

Using iNaturalist to support high school environmental science curriculum

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Photo credit: Nicholas Caruso



Introduction



- The goal of this module is to provide an outline for initiating an iNaturalist project in a high school classroom. Within this document is an outline for initiating the project, collecting data regarding effect on students, and reflections on the experience of implementing a similar project in a high school in North Carolina.
- The module was created as part of a National Science Foundation Research Experience for Teachers grant extension.



Rationale



- The school day is limited in time, and resources. Class periods are often, out of necessity, limited to covering curriculum objectives. Informal and self guided learning are often sacrificed in the name of saving time, and or resources.
- The INaturalist.org platform can automate and collate natural history data points collected independently by students.
- Using this platform teachers and students can communicate and share data with the larger scientific community.
- Here we show how this website can be utilized to help students explore their surroundings with minimal time or resources.

Objectives

- The project was driven by three main objectives.
 - Foster a connection with the natural world
 - Increase student awareness of surroundings
 - Use technology to guide students in exploring their environment and expand their knowledge of native species.

Methods: INaturalist.org Project Creation

- Create username on INaturalist.org

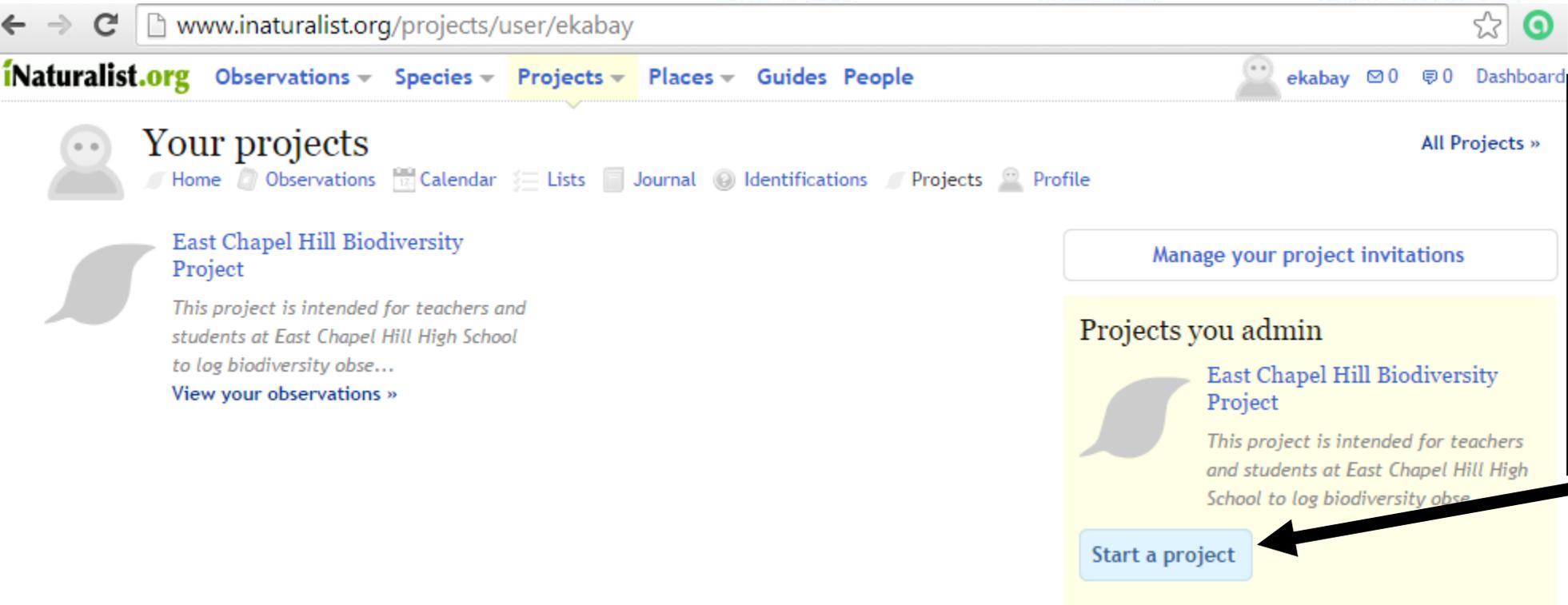
- Initiate new project.

- Project settings permit public or private projects.

It is our recommendation that projects remain open to the public as students benefited from ID's made by the INaturalist.org community. This rewarded students that logged species observations ahead of class deadlines, and engaged them with the technology interface.

- Use the project requirement form to set required data for student to collect. The website will automatically require the information from students, **CUTTING DOWN ON TEACHER GRADING.**

Start your project by entering the "All your projects" tab.



