

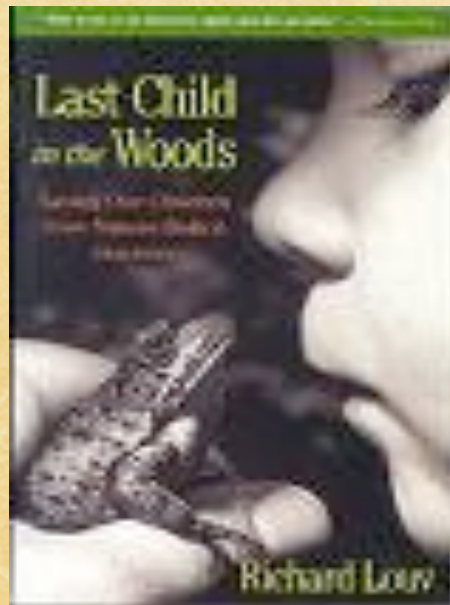
*URBAN ELEMENTARY STUDENTS' VIEWS
OF ENVIRONMENTAL SCIENTISTS, ENVIRONMENTAL
CARETAKERS, AND ENVIRONMENTALLY
RESPONSIBLE BEHAVIORS*



*Dissertation Defense
Patti Horne
4/5/10*

INTRODUCTION

- ◆ Near disappearance of family farms in United States today = possibly the first generation without a familial attachment to the land.
- ◆ Children have 9 hours less free time per week than 25 years ago = less unstructured time outside exploring.
- ◆ Most environmentalists cite their childhood time outdoors as the reason they chose to work for the environment. (Louv, 2008)



- ◆ If children do not develop an affinity for nature, they are not likely to work to protect it as adults.
- ◆ Even more concern for urban students because they tend to spend less time outdoors than their peers.
- ◆ Environmental Education (EE) called on to ensure today's youth connect with nature (Harris, 2005).
- ◆ *No Child Left Inside Act (2009)* originated to advance EE in United States' public schools to increase likelihood of environmentally literate citizens and environmental stewards of the future (NAAEE, 2004).



TERMS

- ♦ **Environmental Education**--foster students' opportunities to "gain knowledge, form positive attitudes about the environment, and practice action skills" (Chawla & Flanders Cushing, 2007).
- ♦ **Environmental Literacy**—an understanding of "the interrelationships between natural and social systems; the unity of humankind with nature; technology and the making of choices; and developmental learning throughout the human life cycle (Disinger & Roth, 1992).
- ♦ **Environmental Stewardship**—individuals demonstrate environmental stewardship through deliberate actions and behaviors that benefit the environment.



A NEW FIELD OF INQUIRY

Mead & Metraux (1957)

- ♦ 35,000 essays by American high school students in response to open-ended prompts.
- ♦ Scientists tended to be: male, wear a white coat, wear glasses, use black notebooks, be older, use equipment, read all of the time, and know dangerous things (p. 386-387)
- ♦ Different prompts resulted in contrasting response patterns. Positive responses about scientists unless it became personal. Then, responses were negative.
- ♦ Culture at the time of the study: Males were asked what type of scientist they would like to be while females were asked what type of scientist they would like to marry

LIT REVIEW CONTINUED

- ♦ ***Chambers (1983)***
- ♦ Created Projective Instrument Draw-a-Scientist Test (DAST). Study from 1966-1977. 4, 087 students in K-5 from United States, Australia, and Canada.
- ♦ Used 7 stereotypical indicators (SI) from Mead & Metraux's study to create a scoring checklist.
- ♦ Average # of SI increased with grade level. Lower grades showed few to no SI.
- ♦ 5th graders used as many SI as adults.
- ♦ ***Finson, Beaver, & Crammond (1995)***
- ♦ ***Barman (1999), Schibeci & Sorensen (1993), Sumrall (1995)***

LIT REVIEW CONTINUED

- ♦ ***Klein & Merritt (1994)*** Effective EE responsive to students prior knowledge/experiences.
- ♦ ***Huber & Burton (1995)***. Effective EE relevant. ***Roth & Lee (2002)*** lived curriculum.
- ♦ ***Bandura (2000)*** Sense of agency. ***Hungerford, Volk, & Ramsey (2000)*** Not fostering learned helplessness.
- ♦ ***Zeldin & Pajares (2000)*** verbal persuasions, vicarious experiences, and knowing others believed in them cited as important in study of women who were successful in science careers.
- ♦ ***Ballantyne, Packer, & Everett (2005)*** Knowledge & skills from listening to an adult. Attitudes and behaviors developed from 1st hand experience in the environment.
- ♦ ***Buldu (2006)*** link between children's perceptions of scientists and their interest in science-related careers

PERCEPTIONS OF ENVIRONMENTAL SCIENTISTS

- ♦ ***Thomas & Hairston (2003)*** 757 junior high and high school students (369 M, 388 F).
- ♦ Only 11% (n = 83) of students drew a female ES
- ♦ Rationale for study:

Studies have examined elementary students' perceptions of scientists in general.

Studies have examined junior high and high school students' perceptions of environmental scientists.

