Dichotomous Key 2
Task Information

Grade: Biology, Middle School Science

Content:
- MST framework reference:
  - Standard 4-The Living Environment
- Regents Biology Syllabus:
  - Unit I, Topic II
- Variance Biology Program Guide:
  - Evolution: Unity & Diversity
- RCT Guide in Science:
  - 8 Middle School Block A

Format: Paper/pencil

Purpose: To use a dichotomous key to identify unknown organisms.

Skills:
- Primary: Classifying
- Secondary: Hypothesizing, Interpreting data

Time: 15 - 25 minutes

Materials:
- metric rulers

Preparation: None

Safety: N/A

Extensions/Modifications: None
Dichotomous Key 2

**Task:** With the millions of living organisms in the world, scientists need a method of identifying an unknown organism. To do this, scientists use a dichotomous key. At this station, you will be using a dichotomous key to identify unknown organisms.

**Directions**

Use the dichotomous key below to identify any three (3) species of the genus *Triangulum* in the accompanying Species Sheet. Record the choices made, and the resulting scientific name, on the answer sheet provided.

**Dichotomous Key**

1. A. Three(3) sided with straight lines
   B. Three (3) sided with wavy lines  
   Go to 2
   Go to 10

2. A. Has no eyes
   B. Has eyes  
   Go to 3
   Go to 5

3. A. Has flagella for movement
   B. Has cilia for movement  
   Go to 4
   Go to 7

4. A. The three sides are of equal length
   B. The three sides are not of equal length  
   *Triangulum equalius*
   Go to 12

5. A. Has crossed-eyes
   B. Eyes not crossed  
   Go to 6
   Go to 9

6. A. Has a single flagellum for movement
   B. Has two or more flagella for movement  

7. A. Total number of cilia for movement are odd
   B. Total number of cilia for movement are even  

8. A. Has a pointed nose
   B. Has a rounded nose  

9. A. Has two cilia on each side for movement
   B. Has more than two cilia on each side  

10. A. Has crossed-eyes
    B. Eyes not crossed  

11. A. Lower half of the body has a dot pattern
    B. Upper half of the body has a dot pattern  

12. A. Has a pointed nose
    B. Has a rounded nose  

*NYS Alternative Assessment in Science Project*
*NSF Grant #MDR-9154506*
1. Choose any three of the species of *Triangulum* from the Species Sheet and key them to their scientific names. Be sure to write in the numbers of the species that you are trying to identify. In the proper spaces below write in the number and letter for each of the choices you made as you identified the species (see example with species #101). When you are sure of the species identification, write in the scientific name in the space provided.

<table>
<thead>
<tr>
<th>Example #101</th>
<th>Species #_____</th>
<th>Species #_____</th>
<th>Species #_____</th>
</tr>
</thead>
<tbody>
<tr>
<td>1B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10B</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scientific name of Example #101 = *Sampulost correctus*

Scientific name of Species #_____ = 

Scientific name for Species #_____ = 

Scientific Name for Species #_____ = 
2. The following *Triangulum* organism was created by a student. It is **not** the same as any of the thirteen organisms shown on the Species Sheet. Can you determine its species? If so, list the steps, as you did before, in making this determination.

3. Draw another example of the organism in question #2 that would "key out" as being the same species.

4. A new species of *Triangulum* was discovered by a lab student in a sample of stagnant pond water. The dichotomous key must be modified to identify the new organism shown below.

A. Between which steps in the key should the new trait be added?

B. Write the new step to allow the key to fit the newly discovered organism.

C. Write a complete scientific name for this new species.
Dichotomous Key 2 - Scoring Rubric

This activity is to be used as an assessment after students have been exposed to the use of a dichotomous key, and therefore know what the term dichotomous refers to, and how it is used. There are 13 species of *Triangulum* pictured; it is suggested that each student identifies any three of the species.

**Question 1**

- 1 point is awarded for each correct name identification of each species.
- 1 point is awarded for each correct choice or step along the way.