Use "Start a project" to create and customize a new project.

INaturalist.org project set up

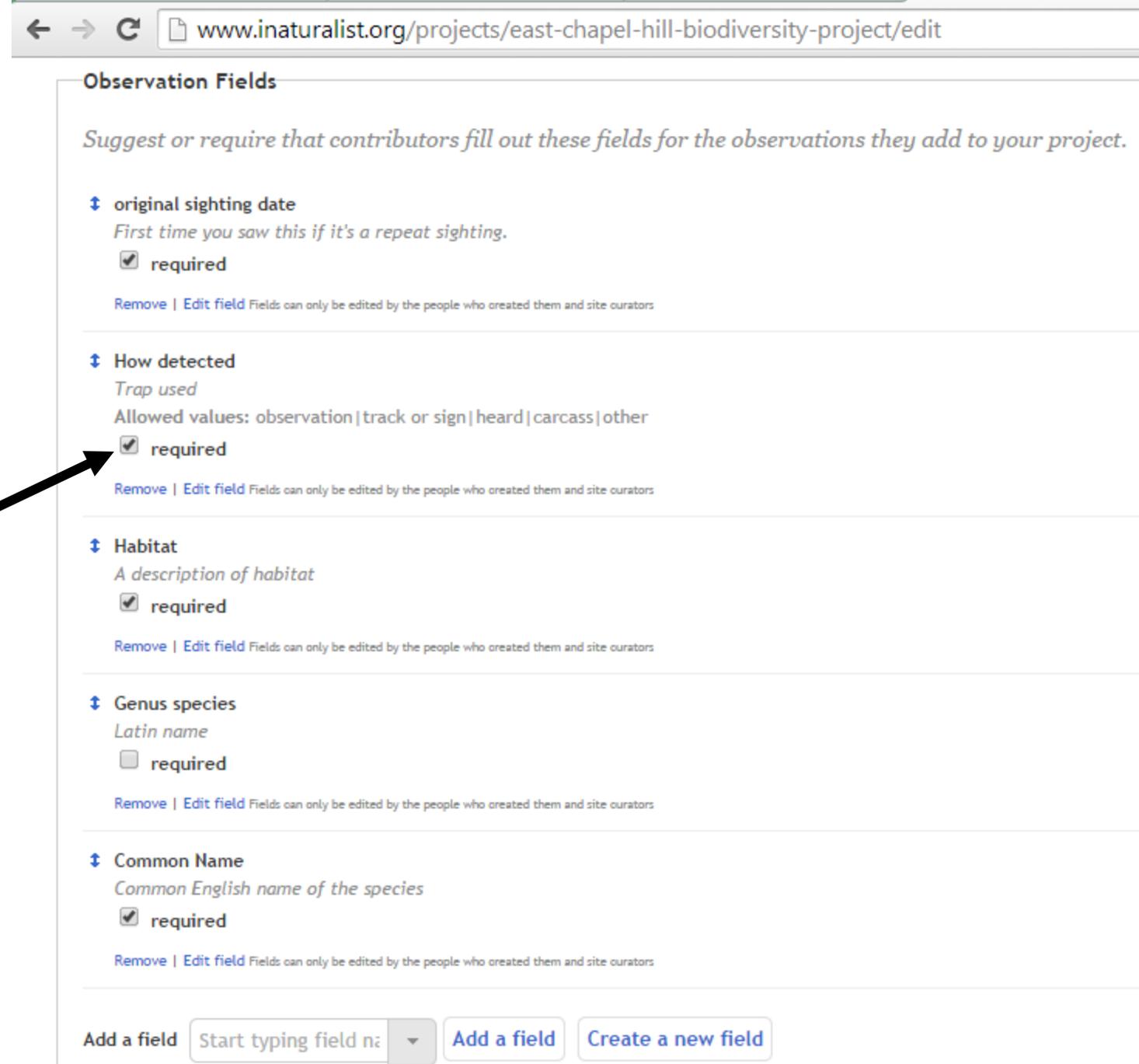
- After initiating a project you will be taken to this screen →
- We chose to leave our project public so students could benefit from interaction with the community.
- Descriptions and terms are defined on this page, customized to the needs of the project.
- Farther down on the same screen INaturalist.org allows for the definition of data the students need to collect.

