Checkerboard Universe Activity—Student's Handout

Introduction

Science attempts to make sense of the complex universe we live in. We ask questions like "How do we know..."? To answer those questions, we make guesses and formulate models of how we think the universe works. We then do experiments to find out just how good our guesses and models really are.

In your science classes, you will undoubtedly learn certain terminology, mathematics, concepts, and principles. However, that is not enough. It is imperative that you learn to think scientifically. That is much harder than just memorizing terms or equations. However, it is what will empower you to solve problems and make good decisions based on sound science.

In this activity, you will gain insight into the methods that you employ in solving problems and conducting investigations. At the end, you will be prepared to discuss your *scientific method*. This activity is about *discovering* of the "rules of the universe" or rather the "rules of the checkerboard universe."

Set Up

In this activity, you will explore the rules of various "checkerboard universes." To accomplish the activity, you need:

- a lab partner
- a set of rules for the checkerboard universes (for your lab partner)
- a set of checkers and a checkerboard

Give the set of rules for the checkerboard universes to your lab partner. **DO NOT LOOK AT THE RULES.** You should give the handout to your partner without looking at the rules; otherwise that ruins the game.

Objective

Your lab partner will be the "god of the universe" and will know the rules for the universe. You, the scientist must figure out the rules of the universe by placing checkers on the checkerboard. If a checker violates the rules, then "god" will say "Not allowed" and you, the scientist, must remove the checker. If the checker is allowed by the rules of the universe, then "god" will say "That is allowed." By experiment alone, you must figure out the rules of the universe.

Procedure

1. Your lab partner should turn to the first universe in the stack of rules (see separate handout) and read the first rule silently.
2. You should begin by placing one checker on the checkerboard.
3. Your lab partner should say, "That is allowed" or "That is not allowed," depending of course on the rule of the universe.
4. If the checker is allowed, leave it on the board. If it is not allowed, remove it. Then, place another checker.
5. This process continues with you placing checkers and leaving them or removing them depending on whether or not they are allowed.
6. You should try to figure out what the rule is by examining the pattern of checkers on the board.
7. When you, the scientist, are convinced that you know the rule, then tell your lab partner the rule. It must be exactly correct or stated in a synonymous or equivalent way in order to be correct.
8. When the rule of the universe is discovered, clear the board. Then, your lab partner should turn the page to the next universe. At this point, you start again to discover the rules of the new universe.
9. Continue until you've discovered the rules for each universe in your lab partner's handout.
10. If you enjoy the process, write some new rules and have your lab partner try to discover the rules that you created. Do you feel like God?

Notes

1. By definition, *neighbors*, or *neighboring checkers*, are checkers that touch at a side. *Diagonal checkers* are checkers that share a corner. By nature of the checkerboard, diagonal checkers must be on the same color squares. A *set of neighbors* is a set of checkers where each checker is a neighbor of at least one other checker. We also call this a *group* of checkers.

2. The simpler the theory, the better. While a theory such as "checkers may go on squares A2, A4, A6...B1, B3, B5..." is technically correct, it is not nearly as good, simple or predictive as "checkers go on red squares."

3. Pay attention to your thinking process and the strategies that you employ in discovering the rules of the universe. You will be asked to discuss them.