The scoring of each species should continue until the last correct choice or step.

The Example given on the Student Answer Sheet (#101) would be awarded 3 points for a perfect answer. But if the student had only been able to reach choice 1B before making a mistake, only 1 point would be awarded.

Since a different number of choices is necessary to identify the different species, the students may end up with different total points. Therefore a percent grade may be given.

Total number of points for each species are given below, including the correct choice for each of the steps.

<table>
<thead>
<tr>
<th>Species name</th>
<th>Correct steps</th>
<th>Possible points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species #101 T. waveus (10B)</td>
<td>(1B - 10B)</td>
<td>3 points</td>
</tr>
<tr>
<td>Species #102 T. monoflagellum (6A)</td>
<td>(1A - 2B - 5B - 6A)</td>
<td>5 points</td>
</tr>
<tr>
<td>Species #103 T. roundflagellum (12B)</td>
<td>(1A - 2A - 3A - 4B - 12B)</td>
<td>6 points</td>
</tr>
<tr>
<td>Species #104 T. polycilius (9B)</td>
<td>(1A - 2B - 5B - 9B)</td>
<td>5 points</td>
</tr>
<tr>
<td>Species #105 T. pointitatus (8A)</td>
<td>(1A - 2A - 3B - 7B - 8A)</td>
<td>6 points</td>
</tr>
<tr>
<td>Species #106 T. polyflagellum (6B)</td>
<td>(1A - 2B - 5A - 6B)</td>
<td>5 points</td>
</tr>
<tr>
<td>Species #107 T. lowdotteus (11A)</td>
<td>(1B - 10A - 11A)</td>
<td>4 points</td>
</tr>
<tr>
<td>Species #108 T. equalius (4A)</td>
<td>(1A - 2A - 3A - 4A)</td>
<td>5 points</td>
</tr>
<tr>
<td>Species #109 T. biciliatus (9A)</td>
<td>(1A - 2B - 5B - 9A)</td>
<td>5 points</td>
</tr>
<tr>
<td>Species #110 T. oddcilius (7A)</td>
<td>(1A - 2A - 3B - 7A)</td>
<td>5 points</td>
</tr>
<tr>
<td>Species #111 T. roundiatus (8B)</td>
<td>(1A - 2A - 3B - 7B - 8B)</td>
<td>6 points</td>
</tr>
<tr>
<td>Species #112 T. pointiflagellate (12A)</td>
<td>(1A - 2A - 3A - 4B - 12A)</td>
<td>6 points</td>
</tr>
<tr>
<td>Species #113 T. upperdotteus (11B)</td>
<td>(1B - 10A - 11B)</td>
<td>4 points</td>
</tr>
</tbody>
</table>
Sample Answer Sheet

Choose any three of the species of *Triangulum* from the Species Sheet and key them to their scientific names. Be sure to write in the numbers of the species that you are trying to identify. In the proper spaces below write in the number and letter (example #101) for each of the choices you made as you identified the species. When you are sure of the species identification, write in the scientific name in the space provided.

<table>
<thead>
<tr>
<th>Example #101</th>
<th>Species # 105</th>
<th>Species # 112</th>
<th>Species # 107</th>
</tr>
</thead>
<tbody>
<tr>
<td>1B</td>
<td>1A</td>
<td>1A</td>
<td>1B</td>
</tr>
<tr>
<td></td>
<td>(1 point)</td>
<td>(1 point)</td>
<td>(1 point)</td>
</tr>
<tr>
<td>10B</td>
<td>2A</td>
<td>2A</td>
<td>10B</td>
</tr>
<tr>
<td></td>
<td>(1 point)</td>
<td>(1 point)</td>
<td>(incorrect)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3B</td>
<td>3B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1 point)</td>
<td>(incorrect)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7B</td>
<td>7A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1 point)</td>
<td>(incorrect)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1 point)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Scientific name of Example #101 = *Samplest correctus*

