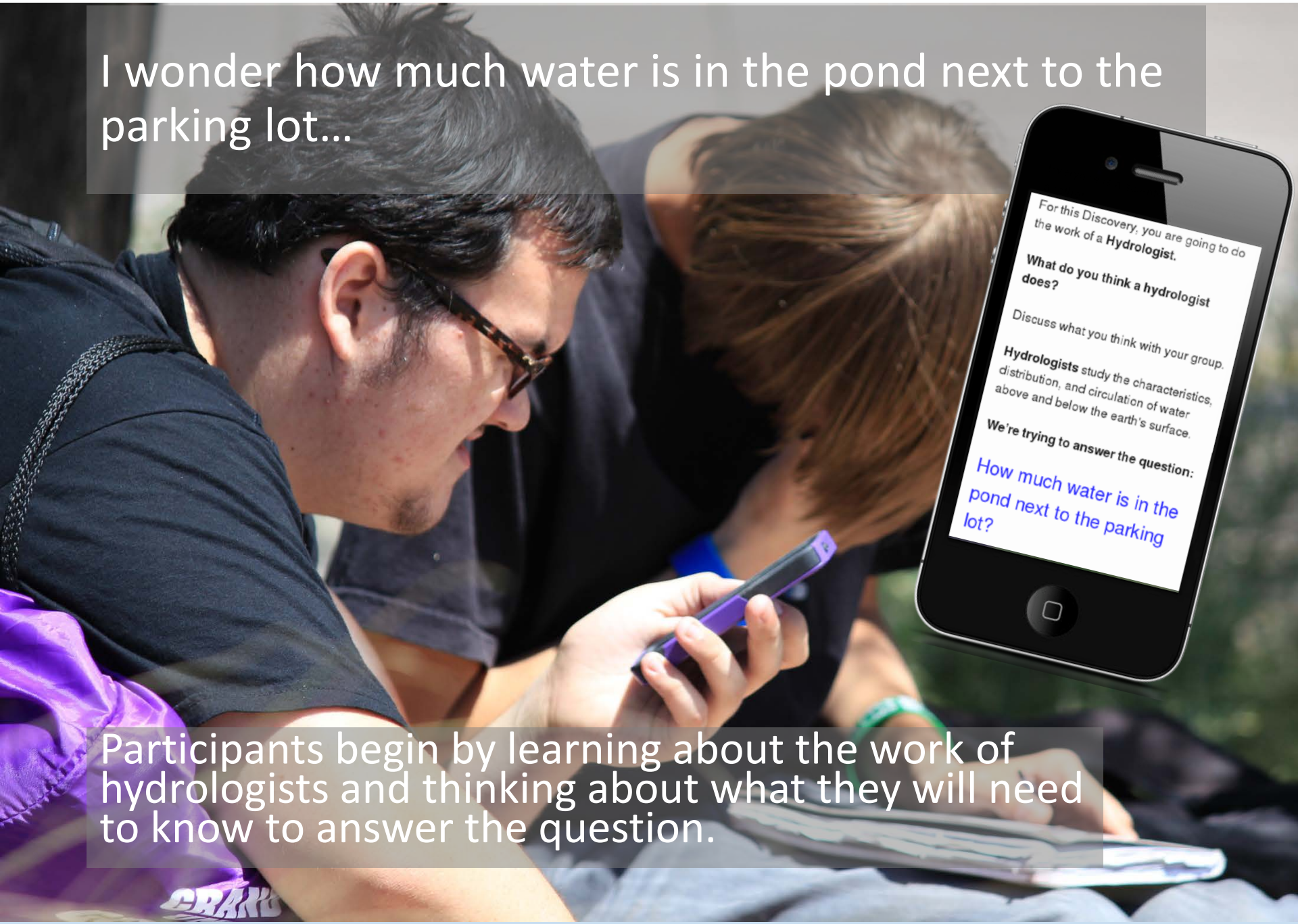
Email Address

What is the difference between a coot and a duck?