(Next slide)

The screenshot shows the 'Editing East Chapel Hill Biodiversity Project' page on INaturalist.org. The browser address bar shows the URL: www.inaturalist.org/projects/east-chapel-hill-biodiversity-project/edit. The navigation menu includes 'Observations', 'Species', 'Projects', 'Places', 'Guides', and 'People'. The user 'ekabay' is logged in. The page title is 'Editing East Chapel Hill Biodiversity Project'. The 'Title' field contains 'East Chapel Hill Biodiversity Project'. The 'Project type' dropdown is set to 'contest'. The 'Preferred membership model' is set to 'open'. The 'Description' field contains the text: 'This project is intended for teachers and students at East Chapel Hill High School to log biodiversity observations and collaborate with scientists. Project objectives include 1. Teach students survey methods and species identification protocols while contributing to citizen scientist initiatives. 2. Monitor and record the biodiversity occupying the natural areas surrounding our school, North Carolina, and beyond. 3. Introduce students to scientific investigations of amphibian biology in temperate North America and central Panama.' The 'Project icon' and 'Project cover' fields both show 'Choose File' buttons and 'No file chosen' text. The 'Terms' field contains the text: 'Pictures must be of species described. Any lewd or inappropriate photos will be deleted immediately. Once an observation has been contributed it is subject to verification and publication on the inaturalist website. Data may be accessed and used by other project collaborators or inaturalist users once the project is made public. Photos must be original photos taken in habitat. Any re-logging of old observations, photos taken from internet searches, or sources other than personal observation are strictly forbidden.'

Data collected by students

- Careful planning of the observation fields can save time when the student data is exported for grading or analyses.
- Checking the “required” box denotes fields students must complete before the observation is accepted by the project.
- It helps to be really clear that leaving out required data will cause an observation to be rejected and not seen by the teacher. We experienced a lot of confusion on this principle.
- We did not require Latin names for observations but many students found and used Latin names.



The screenshot shows the 'Observation Fields' section of the iNaturalist project edit page. The URL in the browser is www.inaturalist.org/projects/east-chapel-hill-biodiversity-project/edit. The page title is 'Observation Fields'. Below the title is a subtitle: 'Suggest or require that contributors fill out these fields for the observations they add to your project.' There are five fields listed, each with a 'required' checkbox and a 'Remove | Edit field' link. An arrow points to the 'required' checkbox for the 'How detected' field.

Field Name	Description	Required
original sighting date	First time you saw this if it's a repeat sighting.	<input checked="" type="checkbox"/>
How detected	Trap used Allowed values: observation track or sign heard carcass other	<input checked="" type="checkbox"/>
Habitat	A description of habitat	<input checked="" type="checkbox"/>
Genus species	Latin name	<input type="checkbox"/>
Common Name	Common English name of the species	<input checked="" type="checkbox"/>

At the bottom of the page, there is a section for adding new fields: 'Add a field' followed by a search input 'Start typing field name', and two buttons: 'Add a field' and 'Create a new field'.

Project homepage

- When the project is finished INaturalist.org gives it a homepage.
- The map is interactive and students can click on observation bubbles to see where their classmates have logged observations.
- We did not put a geographic limitation on the project but that is possible.

The screenshot shows the iNaturalist.org website interface. At the top, the browser address bar displays 'www.inaturalist.org/projects/east-chapel-hill-biodiversity-project'. The navigation menu includes 'Observations', 'Species', 'Projects', 'Places', 'Guides', and 'People'. The main heading is 'East Chapel Hill Biodiversity Project'. A prominent blue button says 'Add observations to this project'. Below the heading is a world map with several observation bubbles: two blue bubbles in the Pacific Northwest, one blue bubble in the UK, and several white bubbles with question marks in the US, Mexico, and South America. To the right of the map is a sidebar with project statistics and navigation options: 'Observations / Map' (583 observations), 'Checklist' (116 of 116 taxa observed), 'Journal', 'Top contributors' (198 members), and a list of the top three contributors: 'chaz_copeland' (11 species, 11 observations), 'ealexander915' (8 species, 8 observations), and 'stowne' (8 species, 8 observations). At the bottom left, there is a link for 'Recent observations View all »'. At the bottom right, there is an 'About' section with the text 'This project is intended for teachers and'.

www.inaturalist.org/projects/east-chapel-hill-biodiversity-project

iNaturalist.org Observations Species Projects Places Guides People

« Projects East Chapel Hill Biodiversity Project

Terms & Rules | Edit project

Add observations to this project

» Observations / Map 583 observations
Atom / KML / CSV / All CSV

» Checklist 116 of 116 taxa observed

» Journal

» Top contributors 198 members

1. chaz_copeland
11 species, 11 observations
2. ealexander915
8 species, 8 observations
3. stowne
8 species, 8 observations

View leaderboard » | View all members »

