



### Program Overview:

Students will classify the species of their TI-Innovator Rover by using the provided file. Students will put their unknown species (Rover) through a battery of tests and observe behavior. The students will work through the process of a dichotomous key to narrow in on which species they are observing.

**Teacher Tip:** If you are using the TI-Innovator Rover for the first time, some initial assembly is required. Please visit [education.ti.com/rover](http://education.ti.com/rover) for information.

### Science Objectives:

- Students will explore a dichotomous key to determine the “species” being observed.
- Students will understand how a dichotomous key works.

### Science Course Connections:

Dichotomous keys are used in biology classrooms to demonstrate the process of classifying organisms. Typically, this relies on morphology and genetic information. In this activity, students will model the use of a dichotomous key by using the behavior of the Rover to make classifications of imaginary species.

**Teacher Tip:** If you or your students are not familiar with how to transfer a file to your TI graphing calculator, files can be transferred from calculator to calculator of the same technology. Files are found at [education.ti.com/scienceinmotion](http://education.ti.com/scienceinmotion).

### Materials and Set-up:

- TI graphing calculator with the file preloaded
    - TI-Nspire™ CX handheld – Dichotomous key.TNS
    - TI-84 Plus CE graphing calculator – DICHOTOMOUS\_KEY.8xp
  - TI-Innovator™ Hub with TI LaunchPad™ Board and USB Cable
  - TI-Innovator™ Rover
  - Provided identification chart
  - Flashlight (a mobile phone light will also work)
  - Yellow tape or construction paper (at least 4” x 2”) that represents animal urine
  - Red tape or construction paper (at least 4” x 2”) (represents blood from prey)
- The TI-Innovator Rover will need plenty of space to move for the activity. Be sure to have a clear space of least 1 meter by 1 meter for each group.
- Be sure to have the TI-Innovator Rover and the calculator fully charged.

**Teacher Tip:** If students are not familiar with running TI-Basic programs on the calculators: For TI-Nspire CX, instruct students to press enter after the closed parenthesis to execute the program. If students are using the TI-84 Plus CE, students should press the **prgm** key, navigate to the program, press enter to paste the program name to the home screen, and then press enter to execute the program.

### Task for Student Investigation:

#### Classifying Rover Species

Students will use the dichotomous key program that randomly assigns the TI-Innovator Rover to one of the seven species below. Students will use the identification chart to classify their Rover.



*Roboticus drago*

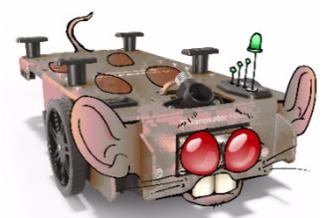
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*Roveridae aqua*



*Innovatidae felis*



*Calclatoridae mus*

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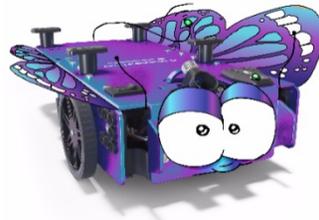
## DICHOTO-ME?

USING THE TI-INNOVATOR™ ROVER

SCIENCE IN MOTION  
TEACHER USAGE GUIDE



*Graphinia aves*



*Codus lepidoptera*



*Programmicus phoenicopterus*

### Student Tasks for Classifying Species

1. When students run the dichotomous key program, the TI-Innovator Rover is assigned one of the seven species.
2. Students should use their imagination to assume that juvenile TI-Innovator Rovers all *look* alike but eventually, as the Rover grows into an adult, it will begin to differentiate its appearance. Instead of physical features, students will use behavior to identify the species.
3. Students will need to review the dichotomous key in order to determine which of the seven species they have. They must start at the top of the key where it says “Predator”, and work their way down based on the results of each of the tests. The program will not allow the tests to be run out of order. For example, if the Rover is a predator, the next test to run is “Nocturnal”. (Nocturnal means active at night.) If the Rover is nocturnal, the next test you would run, according to the dichotomous key, would be “Howls in Dark?”.

### Overview of Identification Tests

- **Predator Test** – “Predator?”
  - Set the Rover about a hand length from the red tape or construction paper.
  - From the menu select the Predator Test. If the Rover is a predator, it will exhibit excitement when it rolls over “blood” (red tape or paper). If it is prey, it will turn around and get away from danger.
- **Time of Day Activity Test** – “Nocturnal?”
  - From the menu, select the Nocturnal Test. Shine a light, such as a phone flashlight, at the Rover’s brightness sensor (located on the back-end of the TI-Innovator Hub) and monitor its behavior.
  - If your Rover is active at night, or nocturnal, it will be sleepy when it’s day time. If it is diurnal, it will be active during the day and sleepy at night.
- **Territorial Test** – “Territorial?”
  - Set the Rover about a hand length away from the yellow tape (or construction paper). This paper is a model for animal urine which is how many species mark their territories.
  - From the menu, select the Territorial Test. When the Rover rolls up to a place that has been “marked” (urinated upon) by another and becomes very agitated and attempts to mark over the spot, it is “territorial”. If the Rover turns and runs away, it is not territorial.
- **Howl in the Dark Test** – “Howls?”
  - Set the Rover at an arm’s distance away from any person or object.
  - From the menu, select the Howl in Dark Test. Place a finger completely over the brightness sensor of the Rover to indicate that it is dark outside.
  - If the Rover “howls” when the lights are out, it is likely *Innovatidae felis*. Otherwise, it must be *Roveridae aqua*.
- **Show of Aggression Test** – “Aggression?”
  - From the menu, select the Aggression Test, and observe the Rover’s behavior.
  - If the diurnal Rover growls and lunges forward and moves backward several times, it is showing an aggressive posture and is ready for a fight. This indicates aggressive behavior and is therefore *Graphinia*



aves. If it turns and runs away, then it isn't aggressive.