What do you think is pictured in the photo below?

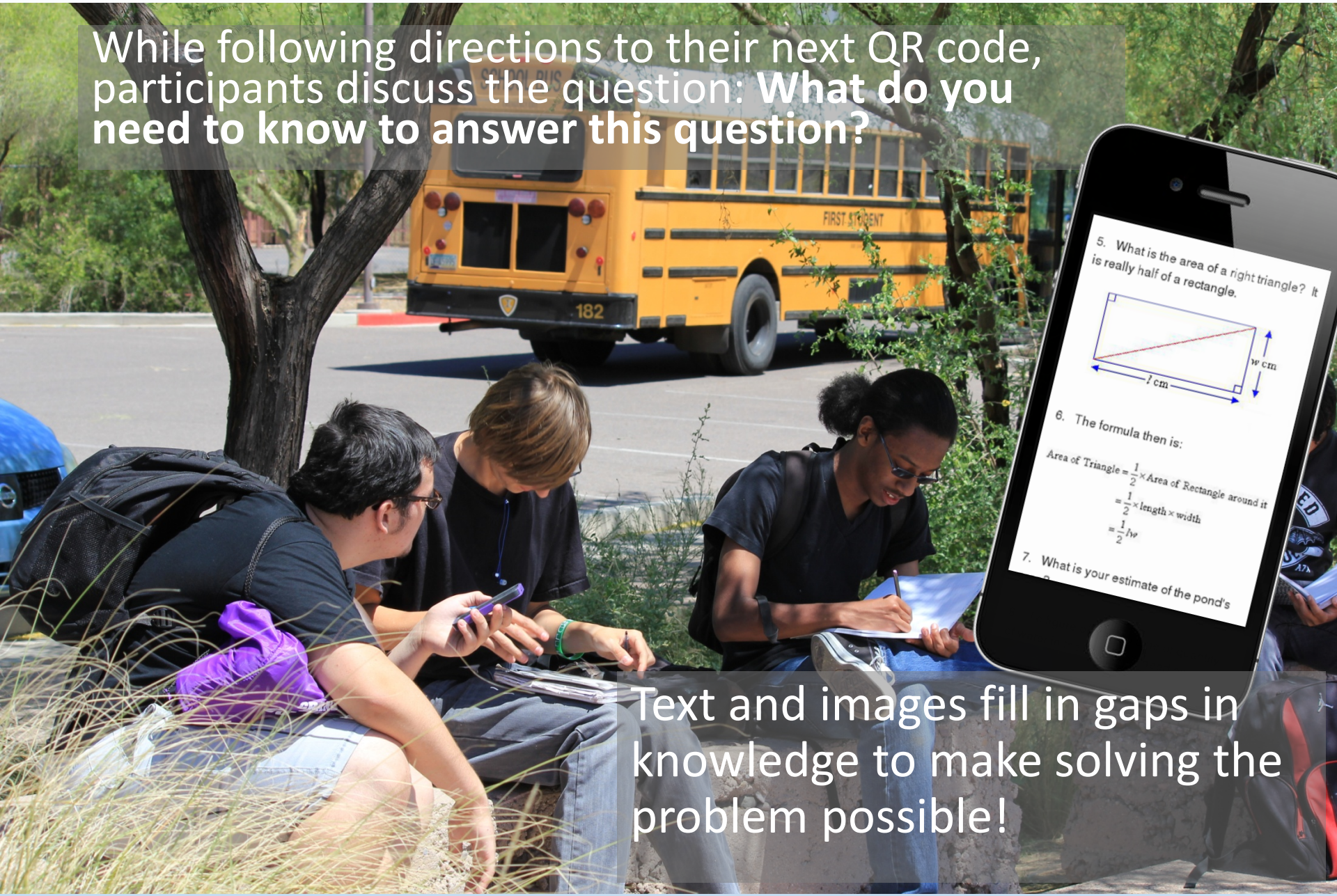
Submit

I wonder how much water is in the pond next to the parking lot…



Participants begin by learning about the work of hydrologists and thinking about what they will need to know to answer the question.