» Stats

» Invite observations

» Add from your observations

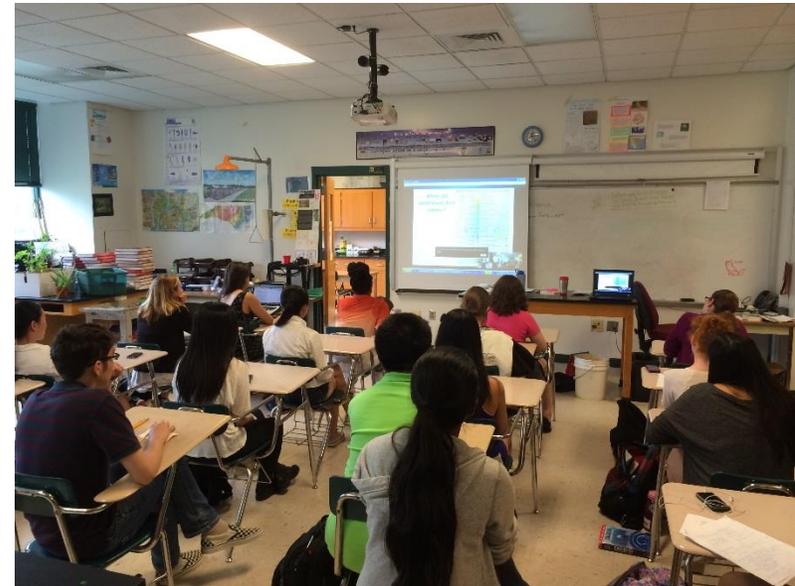
About

This project is intended for teachers and

Recent observations View all »

Student accounts on INaturalist.org

- Students need to create INaturalist.org accounts to participate in the project.
- If a computer lab or mobile laptop cart is available in your school, it can be useful to have students create their accounts in class.
- The entire process takes a class of 30 students just under 40 minutes to complete.



Methods: Initial data collection

- Prior to opening the project to students, we collected entry data using an internet survey.
- We administered the survey using google surveys accessible and **FREE** via a gmail.com account.
- If students are allowed to create their own INaturalist.org usernames then ensure they must enter their username in the survey.
- Survey responses are not restricted to gmail accounts so there is no need for students to create a new email address.
- If time permits, completing the survey and signing up for INaturalist.org can be completed in class to reduce confusion and alleviate internet access issues in student homes.

Google documents used to collect survey data

Advantages

- Google will export survey responses to excel files to aid in analyses.
- Free for administrator and students
- Reduces need for paper printouts

Disadvantages

- Requires computer and internet access
- Access issues in students homes and can be difficult given computer resources in the school building

Pre-project survey questions

- **What email address did you link to the inaturalist project?**
- **What is your inaturalist.org username?**
- **What is your environmental science teacher's last name?**
- Do you have an iphone or android cellphone?
- Do you own a cellphone with a camera?
- Do you own or have access to a digital camera?
- Are you familiar with GPS (Global Positioning System) devices?
- How many types of amphibians can you identify?
- How many types of plants other than trees can you identify?
- How many species of amphibians live in North Carolina?
- What is your first name?
- What is your last name?
- Do you have experience with Facebook?
- How many types of trees can you identify?
- How many types of birds can you identify?
- Do you have experience with google maps?
- Do you have experience with managing digital photographs?

