

# **Cranial Creations in Physical Science**

## **Interdisciplinary and Cooperative Activities**

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## Teaching Guide

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### **Procedural Suggestions for a Typical *Cranial Creations* Creative Writing Exercise**

We devised this suggested set of instructions for the creative writing exercises, but these basic directions could be modified to fit other types of exercises. In fact, you will probably notice similarities to some of the analysis-type exercise instructions.

Each student will do some form of assignment individually, either in class or at home. It might range from something as uncomplicated as answering a question in writing to some of the more elaborate homework projects presented in this book. This individual work will be called the “story” throughout the remaining steps.

#### ***When the Story is Turned In***

1. Collect the “story” papers and stamp them, or mark them in some other way, to show that the individual work was completed, or at least attempted.
2. Hand out the In-Class Student Follow-up questions to be answered individually while you are checking the story papers.
3. If the story was homework, students who did not do the story do not receive these individual questions. Their job is to complete the story in class while the other students do steps 4–9. You need to decide whether to count this makeup work for the same credit as for those who did the homework.
4. Form groups of three (or four, maximum) students. Have each group elect or appoint a scribe who will write down the consensus answers.
5. Hand the stories back to their authors.
6. Each student reads his or her story to the others in the group.
7. After each story is read, the group makes a positive comment about the story to the author (e.g., “Good job!”).

8. After listening to all of the stories, the group must come to a **consensus** on answers to the individual questions. These answers are written by the scribe on the consensus paper (see sample on page *xi*). The sample page has space for six answers because it is our experience that a hardworking group of students will be able to come to a legitimate consensus on five to seven questions in a class period, if they also do the preceding steps.
9. Each group member must sign the consensus paper, indicating agreement with the consensus answers. The scribe then gives you the consensus paper. Individual papers may be stapled to the consensus paper if you want to see all of the group work.

Each person in the group gets the same grade for this group portion of the work. It is based exclusively on:

1. doing the story to begin with.
2. the quality and consistency of the consensus answers.

While the group work is being done, we recommend that you follow some form of structured guidelines for group conduct. Dr. Harry Wong has published a set of four such guidelines that have proved a very valuable tool in our group work. If you do not have an established code of conduct for group work in your classroom, we recommend using Dr. Wong's four rules:

1. You are responsible for your own work and behavior.
2. You must ask each support buddy (group member) for help if you have a question.
3. You must be willing to help any support buddy (group member) who asks for help.
4. You may ask help from the teacher only when the group has the same question.

from *Successful Teaching* by Dr. Harry K. Wong

Using these rules will simplify your supervision of group work because you will only be going to groups who have a legitimate question that none of the group members can answer. To check and see if all group members were asked the question before you were called in, ask a group member who did not have a hand raised what the question is. If that group member does not know the question, refuse to answer and leave the group. As soon as your students find out that you are serious about only answering group questions, you will find far fewer hands raised. Following these rules makes group work much more rewarding for both you and the students.

Scribe's Name \_\_\_\_\_ Date \_\_\_\_\_

## 11. My Fossil's Older Than Your Fossil

**Fossils** are the evidence of organisms that existed millions of years ago. Fleishy parts of animals usually do not fossilize well, but bones and teeth do a fine job of fossilization. Some times, of course, an entire organism is fossilized, but this is very rare. More common whole specimens are those in which an organism has been trapped in something like **amber** (a fossil resin). We can also see what an organism looked like if it left an imprint in mud that hardened and later filled with some substance that assumed the form of the dead organism.

In the exercise that follows, you will have a chance to see how well you can judge which fossil came before which. You will base your judgment on pictures of an artist's reconstructions of a variety of fossilized remains found in the eroded bank of a river.

### Part 1

1. Get into groups as instructed by your teacher.
2. Cut out the pictures of the organisms and arrange them in what you think would be the most logical sequence of development or progression. Assume that one fossil was the ancestor of all the rest and that other organisms were descendants of *specific* other organisms. Use the structures (antennae, tails, etc.) shown on the organisms in the pictures to help you in your decision-making. Also use the following clues:
  - Clue #1: From the original organism (*Tortugis ancientis*), three distinct families branched off and founded their own lines of development.
  - Clue #2: New organisms do not have to have formed in different lines at the same time. They *might* have, but they do not *have* to have.
  - Clue #3: Each of the original three lines *could* have more than one branch.
3. After you have arranged your organisms in your "best guess" order, write down the names of the organisms in whatever pattern you decided was the best (like a family tree). Save the pictures!
4. Take the paper with the written family tree to your teacher when your group is done.

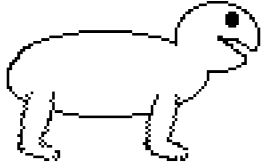
Good Luck!