While following directions to their next QR code, participants discuss the question: **What do you need to know to answer this question?**



Text and images fill in gaps in knowledge to make solving the problem possible!

Then, participants travel to their next destination while developing a plan for action: **What will they DO to answer the question?**

Using a smartphone enables participants to see images and match them to reality on the ground.

Finally, participants put their plan into action. First, pacing off the area of the pond.

Then, calculating and reporting their final answer via smartphone!

Student Survey Results

- 100% of students said that participating in the Discovery Journey **made them want to return to Sweetwater Wetlands**.
- 92% of students reported **enjoying the Discovery Program**, with others remaining neutral saying they neither liked or disliked it.
- 72% of students said they **learned something** from participating in the Discovery Journey.
- **55% of students said they would do a Discovery Journey on their own outside of class**, 36% would not, and 9% said maybe.

Follow-up Interviews

1. What was it like to use your phone to explore nature?

First Student: *It was pretty cool, because a lot of people see phones as a distraction, but using phones for the field trip and being interactive with the whole group was a lot better than not doing anything at all.*

Second Student: *Um, kind of weird, because they're opposite. It's like, using one thing to figure out another thing is really cool, you know? I didn't know about any of the plants or the trees, so it made me learn more about it.*

Follow-up Interviews

2. **How did using your phone for learning change the way you approached the assignment?**

First Student: *Well, technology, how it is now, everything is there with one button, so all the information is like, boom. But it's not really boring, like when you have a paper and it's like, 'ugh, I have to read this'. It just gives you facts on a phone, and it's like, oh hey, I didn't know that or, oh this is really cool. And I thought it was really awesome, because when you scan it, it's just like, 'here it is!'*

Second Student: *Well, I'm mostly on my phone most of the time, so it made me able to be on my phone, yet use technology with it, because most people use technology anyway.*

Third Student: *I guess it was faster, so we could get it off our head before it goes away. So whatever we had on thought, we could get it on the phone and it'd be done.*

Fourth Student: *Hm, it made it simpler, so we had more time to discuss it, and really get into detail on the topic, because with other things you didn't have to use the time to like, write or sit down, or find a place to do things, you could just look it up and then do it right from your hands, so it was a lot quicker.*

Follow-up Interviews

- **If it had just been paper, what would have been different about it?**

It would probably be like, boring. Like regular paperwork that I have to do for school every day. But using the phone is different, this is technology, everyone wants to learn.

- **What was different about it from using paper?**

People got to use their phones, because usually people are like, 'Don't touch your phones!' But I thought it was different, and connecting to teens, because teens use our phones, so we might as well put them to use. Usually some people are saying, 'oh, you're using your phone for something ridiculous or something,' but they felt like, hey, thinking like a teen, so let's go with the project further with the phone. Teens are connected with the internet and stuff, and technology.

Follow-up Interviews

- **Is there anything else you want to tell me about your DJ?**

It made me want to go to other places where there are the same, like spots like that, but at different areas in Tucson.

- **Follow-up Question: What were your thoughts about learning in that way with the phones?**

Sooner or later, that's how it's going to be, so I think it's good to try it out now and see how it works, so later we can figure out…I don't know how to explain it, but. You know?

Follow-up Interviews

- **How could the Discovery Journey Program be improved?**

It was a little repetitive, the questions were kind of all … were just worded differently, that's one thing we discussed from QR to QR, it was practically the same question, so maybe just some variety.