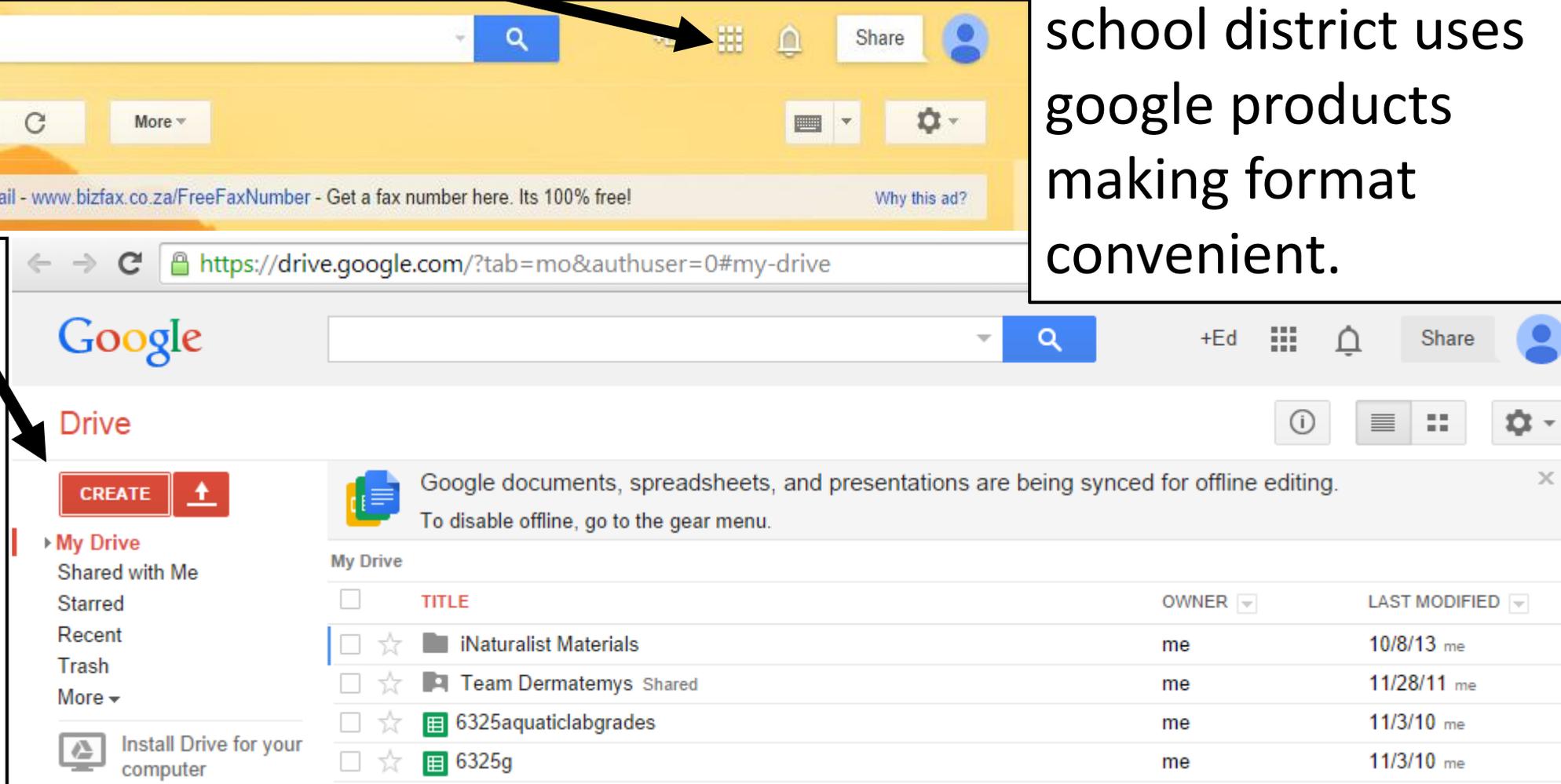
Use the grid icon at the top left hand corner of the gmail home screen to go to google drive and create the survey.

Here



Other online survey services are available. Our school district uses google products making format convenient.

Use the Create tool to select "form" to customize a survey. Google exports results to excel or email.



	TITLE	OWNER	LAST MODIFIED
<input type="checkbox"/>	iNaturalist Materials	me	10/8/13 me
<input type="checkbox"/>	Team Dermatmys Shared	me	11/28/11 me
<input type="checkbox"/>	6325aquaticlabgrades	me	11/3/10 me
<input type="checkbox"/>	6325g	me	11/3/10 me

- The google form can be fully customized and email to each individual student if possible.
- Students may also access the survey using a link provided on a class website.
- Surveys can be timed or untimed.

The screenshot shows the Google Forms editor interface. At the top, the browser address bar displays the URL: https://docs.google.com/forms/d/1GJXjbAD2SPJVwYEZIBfNRkBO9JP36zoB_EA5NHIGBVc/edit. The form title is "Untitled form". The menu bar includes "File", "Edit", "View", "Insert", "Responses (0)", "Tools", and "Help". A notification states "All changes saved in Drive". The main toolbar contains "Edit questions", "Change theme", "View responses", and "View live form".

The "Form Settings" section is expanded, showing the option "Show progress bar at the bottom of form pages" which is currently unchecked. Below this, the "Page 1 of 1" section is visible, containing the form title "Untitled form" and a "Form Description" field.

The question configuration section includes:

- Question Title:** A text box containing "Untitled Question".
- Help Text:** An empty text box.
- Question Type:** A dropdown menu set to "Multiple choice".
- Go to page based on answer:** An unchecked checkbox.
- Options:** Two radio button options. The first is "Option 1" in a text box. The second is "Click to add option" in a text box, with a link "or Add 'Other'" to its right.
- Advanced settings:** A section with a "Done" button and a "Required question" checkbox which is currently unchecked.

