

Changing Over Time Laboratory Kit Evaluation

251014 Carolina Biological Supply

Rich Stein

Carolina Biological Supply Company has produced multiple labs within a series labeled "Inquiries in Science." Labs within these series claim to "help students understand hard-to-grasp concepts." With the laboratory kit Carolina supplies instructors with suggestive teaching techniques. The recommended techniques were designed to help students "through guided inquiry." The teacher's manual gives the instructor background information on each activity and suggested discussion question. The Changing Over Time laboratory kit supplies the instructors with three activities. Each activity investigates one area of the evidence of evolution.

Activity 1: Kinship Activity Sheet

Each pair of students receives a "Kinship Activity Sheet." Within their pair students must discuss with their partner about which organism out of a group of three does not belong. Students must find the two organisms most closely related and document which organism is the least related. The activity sheet contains six groups of organisms and students should record their answers within their science notebook.

This activity is an excellent discussion starter for the evidence of evolution unit. Many students will struggle with the reasoning for some organism's relationship. It is recommended that the instructor provides cladograms or any type of phylogeny diagram to help facilitate the discussion. It is also recommended that the sheets provided to the students are laminated to preserve the color and structural integrity of the paper.

Activity 2: Structure Cards

Working in the same groups, students are given a stack of cards. On one side of the cards is displayed an organism or an organism's body part, on the other side is a short description of the particular part being investigated. Students are asked to put the cards into groups. Students should consider: what the structure does, the function of the structure and their appearance.

This is another activity that could bring up many great classroom discussions. The instructor does not tell how the cards should be grouped; he/she just gives factors to consider. In that respect, there are multiple ways to group the cards and the instructor should be prepared to have large classroom discussion about why cards were grouped a certain way. It is recommended the instructor encourages the students to read the back of the cards and fill out the table provided in the lab manual for what cards are grouped, the category description and the reasoning. Within the instructor manual it is recommended you do not reveal the correct ordering until after all activities are complete. As an evaluation committee we did not see the reason why to wait; activity 3 plays a role in evolutionary change over time but the instructor may run into some difficulty meshing the two concepts together with a lower level biology class.

Activity 3: Antibiotics and Resistance

Students will be working within groups to investigate the antibiotic resistances of *Escherichia coli* to ampicillin. Students streak a culture of *E. coli* onto an Ampicillin Concentration Gradient agar plate. The culture is allowed to grow for 24 hours and students should observe multiple colonies of *E. coli*, majority growing in the least concentrated ampicillin region. From this agar plates students are then asked to design an experiment to investigate ampicillin resistant bacteria. Students have at their disposal agar plates with ampicillin, agar plates without ampicillin and blank sterile antibiotic disks.

This activity requires a lot of teacher preparatory time. The instructor needs to prepare 25 agar plates; three different types with each requiring some type of modification. The instructor also needs to be precise in the preparatory technique or else students will not obtain any accurate results. This activity provides students with excellent hands on examples of real bacteria going through real evolution in a time frame they can observe. The experimental design gives students freedom to conduct their own guided investigation but instructor guidance will be needed. Depending on the level of biology students the experimental design section may need to be completed as a class, as many students may not see the big picture idea. This activity can easily be substituted with another activity depending on time; such as "Natural Selection & Antibiotic Resistance" by Ward's Natural Science, which may only require 30 minutes

Carolina Biological Supply put together a multi-level laboratory kit for biology students of all abilities. Some activities are more advanced and can easily be explored into more detail depending on the curriculum goal of the class. This is a highly recommended kit as it provides the instructor with excellent discussion material that can be manipulated, expanded, or shortened without hurting the overall goal of the kit, "help students understand hard-to-grasp concepts." Instructors should be prepared to pay a high price for the kit but the materials given to the instructor will last for years and refill kits for *E. coli* samples and ampicillin are available or can be purchased elsewhere.

Reference:

Carolina Biological Supply

<http://www.carolina.com/product/life+science/inquiries+in+science+biology+series/inquiries+in+science-+changing+over+time+kit.do?sortby=ourPicks>

Ward's Natural Science

<http://wardsci.com/product.asp?pn=IG0034777&name=Natural+Selection+and+Antibiotic-Resistant+Bacteria+Lab+Activity&bhcd2=1249437783>