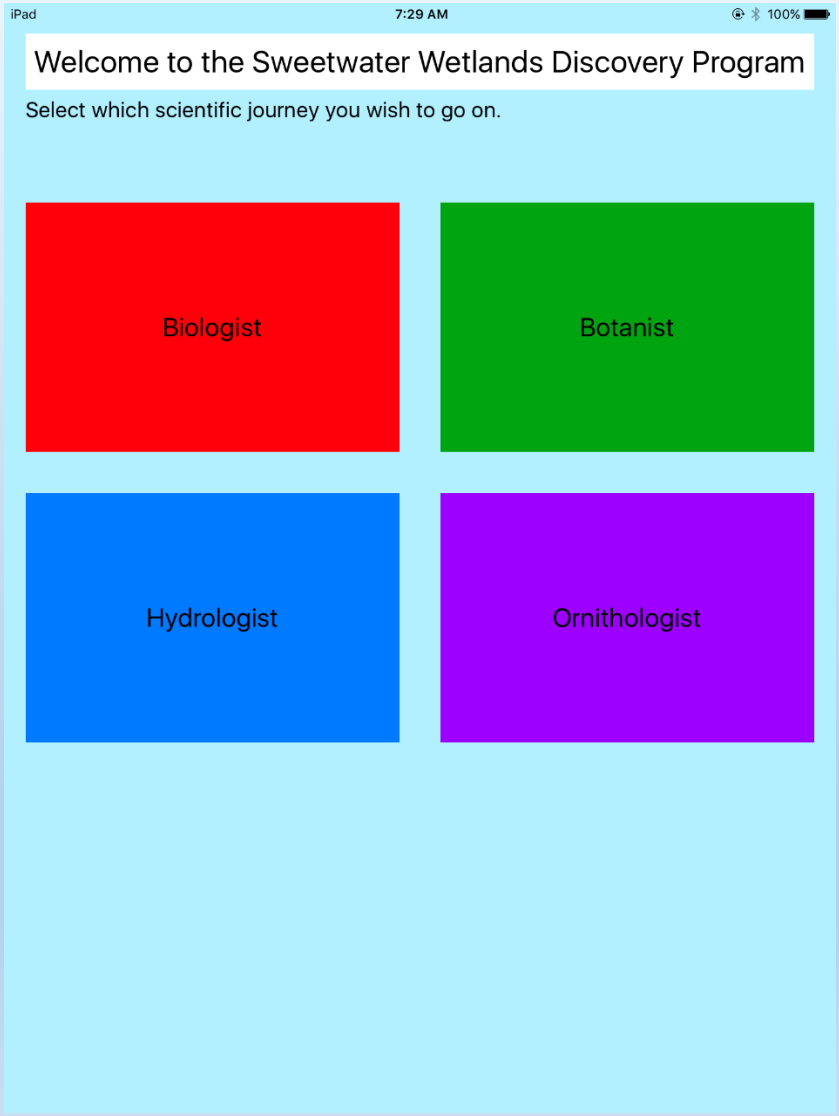
Initial Technology Hurdles

1. Middle school students may not have cell phones and parent chaperones may not be present or willing to allow students to use their phones.
2. Many users that have smart phones do not have data plans. They rely on WiFi for the data use needs.
3. Many sites where we might like to install Discovery Journeys have limited cell/data service.

Solution: Building an app for use on Tablets!

Use of Tablets and the Discovery Program App

- A UA student is working on the Discovery Program App to be downloaded to tablets for student use.
- This will eliminate the use of personal cell phones and wifi.



iPad 1:20 PM 54%

Biologist

I wonder... "What evidence is there to show that different types of animals live at Sweetwater Wetlands?"

You're a Wildlife Biologist!
As you follow the path to the next red QR code, ask yourself (and your buddies):
What do we need to KNOW to answer that question?

Directions

Follow the paved path across the bridge, and then turn to the right.

Continue along the paved path, staying to the left when you reach the fork in the path.

You will find your next red QR code under the ramada.

QR Code Number: Enter Code Here. Go

Taking the Biologist Discovery Program Journey

Questions prompt thinking .. Then provide clues.

iPad 1:21 PM 54%

Biologist

What do you need to know to answer the question, "What evidence is there to show that different types of animals live at Sweetwater Wetlands?"