Results pre-project survey

- 241 students surveyed
- 186 have an iphone or android cell phone
- 215 have a cellphone with a camera
- 195 own or have access to a digital camera
- 4 students report not having access to any of the three methods for digital photography
- Work-arounds were found for the four students using school resources, and 1 student was found to have not filled out survey accurately.

Methods: Project Initiation

- Once the INaturalist.org project is set up and students have joined the project, data collection is flexible.
 - We assigned between 2 and 4 unique observations per quarter throughout the year. We assigned more in the fall and spring when species are easier to locate and identify.
- Students were awarded modest amounts of extra credit for entering observations. (1 extra point per observation out of a possible 400 per quarter)
- Deadlines were assigned and project csv files were downloaded at predetermined times to avoid confusion over assignment submission.

Methods: Post project survey questions

- Did you add observations to the INaturalist.org project?
- Did you add extra observations on the INaturalist.org project? How many?
- Rate your enjoyment of the INaturalist.org project 1 to 5.
- How likely are you to add observations to the project during the summer?
- Did you learn to identify any new species by participating in the INaturalist.org project? How many?
- Did you use the INaturalist.org community to help you make identifications?
- Did the INaturalist.org project motivate you to observe nature more closely?

Methods: Post project survey questions contd.

- Are you more likely to observe nature after participating in INaturalist.org?
- Did your experience with the INaturalist.org project change your perception of any species of the outdoors?
- Was there a part of the project that you found most enjoyable?
- Is there something that you can suggest to make this kind of activity more successful in the future?
- Did you log any amphibian observations?
- Have you learned to identify any amphibian species since the project started?

Results

- At the end of the project post data was collected using INaturalist.org and Google forms
- Student data was exported and downloaded from INaturalist.org
- Students replied to a second google form to help gauge impact of the experience on students
- The following slides are a compilation of pictures and numbers from our pilot year using INaturalist.org to help connect students to nature

Quantitative Results: Google survey

- 179 students took post survey

Questions	Yes	No
Did you add observations to the INaturalist.org project?	114 (64%)	65(26%)
Did you add extra observations on the INatrualist.org project? How many?*	16 (9%)	163 (91%)
Did you use the INaturalist.org community to help you make identifications?	61 (34%)	118(66%)
Did the INaturalist.org project motivate you to observe nature more closely?	87(49%)	91(51%)**
Are you more likely to observe nature after participating in INaturalist.org?	55 (30%) (45 maybe)	79 (44%)
Did your experience with the INaturalist.org project change your perception of any species of the outdoors?	71 positive change (40%)	105 no change (59%)
Have you learned to identify any amphibian species since the project started?	53 (30%)	126 (70%)



**Not all students elected to answer this question and no option was given for “no change”.

*Not enough students added extra observations or reported how many

Qualitative Results: Student comments from google survey



Photo credit: Nicholas Caruso

Was there a part of the project that you found most enjoyable?	Is there something you can suggest to make the project more successful?
Going out into nature	more nature walks
Taking photos and looking for species	give more extra credit points for completing it
I liked taking nature walks	Try not to ask for specific animal types. Amphibians were very, very tough to find. It was a decent project though, I didn't hate it and it was semi-enjoyable. I got a few good walks and looks at nature out of it. Maybe spending a day out in the woods searching for certain animals would be a nice thing to do. That's the only suggestion I have.
taking pictures	it's already really fun
Being able to see other people's observations and comment	going on more nature walks during class or over the weekend in order to help us find species
nope	scoring system and prize for top scores to motivate people to participate more
looking at pictures that others took	include or mention it more in classes
I really liked walking in the woods to find living organisms	Pretty straight forward and seamless! Had a great time with it

Quantitative Results: INaturalist data

- 195 student participants
- 583 total observations
- 294 research grade observations
- 116 different taxons
- 77 amphibian observation across 29 species

Field excursions support the INaturalist.org project.



