

Iowa Science Teachers Journal

Volume 31 | Number 1

Article 3

1994

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Recommended Citation

Bonnett, Barbara A. (1994) "Measurement in Elementary Science," *Iowa Science Teachers Journal*: Vol. 31 : No. 1 , Article 3.

Available at: <https://scholarworks.uni.edu/istj/vol31/iss1/3>

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MEASUREMENT IN ELEMENTARY SCIENCE

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Ten year olds have great difficulty drawing the human face and form in proportion. To see if that skill could be enhanced, our fifth grade class set out to explore human proportion and measurements using metric rulers, meter sticks, graph paper and helpful partners.

Drawing Hands to Scale

To practice measuring, the children traced their own hands on plain paper. The ruler was then used to measure the widths of the hand and the centimeters were recorded on the drawing. After the base of the hand was determined with a drawn line, each finger was measured from that base line to the tip. (Determining where a body part begins and ends is a problem during this entire project.) Once hand measurements were taken, they were used to make a scale drawing on 1/4" graph paper. Each square equalled one centimeter.

A Bigger Challenge: Scale Drawings of Faces and Bodies

Drawing the head seemed a manageable task after the challenge of measuring the hand with its many bone lengths to determine. Discussion with the students and a rough diagram on the black board indicated where measurements should be taken. The teacher then demonstrated measuring techniques on a student. The ruler was placed in front of the face and measurements were taken from the chin up. The horizontal measurements were taken from an imaginary middle line on the face. Working with partners (mirrors are helpful, too), students measured and recorded their data on the rough diagram. That completed, 1/4" graph paper was used for the scale drawing. Students need guidance to establish a base line and a middle line before proceeding.

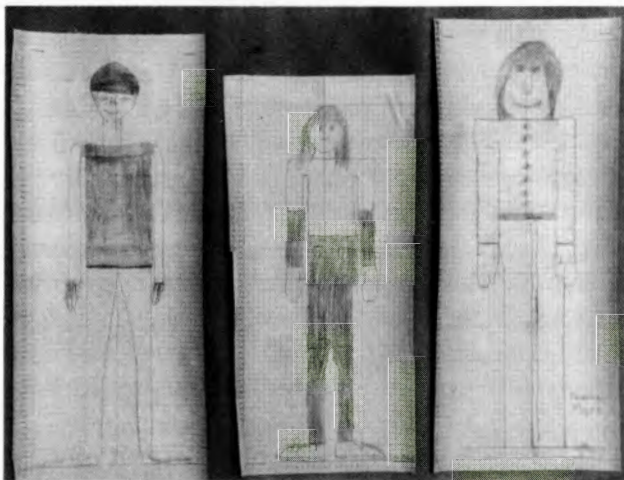
Students will not want to put the eyes in the center of the face, which is in true proportion, but rather in the forehead area where they perceive them to be. At this age, the true placement of eyes is a "discrepant event," and children must constantly be encouraged to record accurately what the measurements tell them.

If the teacher and students can maintain their enthusiasm and patience, the entire body can be diagrammed. First, measure the height of each child in the class and involve them in determining the numbering of the graph paper. (The one-to-one relationship used in previous scale drawings is not practical for the whole body.) Manipulate the discussion toward two-to-one scale so that each square will equal two centimeters and two sheets of graph paper glued together will accommodate heights. Then, with the help of partners, the numbering of paper and taking of body measurements may proceed.

Constantly insist that measurements be recorded *to scale* because the children will “draw” the arm with the hand attached at the elbow and swear they measured each part of the arm and hand. Measuring with the rulers and meter sticks is awkward; metric dressmaker tapes, if available, are more suitable.

As students complete their work, the scale drawings should be displayed for all to enjoy. (Parents loved them at conference time.) Completion of the project occurs unevenly, so supplemental projects are necessary for those who finish early.

A natural outgrowth of these activities is graphing. Different body parts can be compared: the length of the head and the length of the foot, the hand and the foot, the height of one class and another class, etc. The students and teacher can brainstorm for measurements they are interested in comparing.



Scale drawings of students' bodies

Outcomes

Did fifth grade students become more perceptive to body and face proportion after this project? No! In later art projects of action figures and in self-portraits, eyes peered from foreheads and hands dangled from elbows. Apparently, the ability to observe proportion is a skill that cannot be taught until the child has reached a certain stage of maturation.

Were the students able to estimate measurements of objects competently in centimeters? Yes! In subsequent activities they also demonstrated competence in the manipulation and reading of measuring tools, as well as graphing and measuring to scale. The floor plan of our classroom, to scale, was successfully completed with little teacher direction.

Drawing bodies to scale is an engaging activity for students. While it does not change their perceptions of bodily proportions, this activity does develop graphing and measurement skills.