What are animals? Show

What does "evidence" mean? Show

Continue

iPad 1:21 PM 54%

Biologist

What do you need to know to answer the question, "What evidence is there to show that different types of animals live at Sweetwater Wetlands?"

All living things can be divided into two main groups: The Animal Kingdom and the Plant Kingdom. So, animals include more than just mammals. They also include insects, reptiles, birds, and fish. Show




Evidence is a sign that helps lead to a conclusion. So, you will be looking for signs of animal life. Show

Continue

Directions lead students on a tour of the site …. And prompt them to observe along the way.

The Discovery Journey is about exploring … and looking at the site from a scientists perspective.

iPad 1:23 PM 54%

Biologist

What will you do to answer the question, "What evidence is there to show that different types of animals live at Sweetwater Wetlands?"

What have you and your group decided to do?

Show

How will you record your observations?

Show

Continue

iPad 1:23 PM 54%

Biologist

What will you do to answer the question, "What evidence is there to show that different types of animals live at Sweetwater Wetlands?"

What have you and your group decided to do?

Show

Scientists make observations in a systematic way; their investigations are done in the same way every time. Here are some ideas that you might use to design your procedure.
1) Make observations as you walk. Follow the directions, walking along the path for two minutes. Look for signs of animal life.
2) Make observations when you stop. After 2 minutes of walking, stop and look around. Look for footprints, scat, feathers, worn-down vegetation, and animal homes. Look in the trees for nests, on the ground for holes, and along the water for homes.

In science, if you didn't write it down, it didn't happen! You need to take good field notes in order to analyze your evidence as a whole. Draw what you see, and label your drawings. Take organized notes.

Show

Have you seen animal homes, tracks, scat, sounds, or other evidence?

Continue

Discovery Journey's lead students to new areas of the place; offering multiple opportunities to make observations and deepen their thinking.