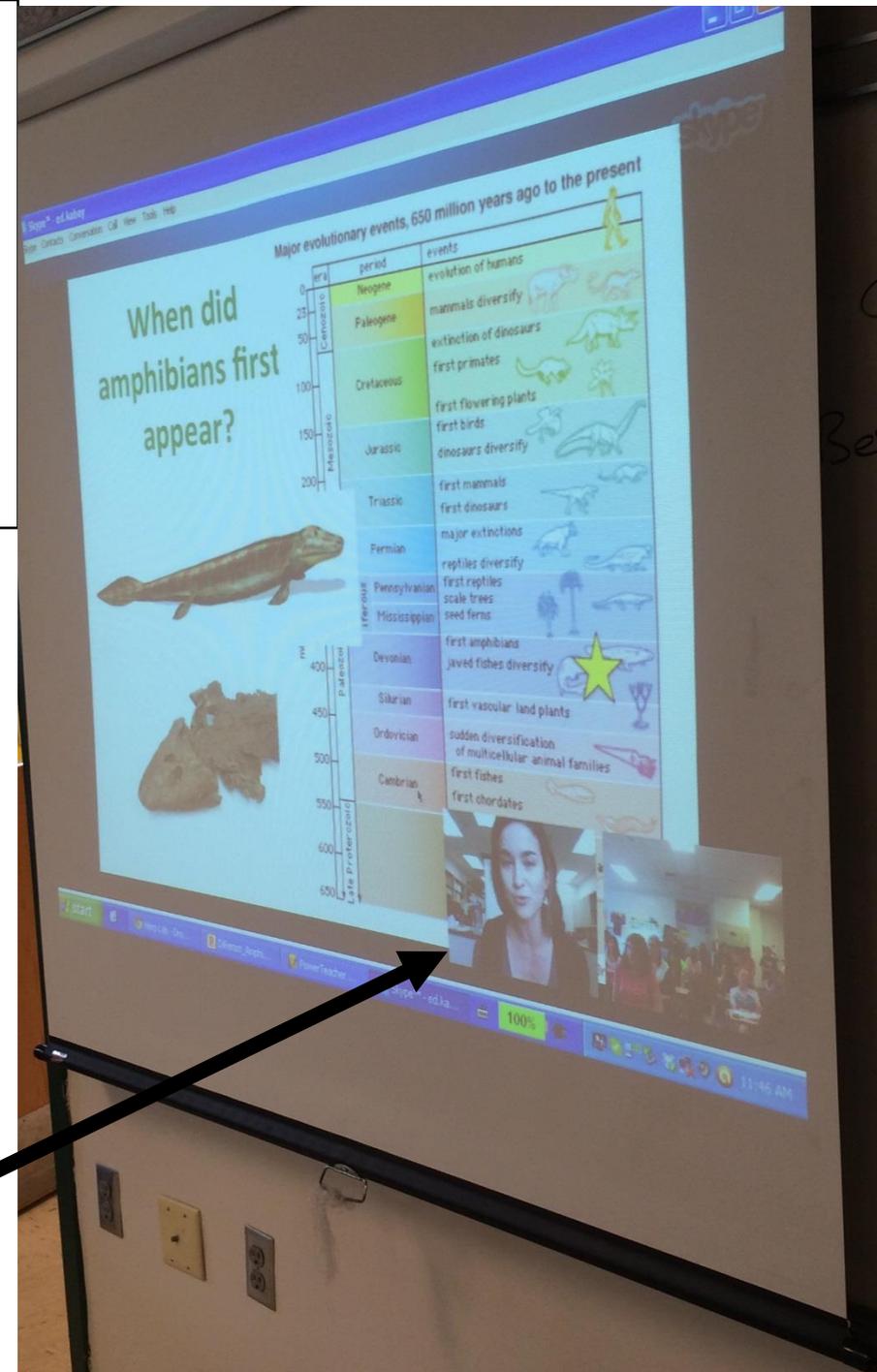
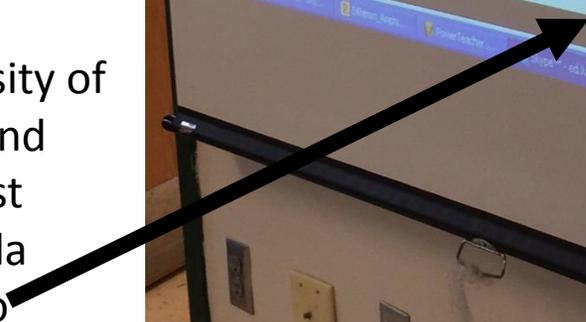
INaturalist.org, NSF, and Skype helped connect students to University of Maryland Scientists



