

TxCETP Course Component:

The Key to Classification
“The paths most traveled”

I. General Information

“Understanding Classification”

Overview of Course Component:

The Classification Inquiry Course Component is designed to facilitate an inquiry-based approach to understanding key concepts in the science of taxonomy. The activities included in the Course Component allow students to develop an appreciation for the rules governing taxonomy, as well as hands-on practice in using dichotomous keys.

Objectives of Course Component:

The student is expected to: (1) be able to apply taxonomic rules with an understanding of the limitations inherent within taxonomy as a discipline, (2) analyze the relationships among organisms and develop a model of a hierarchical classification system based on similarities and differences using taxonomic nomenclature, and (3) collect and classify organisms at several taxonomic levels such as species, phylum and kingdom using dichotomous keys.

Overall Time Frame for the Course Component:

Approximately two, fifty minute classes and 20 minutes of a third class.

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II. Operational Details

Knowledge Level I

Inquiry Activity

A. Objective: Students establish that classification is relevant to their lives by classifying objects and evaluating their classifications.

B. Time Frame for Activity: 30 - 50 minutes

C. Materials: None

D. Procedure:

1. Individually, students list examples of classification systems based upon their experience.
2. Students confer and consult with each other regarding their respective lists and decide whether their classifications are scientific or non-scientific.
3. Instructor provides the opportunity for at least some of the groups to present their reasoning to the class as an introduction to the following information.
4. Students are asked to review the criteria necessary for something to be called “scientific” (covered in the Scientific Inquiry CC):
 1. Testable
 2. Part of the natural world
 3. Tentative
 4. Reproducible
 5. Objective
5. Students re-evaluate their initial lists from Step #1.

E. Formative Assessment:

1. After Step #5 of the Procedure, ask the students to individually (anonymously if they wish) record a response to the following question which is then collected:
 1. What prior conceptions did you possess? What new concepts have you learned regarding the classification?
2. Collect the list of classifications each student wrote and then modified (if modification occurred!).

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Knowledge Level II

Inquiry Activity

A. Objective: Students classify a group of objects, design a classification key and evaluate their designs.

B. Time Frame for Activity: at least 50 minutes

C. Materials:

1. Classification objects:
 - a. photocopies of 5-8 objects (for large classes)
 - b. t-shirts or shoes or fasteners or lab equipment
 - c. 3-5 woody twigs
 - d. any object that is appropriate to your course

D. Procedure:

GROUPING:

1. Students obtain the objects or twigs to classify.
2. Students group the objects and name each group.
3. Students are introduced to the hierarchy of classification.
4. Students determine how the hierarchy applies to their groupings of objects.
5. Binary nomenclature is introduced. (See part E. Assessment)
6. Students evaluate their groupings.

KEYING:

7. Discuss dichotomous keys (“either/or keys”).
8. Students will study a dichotomous key for classifying cars in a parking lot. (See “Appendix of Resources”).
9. Students design their own dichotomous key for their objects. If using twigs, see Appendix of Resources.
10. Students exchange keys and attempt to use some other group’s key for identifying the object.
11. Students check with each other to see if their identification is the same as the one the authors of that key determined.
12. Students critique the keys orally in their groups and the instructor asks for strengths and weaknesses of the keys they used.

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E. Formative Assessment:

1. Peer review of the accuracy of the key design as measured by the number of objects that were keyed correctly.
2. Outside of class complete the following assignment:
What is binomial nomenclature? Why are scientific names important?
Justify your answers by using the article on *Acacia* (See Appendix of Resources)

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Knowledge Level III

Inquiry Activity

- A. Objective: Students classify phyla using characteristics discussed.
- B. Time Frame for Activity: Previous lectures on diversity, 5 minutes to make assignment, 20 minutes to key out several specimens and review the design of the keys during the next class meeting.
- C. Materials:
1. One specimen from each group covered during the previous lectures on phyla.
 2. Original and photocopies of keys made by students outside of class.
- D. Procedure:
1. Students are given the out-of-class assignment to produce a key of 5 phyla or classes (as designated by the instructor) discussed during previous classes. Students are asked to photocopy the key that they make and bring it to the next class meeting.
 2. During the next class meeting, students study samples of organisms and/or photographs, and models of organisms and use their keys to identify the organism or objects.
 3. Students listen to the discussion of the organisms and re-evaluate/enhance/improve the design of their keys.
 4. At the end of class the students turn in the original with changes and the photocopy without changes.
- E. Formative Assessment:
1. Students send e-mails to professor addressing the following question:
 1. What was the most difficult part of designing your dichotomous key?
 2. Collect student keys for assessment.

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III. Summative Assessment & Evaluation

Contents

Course Component Summative Assessment:

1. List two daily activities that involve classification.
2. Develop a hierarchical classification for where you live using at least five different location levels.
3. Use line drawings of organisms (provided by the instructor) discussed in class and appropriate terminology to do the following:
 - a. Provide a correct name (as discussed in class) for each organism. If you do not remember the name, then assign the organism a letter.
 - b. Use appropriate terminology to prepare a dichotomous key that would allow you to identify each organism by name.

Course Component Evaluation:

1. Evaluation Instrument for Professor
2. Evaluation Instrument for Students

Faculty Evaluation of Science Course Component (SC²)

Title of Course Component: _____

Institution: _____ Title and Course Number: _____

Faculty Member's Name: _____ Email address: _____

Address: _____ Phone: _____

Number of students enrolled in the course: _____

% of those enrolled pursuing secondary certification in science: _____

Please circle your responses for items 1 - 6 using the following scale:

1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree

1. The SC² was user-friendly for faculty 1 2 3 4 5
2. The SC² was user-friendly for students 1 2 3 4 5
3. The SC² was an effective use of class time 1 2 3 4 5
4. Technology was an integral part of the SC² 1 2 3 4 5
5. I used teaching methods with this SC² that were new for me 1 2 3 4 5
6. If you agreed with item #5, what new teaching methods (group instruction, student inquiry, use of technology, alternative student assessment, etc.) did you use and what is your reaction to the use of those methods?

7. What insights (pedagogical or content) did you acquire through the use of the SC²?

8. What are the strengths of the SC² and what improvements and/or changes should be made in its design?

Student Evaluation of Science Course Component (SC²)

Title of Course Component: _____

Professor or Instructor's Name: _____

Institution: _____ Title & Course Number: _____

Classification: _____ Intended Major: _____

Are you pursuing certification in secondary education in addition to your major? _____

Your age: _____ Sex: _____ Ethnicity: _____

Thank you for providing vital feedback regarding your experience with this approach to learning science. Using your own observations and opinions, please circle your responses for items 1 - 6 using the following scale:

1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree

1. The SC² appeared to be user-friendly for faculty 1 2 3 4 5

2. The SC² was user-friendly for students 1 2 3 4 5

3. The SC² was an effective use of class time 1 2 3 4 5

4. Technology was an integral part of the SC² 1 2 3 4 5

5. The teaching methods used within this SC² were new to me 1 2 3 4 5

6. If you agreed with item #5, what specific teaching methods (group instruction, student discussion, use of technology, alternative methods of grading, etc.) were new to you and what is your reaction to the use of those methods?

7. Please give us your opinion regarding your overall reaction to the SC² in terms of whether you found its use helpful in learning the main concept of the SC², or if the SC² clarified certain ideas or if the use of the SC² made your learning more difficult or confusing, etc.

8. In summary, what are the strengths of the SC² and what improvements and/or changes should be made in its design?

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IV. Appendix of Resources

Contents

Knowledge Level II:

- A. Article on *Acacia*
- B. Dichotomous key for classifying cars in a parking lot