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There Go the Legos!

Learning to observe and write – piece by piece.

By James T. Scarnati

WHILE SEARCHING through my children's toy closet one day, I was caught in the act by my daughter. "Dad," she asked, "what are you looking for?" Hesitantly, I answered, "Well, I'm looking for your Legos." My son, who was also present, turned to his sister and sighed, "Dad is at it again."

The ubiquitous Lego can be an educator's best friend. From a child's toy to a sophisticated teaching tool, Legos can become anything you want them to be. "There Go the Legos" is a powerful activity, appropriate for children in grades five through nine, that requires students to reconstruct a Lego structure after reading other students' written descriptions of the construction process. The connection between explicit writing and scientific observation becomes apparent when reinforced through this concrete learning experience. Through this activity, students will observe, classify, measure, record and interpret data, and create models. Best of all, students will see how a familiar toy can become a tool for science learning.

Structural Guidelines

Before the lesson, assemble a unique four-piece Lego structure for each student in the class as well as a duplicate model of each structure (students will use the duplicates to check their work at the end of the activity). Place each structure and its duplicate into separate envelopes and number them so that students can match them later. Put one set of envelopes aside.

The construction and design of each Lego structure should differ markedly from the others. The difficulty of the activity increases when fewer discriminators are used (in other words, when the Lego pieces look more alike). Use the following guide to build each Lego structure, keeping in mind the abilities of your students:

- easiest – two Legos that are different sizes and different colors;
- moderately difficult – three Legos that are different sizes but the same color;
- hard – four Legos that are the same size and the same color;
- and challenging – five or more Legos that are the same size and the same color.

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Lessons with Legos

To begin my Lego lesson, I review the four purposes of writing: describing, explaining, narrating, and persuading. It is important for students to understand the relationship between the language arts and real-life scientific observation. Unlike creative classroom writing assignments, scientific writing is based on the logical observation of natural events. Such common examples of observation skills used in the science classroom are watching a melting ice cube to determine its change in shape, using a microscope to see the behavior of amoeba, and observing the sprouting of a seed over a period of time.

To begin the activity, I hand out the following materials:

- numbered envelopes containing Lego structures,
- "space alien scenario" activity sheets,
- metric rulers (optional),
- pencils,
- and paper.

Then, I ask each student to record the number of his or her envelope on the upper right-hand corner of the activity sheet before removing the structure from the envelope. Next, the class follows along as I read aloud from the activity sheet:

> It is the year 2065. An alien scientist has visited our planet and left an assortment of strange devices. Each of you has one of these devices. Our scientists have examined them and have told us that all the devices can be taken apart easily; however, they must be put back together in exactly the same manner, or they will detonate and vaporize everything nearby. Unfortunately, our transporter beam is broken. Space Command urgently requests that we send these devices to headquarters, but to do so we must first disassemble them and then send the pieces through the U.S. Mail. As a Space Command cadet, your task is as follows:
>
> 1. Carefully examine the construction of the device.
> 2. List important observations about the device on your activity sheet.
> 3. In 20 minutes and on the paper provided, write detailed instructions for constructing the device. Do not illustrate your instructions.
> 4. Carefully read the instructions you have written and again observe the device.
> 5. Completely disassemble the device and put all the parts in the envelope along with your written instructions.
> 6. Seal the envelope and write down your number so you'll know later which one you did.

Once I've finished reading, the children have a chance to ask questions. The most common question is typical for young children, "How long does this have to be?" When the children are finished asking questions, I begin the lesson by reminding them to write clearly and concisely.