- **Orange Flash During Mating Dance Test – “Mating?”**
  - From the menu, run the Mating Test. If a diurnal, non-aggressive Rover blinks its mating light orange several times, it is likely the mating signal for *Programmicus phoenicopterus*. If it blinks but is another color, such as purple, it is likely the mating signal for *Calculatoridae mus*.

You should have enough information to determine which Rover species you have. Press “Classify” on your calculator to identify yours. If you are correct, your calculator will prompt you to try to classify a different species.

### Questions

- What's the purpose of a dichotomous key?
- How would a dichotomous key work for plants such as trees? Would you use behavior, morphology, or some other characteristics?
- True or False – Dichotomous keys focus on trying to find *differences* between species.

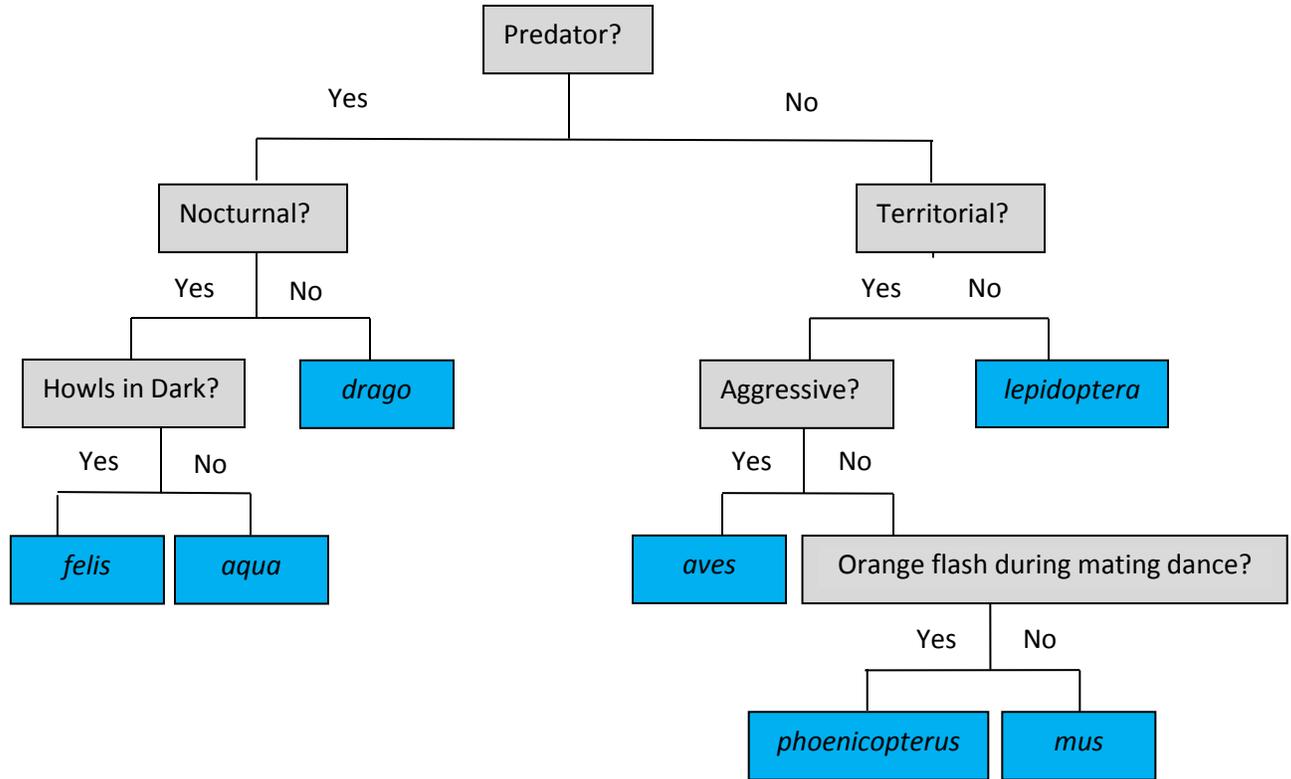
### Going Further:

Students can run through the activity again using a different “species”. Simply restart the program. It will randomly assign the students 1 of 7 possible species.



### TI-Innovator Rover Species Identification Chart

Use this dichotomous key to identify the species name of your Rover. Remember that you must conduct all tests in the order shown in the chart below.



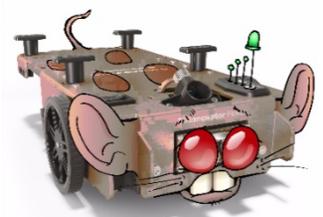
*Roboticus drago*



*Roveridae aqua*



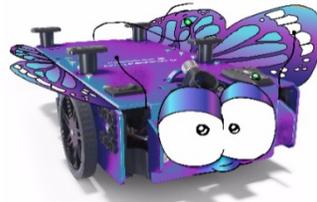
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