**Question 1.**

Scientific name of Species #105 = *Triangulum pointiatus*
Actual points _6_
Possible Points = _6_

Scientific name for Species #112 = *Triangulum oddcilius*
Actual Points _2_
Possible points = _6_

Scientific Name for Species #107 = *Triangulum waveus*
Actual Points _1_
Possible Points = _4_
Question 2

- Award 1 point for each correct step in the determination and correct naming of the organism *Triangulum oddcilius*. (steps; 1A, 2A, 3B, 7A)

4 points total

Question 3

- Allow 4 points if each of the following traits are shown in the student drawing:
  * Sides are straight lines
  * Has no eyes
  * Has cilia for movement
  * Total number of cilia for movement are odd
  (Note: The number must be odd and other than 3)
- 3 points if any three of the above traits are shown correctly
- 2 points if any two of the above traits are shown correctly
- 1 point if any one of the above traits is shown correctly
- 0 points if responses are incorrect, or no response is provided.

Note: Deduct 1 point from the total points for this question for each trait shown that should not be present (e.g.: a nose)

4 points total

Question 4

A. • Allow 1 point if the student correctly identifies steps ten (10) and eleven (11).
• Allow 0 points for incorrect responses, or no response provided.

B. • Allow 2 points if the student correctly describes two different conditions for the new trait.
  (Example:  
  A. Half the body has a dot pattern
  B. The whole body has a dot pattern.)
• Allow 1 point if the student correctly describes one condition for the new trait.
• Allow 0 points for incorrect responses, or no response provided.

C. • Allow 4 points if the student properly writes the scientific name of the new species using each of the following conventions:
  * name consists of genus and species
  * the genus name is *Triangulum*
  * underlining entire name
  * first letter of the genus name capitalized, first letter of the species name lower-case
• Allow 3 points if any three (3) of the above conventions are used correctly.
• Allow 2 points if any two (2) of the above conventions are used correctly.
• Allow 1 point if any one (1) of the above conventions is used correctly.
• Allow 0 points for incorrect responses, or no response provided.

7 points total
**Student ID________________________**

**Scoring Form - Dichotomous Key 2**

**Male / Female (circle one)**

**Question 1:**

**Directions:** Circle each of the species chosen.

<table>
<thead>
<tr>
<th>Species #</th>
<th>Points Possible</th>
<th>Points Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Possible Points: ____

Points Awarded: __________

**Triangulum Identification score:** \[rac{\text{points awarded}}{\text{possible points}}\]

---

**Question 2:**

Correct steps and naming of *T. oddcilius* 0 1 2 3 4 5

**Question 3:**

Traits shown in student drawing (including deductions) 0 1 2 3 4

***NOTE: Lowest possible score 0 points***

**Question 4:**

A Correctly identifies steps 0 1

B Writes accurate descriptions of the new trait 0 1 2

C Writes a scientific name using binomial nomenclature 0 1 2 3 4

**Total question score:** __________

Total possible score questions #2 - #4 - 16 points
Student ID: BIO - DK - 1

Scoring Form - Dichotomous Key 2

Male / Female (circle one)

Question 1:
Directions: Circle each of the species chosen.

<table>
<thead>
<tr>
<th>Species #</th>
<th>Points Possible</th>
<th>Points Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>102</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>103</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>104</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Possible Points: 16
Points Awarded: 15

Triangulum Identification score: \[
\frac{\text{points awarded}}{\text{possible points}} = \frac{15}{16} = 93.8\%
\]

---

Question 2:
Correct steps and naming of T. oddcilius

Question 3:
Traits shown in student drawing (including deductions)

*** NOTE: Lowest possible score 0 points ***

Question 4:
A Correctly identifies steps 0 1 2 3 4
B Writes accurate descriptions of the new trait 0 1 2 3 4
C Writes a scientific name using binomial nomenclature 0 1 2 3 4

Total question score: 15 pts
Total possible score questions #2 - #4 - 16 points
Choose any three of the species of *Triangulum* from the Species Sheet and key them to their scientific names. Be sure to write in the numbers of the species that you are trying to identify. In the proper spaces below write in the number and letter for each of the choices you made as you identified the species (see example with species #101). When you are sure of the species identification, write in the scientific name in the space provided.

