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A complete write-up as well as supplies for this activity can be obtained from Carolina Biological Co.\*



**Concept:** Technology of slime/glue polymers

**National Science Standards:**

A	B	C	D	E	F	G

**Objective:** Students will apply observations from their previous slime experiments to a “real world” scenario. They will simulate a company which designs soles for athletic shoes to meet certain needs. Students will also practice cooperative learning and communication skills.

**Suggested grade levels:** 4-8.

**Estimated time:**

- Teacher prep: 1-3 hours.
- Activity: 1-3 weeks, depending on time and depth of involvement

**Materials needed (per group):**

- variety of athletic shoes (Use students’ own shoes or bring in specific kinds; this is for whole group discussion.)
- labeled and stored slimes/glue polymers from preceding experiment
- data chart constructed in preceding slime experiment
- cardboard shoe pattern
- Play Doh™ (optional)
- Lysol™ (optional)
- large Ziploc™ bag (to store finished product)
- paper and pencil
- GOGGLES
- hats or badges for different jobs (optional)

**Safety/Disposal:**

Caution students against ingesting slimes/glue polymers. Goggles should be worn when working with the slimes/glue polymers.

There is typically no danger in handling the slimes or glue polymers, but students should wash their hands after use. Should redness or itching occur, wash the area with a mild soap and avoid further contact. Students with especially sensitive skin or students who know they are allergic to borax or detergent products should avoid contact.

Students should be cautioned not to place either the slime or glue polymer on wooden furniture,

since it will leave a water mark. If either the slime or glue polymer spills on the carpet, apply vinegar on the spot and follow with a soap-and-water rinse. Do not let either harden on the carpet.

The slime/glue polymer shoe sole will keep for a time if stored in a plastic bag. A small amount of Lysol™ may be added to prevent molding. You may wish to freeze finished products until presentations. Discard sole and bags in waste can when finished.

### Procedure:

1. Compare/contrast/discuss in large group variety of shoes/soles.

Options: a. Use students' shoes.

b. Bring in variety of sports shoes (i.e. basketball, golf, running, etc.).

c. Discuss old shoes versus new shoes.

d. Invite a speaker (i.e. coach, athlete, shoe salesperson).

1. 2. Introduce students to the following scenario:

*Your corporation must develop a gym shoe which has specific components for an athlete who plays a particular sport. First, decide for which sport (basketball, soccer, etc.) the shoe will be designed. Discuss the characteristics your company needs to consider to enable an athlete in that sport to do well. Develop a shoe sole with all of these properties in mind.*

3. Form design teams of four and decide on a company name and assign/choose a job for each team member. Jobs include (but aren't limited to):

a. Research Project Leader (CEO)

Job description: sets/outlines goals, time keeper, keeps group on task, communicates with the teacher

b. Product Manager

Job description: construction of product

c. Quality Control Manager

Job description: checks to see if design meets qualification of the buyer

d. Marketing/Advertisement

Job description: promotion and explanation of design

Suggestion: Have hats or badges with job names on them to identify each student's role. Be sure to explain the meaning of each job description before choosing roles.

4. Teams design a shoe pattern deciding on the best polymer or polymer combinations. Students should refer to their property observation chart from their previous experiment when designing their sole.
5. Teams construct shoe sole design using polymers and cardboard pattern. You may want to make a rim of Play Doh™ around the outline of the shoe to provide an interior area to place the polymers, rather than just a flat piece of cardboard. Place product in Ziploc™ bag. Seal and store flat. A spray of Lysol™ into the bag may be used to prevent molding. You may want to freeze the finished products until time for presentations. **REMEMBER THAT TIME BETWEEN CONSTRUCTION AND PRESENTATION SHOULD BE CONSIDERED BECAUSE SLIMES WILL RUN OFF PAPER PATTERN. FREEZING PRODUCT MAY HELP.**

6. Design teams will prepare and present a two minute presentation describing the reasons for choosing various polymers for particular parts of the sole. Suggested options: TV/radio ad, newspaper ad, billboard, video, computer web page.

**Wrap-up:**

- Expected results: Each design team will produce a product and make a presentation about their product.
  - Discussion questions: What problems did you encounter while designing your shoe sole? Why did you use the polymer(s) that you did? How is this problem like the real world? How did you assist you team? How did your team members help you? What were the strengths of your team? What were the weaknesses of your team?
- Follow-up questions: Would you do anything differently if you did this again? How would you justify the different designs of shoes on the market? Do you think the price of different brands of athletic shoes is appropriate? How do manufacturers decide on the price of a pair of shoes? Why are you willing to pay the price asked for a pair of athletic shoes? Can you think of anything else that could be manufactured in this way (using polymers)?

**Extensions:**

- Research project (i.e. shoe design, natural and synthetic rubber, shoe manufacturing, etc.)
  - Consumer surveys
  - Design environmentally friendly packaging for finished products.
  - Design and draw top portion of shoe to attach to their sole.
  - Design and market other polymer products.

**Resources/Bibliography:**

\*A full write-up and supplies of this activity are available from Carolina Biological Supply Company. The write-up is entitled "Polymer Studies in Compounding" and written by Sandra Van Natta, Mary E. Harris, and Sue Hall.

This activity is based on a presentation at the MATR Institute by Sandra Van Natta, a middle school teacher in Cincinnati, Ohio.