Student participants



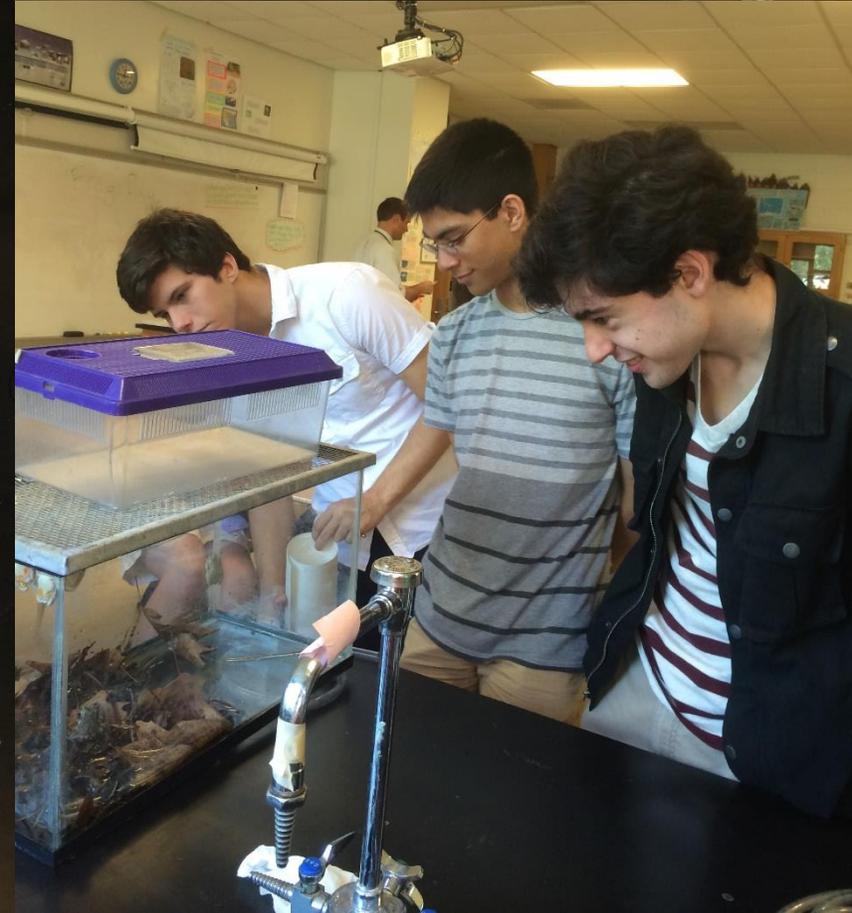
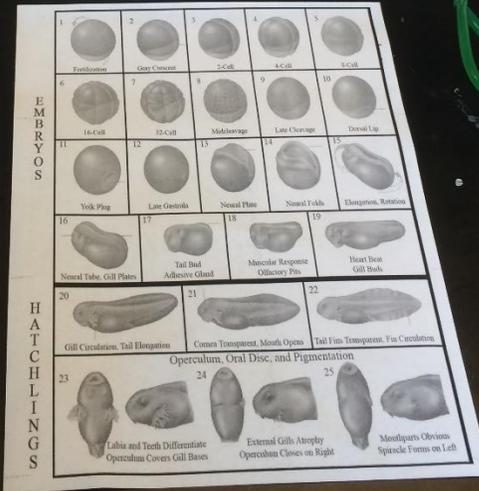
University of Maryland Scientist Graziella Drenzo



When did amphibians first appear?

period	events
Neogene	evolution of humans
Paleogene	mammals diversify
Cretaceous	extinction of dinosaurs
	first primates
Jurassic	first flowering plants
	first birds
Triassic	dinosaurs diversify
	first mammals
Permian	first dinosaurs
	major extinctions
Pennsylvanian	reptiles diversify
	first reptiles
Mississippian	scale trees
	seed ferns
Devonian	first amphibians
Silurian	jawed fishes diversify
Ordovician	first vascular land plants
	sudden diversification of multicellular animal families
Cambrian	first fishes
	first chordates

Students having fun on frog day!



Lessons learned

- Careful design of introductory survey can help gauge growth of appreciation as well as measure feasibility of a digital project
 - Measuring growth was planned for the second year of the project, however after this year growth can be measured within a year as well as between years
- Budget mid year survey time to gauge student involvement and give opportunity for improvement suggestions
 - This can help bridge the gap between warm seasons in temperate regions
- Additional guided/targeted searches are necessary if a certain taxon is targeted
- Our project was optional for students, but it can be implemented as a project grade: see <http://protecthabitat.wordpress.com/inaturalist-curriculum/> for an example

Reflections

- Digital media, social media, and other platforms helps to engage a variety of different learners
- Smartphones and other devices can be utilized to help students engage with environmental curriculum outside the classroom
- Most students enjoy time outside and the INaturalist.org project helps give purpose to time spent outdoors
 - Also motivates students to explore outdoor areas on their own
- Engaging students in citizen scientist initiatives can help collect valuable natural science data
- Optional format for project alleviates need to find time for teacher led guidance during class time

This work was made possible by the following organizations

- National Science Foundation
- Research Experience for Teachers Grant Extension
 - University of Maryland
- East Chapel Hill High School

Sources

- <http://protecthabitat.wordpress.com/inaturalist-curriculum/>