<table>
<thead>
<tr>
<th>Example #101</th>
<th>Species #102</th>
<th>Species #103</th>
<th>Species #104</th>
</tr>
</thead>
<tbody>
<tr>
<td>1B</td>
<td>1a</td>
<td>1a</td>
<td>1a</td>
</tr>
<tr>
<td></td>
<td>2b</td>
<td>2a</td>
<td>2b</td>
</tr>
<tr>
<td>10B</td>
<td>5b</td>
<td>3b</td>
<td>5b</td>
</tr>
</tbody>
</table>

Scientific name of Example #101 = Samplest correctus
Scientific name of Species #102 = *Triangulum monoflagellum*
Scientific name for Species #103 = *Triangulum sordidiflagellum*
Scientific Name for Species #104 = *Triangulum polyceius*
2. The following *Triangulum* organism was created by a student. It is not one of the thirteen shown on the Species Sheet. Can you determine its species? If so, list the steps, as you did before, in making this determination.

   ![Image of a simple triangle with two small triangles on the sides](image)

   1a, 2a, 3b, 7a  *Triangulum oddilibic*

3. Draw another example of the organism in question #2 that would "key out" as being the same species.

   ![Image of a detailed organism with dots and patterns](image)

4. A new species of *Triangulum* was discovered by a lab student in a sample of stagnant pond water. The dichotomous key must be modified to identify the new organism shown below.

   ![Image of a complex organism with multiple layers and patterns](image)

   A. Between which steps in the key should the new trait be added?

   10 & 12  Step 11 should be a new trait.

   B. Write descriptions of this of this trait, for this step, based on the drawing of the newly discovered organism.

   The organism has dots on the upper part of its body.

   C. Write the scientific name for this new organism.

   *Triangulum low; upperdottens*
**Student ID**: Bio - DK - Z

**Scoring Form - Dichotomous Key 2**

**Male / Female** (circle one)

**Question 1:**

Directions: Circle each of the species chosen.

<table>
<thead>
<tr>
<th>Species #</th>
<th>Points Possible</th>
<th>Points Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>111</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>113</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Possible Points: 15
Points Awarded: 15

Triangulum Identification score: \(rac{\text{points awarded}}{\text{possible points}} \) = \( \frac{15}{15} \) 100%

---

**Question 2:**
Correct steps and naming of \( T. oddcilius \)

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

**Question 3:**

Traits shown in student drawing (including deductions)

*** NOTE: Lowest possible score 0 points ***

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

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**Question 4:**

A Correctly identifies steps

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

B Writes accurate descriptions of the new trait

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

C Writes a scientific name using binomial nomenclature

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Total question score: 11 pts
Total possible score questions #2 - #4 - 16 points
Choose any three of the species of *Triangulum* from the Species Sheet and key them to their scientific names. Be sure to write in the numbers of the species that you are trying to identify. In the proper spaces below write in the number and letter for each of the choices you made as you identified the species (see example with species #101). When you are sure of the species identification, write in the scientific name in the space provided.

<table>
<thead>
<tr>
<th>Example #101</th>
<th>Species # 113</th>
<th>Species # 110</th>
<th>Species # 111</th>
</tr>
</thead>
<tbody>
<tr>
<td>1B</td>
<td>1B</td>
<td>1A</td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td>10B</td>
<td>10A</td>
<td>2A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11B</td>
<td>2B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3B</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>7A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8B</td>
</tr>
</tbody>
</table>

Scientific name of Example #101 = *Samplest correctus*
Scientific name of Species #113 = *Triangulum upperdottius*
Scientific name for Species #110 = *Triangulum oddvilius*
Scientific Name for Species #111 = *Triangulum roundatus*
2. The following *Triangulum* organism was created by a student. It is **not** one of the thirteen shown on the Species Sheet. Can you determine its species? If so, list the steps, as you did before, in making this determination.

```
LA → 2A → 3B → 7A  Answer: Triangulum oddius
```