(continued)



11. My Fossil's Older Than Your Fossil (*continued*)

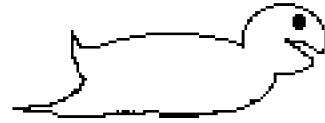
*Illustrations of Tortugis Species*



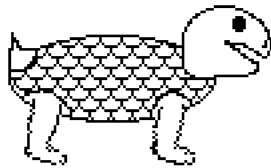
*Tortugis ancientis*



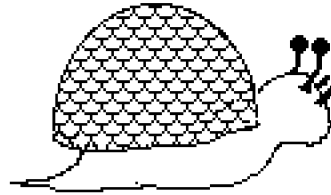
*Tortugis predatoris*



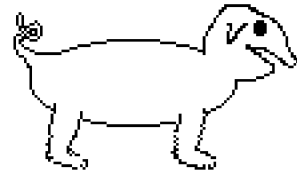
*Tortugis slidereni*



*Tortugis scalifiedis*



*Tortugis molluskus*



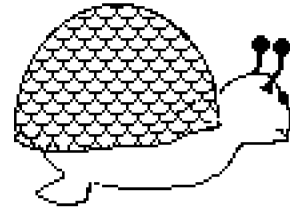
*Tortugis proboscis*



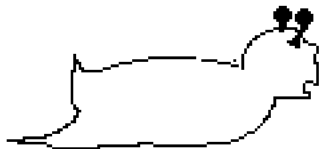
*Tortugis porkii*



*Tortugis spinalis*



*Tortugis apodis*



*Tortugis slugenii*



*Tortugis tortugis*

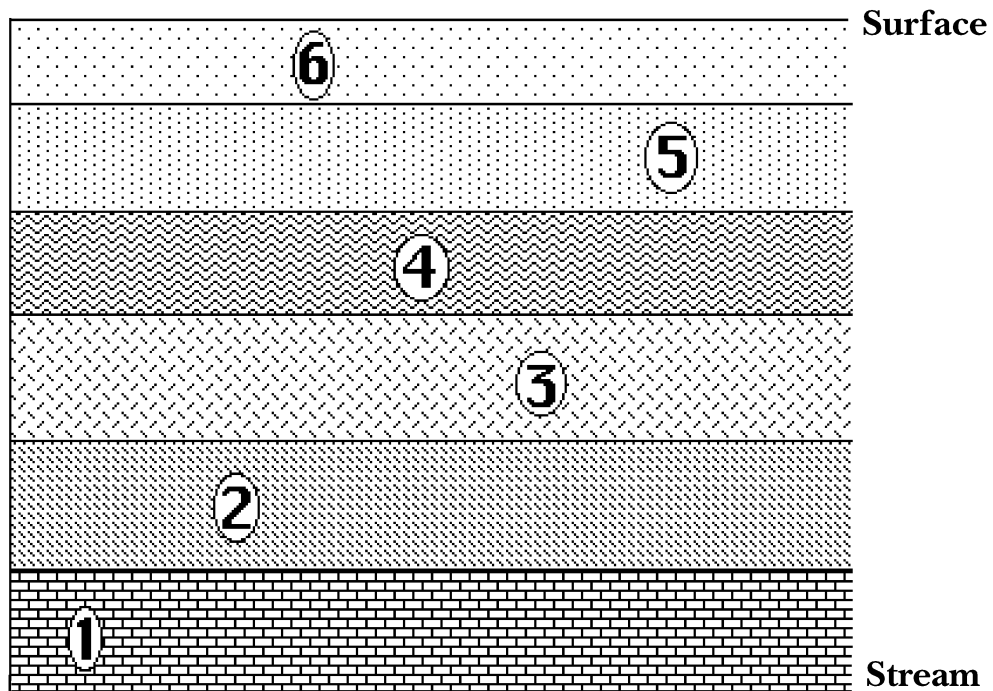
Scribe's Name \_\_\_\_\_ Date \_\_\_\_\_

### 11. My Fossil's Older Than Your Fossil (*continued*)

**Part 2**

Congratulations! You completed the first part of this assignment. Now you will get a chance to see where the fossils were found and consider modifying any of your answers before you turn them in.

Below is a diagram of the river bank strata where the *Tortugis* fossils were discovered. Below the diagram is a list of **strata layers** and fossil names. Each fossil name appears after the number of the layer in which it was discovered. You may assume that the layer labeled with a name is the lowest layer in which that particular type of fossil was found.



Stratum number	Fossil name
1	<i>Tortugis ancientis</i>
2	<i>Tortugis scalifiedis</i>
3	<i>Tortugis slidereni, Tortugis tortugis</i>
4	<i>Tortugis slugenii, Tortugis proboscis</i>
5	<i>Tortugis spinalis, Tortugis apodis, Tortugis porkii</i>
6	<i>Tortugis molluskus, Tortugis predatoris</i>

Redraw your family tree as needed to match this new information.

(*continued*)



### 11. My Fossil's Older Than Your Fossil (*continued*)

**Important note:** Just because the name of one of the *Tortugis* organisms appears directly above another name on the list, it does not mean that those two organisms are directly related.

Now answer the following questions as assigned by your teacher.

1. Which were the oldest fossils after *Tortugis ancientis*? How did you decide that?
2. In which layers were the most *complex* fossils located?
3. Could there be species of *Tortugis* other than those that have been found? Explain why or why not.
4. Look carefully at each of the *Tortugis* specimens. Write down what you think each one ate and where it lived. Explain why you made the decisions you did.
5. a. Choose any two consecutive steps in the family tree you ended up with. Make a drawing of one other type of *Tortugis* that would be like a missing link between the two that are on your family tree.  
b. Name your creature *Tortugis* \_\_\_\_\_. Choose a species name that would be as appropriate for your organism as the species names for the known specimens.