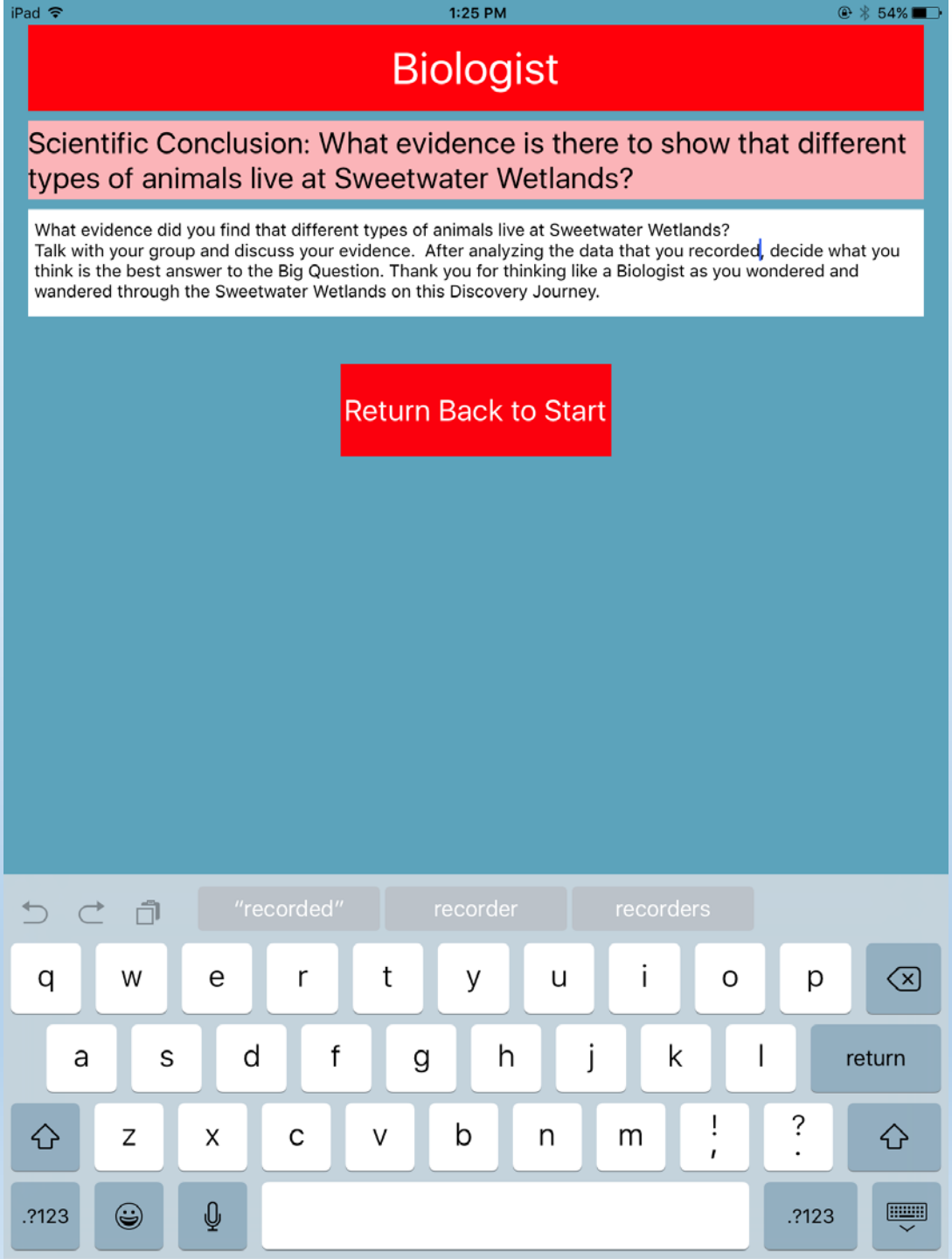
Explain Everything

A note taking, photo taking, video recording, audio recording, method to record scientific observations.

Explain Everything

In the end, they summarize their scientific investigations submitting their conclusion in the app.

This provides a means to measure the impacts of the program!



Discovery Program	Task	Hours	Program Manager Cost
Planning	Program oversight & networking to establish relationship	1.25	$31
	Internal coordination	0.75	$19
	Planning and communication with community reps	3	$75
	Ordering Signage and Posts	1	$25
Implementation	Travel Time	2.01	$50
	Day 1 Scoping out site	16	$400
	Day 2 Mapping Journey directions	8	$200
	Day 3 Testing Journey directions and finalizing answers	8	$200
	Data verification & input	8	$200
Evaluation	Evaluation	4	$100
Subtotal	**Staff Time Sub-total**	**52.01**	**$1,300.25**
	Task	**Hours**	**Program Manager Cost**
App Development	Plan page contents; write, review, edit text, (outside page creation)	8	$200
	Collaborative review/revision of DJ contents	8	$200
	Prep photos for use on DJ site	8	$200
	Create graphics i.e. data forms or hand-drawing examples (scan, draw, find, modify)	6	$150
	Copy and paste the text (assumes all contents are ready)	4	$100
	Test and modify display of info online (debugging)	4	$100
	Final revision of online pages based on field test and user review	2	$50
Subtotal	**Development Staff Time Subtotal**	**40**	**$1,000**
Supplies & Labor			
Item	**Price per Item**	**# Items**	**Price**
	Backhoe to dig holes (at $57.00/hour)	8	$456
	Cementing in signs	8	$456
	25 Metal Posts	16	$400
	Welding	16	$160
	Signs	16	$160
	Tablets ($379 each)	10	$3,790
	Tablet Cases (23 each)	10	$230
	Explain Everything App	10	$80
Subtotal	**Materials Sub-Total**		**$5,732.00**
Total Project Cost			**$8,032.25**

START HERE: Fill in the 4 variables to estimate costs for installing a Discovery Program

Preserve/Outdoor Site	**1**
Number of discovery journey	**4**
Distance from WRRC (hours, one way)	**0.67**
Program Manager Hourly Rate ($)	**25**

Contact Information

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ARIZONA WET Water Education

Discovery Program

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