3. Draw another example of the organism in question #2 that would "key out" as being the same species.

```

```

4. A new species of *Triangulum* was discovered by a lab student in a sample of stagnant pond water. The dichotomous key must be modified to identify the new organism shown below.

```
```

A. Between which steps in the key should the new trait be added?

```
IB → 10A → 11 A & B  Between: 10 and 11
```

B. Write descriptions of this of this trait, for this step, based on the drawing of the newly discovered organism.

```
IB → 10A → 11 A & B
```

C. Write the scientific name for this new organism.

```
Triangulum lacustris triangulum upper dots
```

Student ID: B10 - DK - 3

Male / Female (circle one)

Question 1:
Directions: Circle each of the species chosen.

<table>
<thead>
<tr>
<th>Species #</th>
<th>Points Possible</th>
<th>Points Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>108</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>111</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>112</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

Possible Points: 17
Points Awarded: 8

Triangulum Identification score: \( \frac{\text{points awarded}}{\text{possible points}} = \frac{8}{17} = 41.2\% \)

Question 2:
Correct steps and naming of T. oddcilius

0 1 2 3 4 5

Question 3:
Traits shown in student drawing (including deductions) \((-2\))

0 1 2 3 4

*** NOTE: Lowest possible score 0 points ***

Question 4:
A Correctly identifies steps

0 1

B Writes accurate descriptions of the new trait

0 1 2

C Writes a scientific name using binomial nomenclature

0 1 2 3 4

Total question score: 10

Total possible score questions #2 - #4 - 16 points
Answer Sheet

1. Choose any three of the species of *Triangulum* from the Species Sheet and key them to their scientific names. Be sure to write in the numbers of the species that you are trying to identify. In the proper spaces below write in the number and letter for each of the choices you made as you identified the species (see example with species #101). When you are sure of the species identification, write in the scientific name in the space provided.

<table>
<thead>
<tr>
<th>Example #101</th>
<th>Species # 108</th>
<th>Species # 112</th>
<th>Species # 111</th>
</tr>
</thead>
<tbody>
<tr>
<td>1B</td>
<td>1A</td>
<td>1A</td>
<td>1A</td>
</tr>
<tr>
<td>10B</td>
<td>2A</td>
<td>2A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4A</td>
<td>4B</td>
<td>7B</td>
</tr>
<tr>
<td></td>
<td>6A</td>
<td>6A</td>
<td>8A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8B</td>
<td></td>
</tr>
</tbody>
</table>

Scientific name of Example #101 = *Samplest correctus*

Scientific name of Species # 108 = *Triangulum monosflagellum*

Scientific name for Species # 112 = *Triangulum portatus*

Scientific Name for Species # 111 = *Triangulum ptygicus*
2. The following *Triangulum* organism was created by a student. It is **not** one of the thirteen shown on the Species Sheet. Can you determine its species? If so, list the steps, as you did before, in making this determination.

   *Triangulum oddcius*

   ![Diagram of Triangulum oddcius]

   I determined its characteristics using the dichotomous key and then when I found the last characteristic I looked across from it and found its binomial nomenclature.

3. Draw another example of the organism in question #2 that would "key out" as being the same species.

   ![Diagram of another example of Triangulum]

4. A new species of *Triangulum* was discovered by a lab student in a sample of stagnant pond water. The dichotomous key must be modified to identify the new organism shown below.

   ![Diagram of new Triangulum species]

   A. Between which steps in the key should the new trait be added?

   *between 11 and 12 whole body has dotted pattern*

   B. Write descriptions of this of this trait, for this step, based on the drawing of the newly discovered organism.

   *whole body has dotted pattern*

   C. Write the scientific name for this new organism.

   *Triangulum whokedotcus*