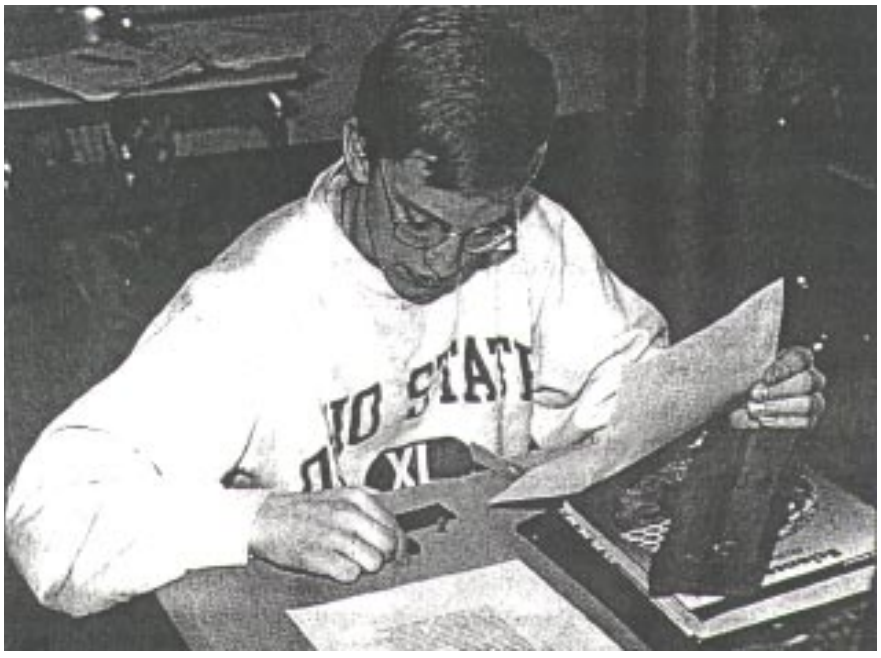
Device Description

Students then focus their attention on the Lego structure. They touch it and examine it from all angles. Since the most difficult part of writing is getting started, some students experience what I term the "blank paper syndrome." To help these students, I suggest that they list the obvious characteristics of the Legos, such as their color, shape, and size.

Some students immediately begin to write. Initially, students focus on the color of the Legos. Students also describe the number of knobs, dots, pegs, or bumps present. Others discover that the device has a top and a bottom. The children also describe, in order, the steps for constructing the device: "First, place the blue eight-bump Lego on the desk. Second, pick up the yellow six-bump Lego . . ." and so on. A metric ruler enables students to make more accurate observations.

During this part of the activity, students (often with fiendish smiles) seem to imagine vaporizing everything around them. Some students work through the description by talking out loud. Other students

(opposite) Each student first writes careful instructions for assembling a Lego structure, then dismantles the structure, exchanges it with a classmate, and (below) attempts to follow the other student's instructions for reassembly.



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record their actions as they disassemble the structure. When the clock approached the 20-minute mark, most of the class will have completed the task.

Lego Reconstruction

When all the students have finished, I move from desk to desk and collect the sealed envelopes. Then, I randomly redistribute the envelopes containing the disassembled Legos and reassembly instructions, and I read aloud the following scenario:

> Open your envelope. As a cadet at Space Command Headquarters, your task is to follow the written instructions to create an exact copy of the structure described using the disassembled parts found in the envelope. If you are careless, everything will be vaporized. The future of Space Command depends on you. You have 15 minutes to complete this task.

As the children attempt to assemble their devices, they express bewilderment, frustration, and amusement. They are experiencing firsthand a stumbling block scientists know well – the difficulty of clearly communicating observations.

At this point, the students begin to realize why the ability to communicate in precise language is of paramount importance.

One by one, students assemble their devices. When most students have finished, I interrupt the class to announce, "When you have completed the construction of your device, match the number on your activity sheet to the number on the envelope that contains the 'duplicate' model. Compare the two structures to see if you have accomplished your task."

Many students successfully follow the written explanation and replicate the structure. Other students are disappointed by their inability to control the situation successfully, even though they followed the instructions exactly. In these cases, the instructions are incorrect; most commonly, students have communicated an erroneous sequence of events or have described the Lego pieces inaccurately.

Cadet Reaction

Student reaction to the activity is overwhelmingly positive. As one student said, "The activity was fun; it was challenging to both write the instructions and assemble the device." Perhaps another student best summed up this activity when he said, "The project was cool. It really made you think."

One time, a less-than-enthusiastic student inadvertently reinforced the value of the activity when he commented, "This was all right, but I didn't see the point – unless it was learning how to read and write directions thoroughly." Precisely the point of the lesson! During the activity, the ability to communicate in a concise manner becomes a meaningful task worth pursuing. The activity also provides a situation where every student's destiny is in the hands (or handwriting) of another student.

This activity teaches children that concise, accurate communication is a goal worth pursuing.

Activity Assessment

To conclude the activity, I ask students to analyze the instructions they used to reconstruct the "alien devices" and to identify the key phrases or words they found most helpful. These usually include:

- The use of sequence, such as "Step 1, . . . Step 2, . . .";
- information on relative position of the Legos, such as "the black part is the base" or "the red one is on the bottom";
- classification of the different Lego shapes through descriptive terms like "rectangular";
- the use of measurement, as in "the piece with eight dots";
- and the use of spatial relationship, such as "the Legos form a cross."

You can use this activity as a part of a reinforcing sequence of lessons designed to make the observation process meaningful. The next time students need to describe a natural event or object, the Lego activity can be an excellent frame of reference. Children will transfer what they have learned – that the scientific process demands accurate observations.

Playtime Is Over

Observation is a vital part of science. The Lego activity graphically depicts the relationship between the language arts and scientific observation. I have successfully adapted the activity to teach observation techniques and writing skills to students of all ages, including adults. The materials needed are simple and found in most classrooms. However, if worse comes to worst, you can also "borrow" Legos from your children, nieces, or nephews – just make sure you don't get caught as I did!

Resources

Jacobs, H. H. (Ed.). (1989) *Interdisciplinary curriculum: Design and implementation.* Alexandria, VA: Association for Supervision and Curriculum Development.

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