No studies of elementary students and the DAEST were revealed.

If EE is going to be incorporated more often and at younger grades, students' perceptions must be identified to inform curriculum and instruction.

RESEARCH QUESTIONS

1. How do urban fifth grade students view environmental scientists?
2. How do urban fifth grade students view environmental caretakers?
3. How do urban fifth grade students view their own roles regarding environmental responsibility?
4. Do male and female students' views of environmental scientists, environmental caretakers, and environmentally responsible behaviors differ?

METHODOLOGY

Research Design

Non-experimental, mixed methods design (Creswell, 2009).

Instruments

Draw-An-Environmental-Scientist Test (DAST)

Draw-An-Environmental-Caretaker Test (DAECT)

Semi-Structured Interviews

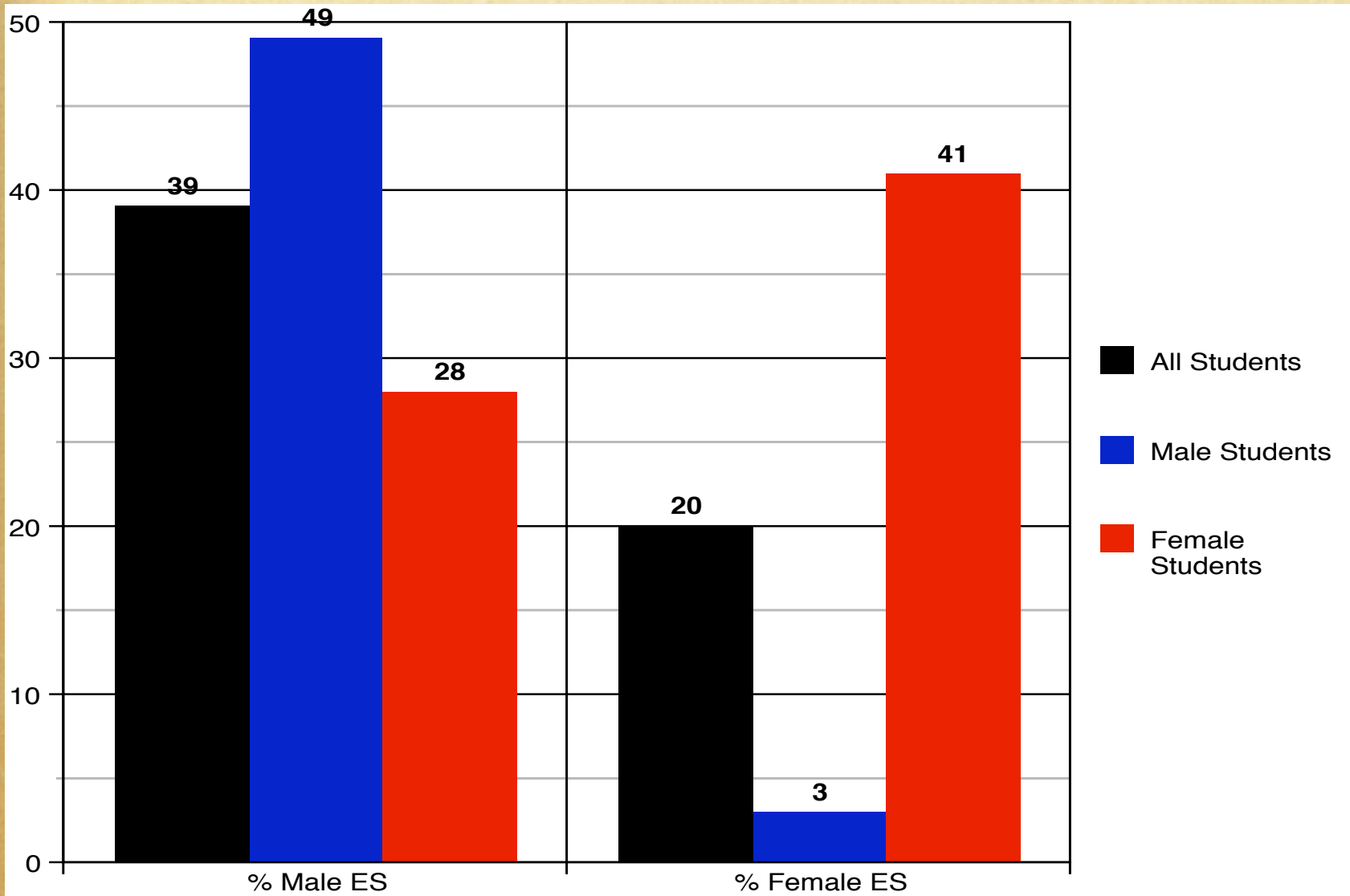
SAMPLE

	District Demographics	Sample Demographics
Title I Elementary Schools	12/14 (87.5%)	4/5 (83.3%)
Ethnic Distribution	~79% African American. ~19% Caucasian ~ 2% Hispanic, Native American or Asian	71.6% African American 25.6% Caucasian 2.8% Hispanic, Native American or Asian
		54% males (173) 46% females (147)
Total # of 5th Graders	~950	320

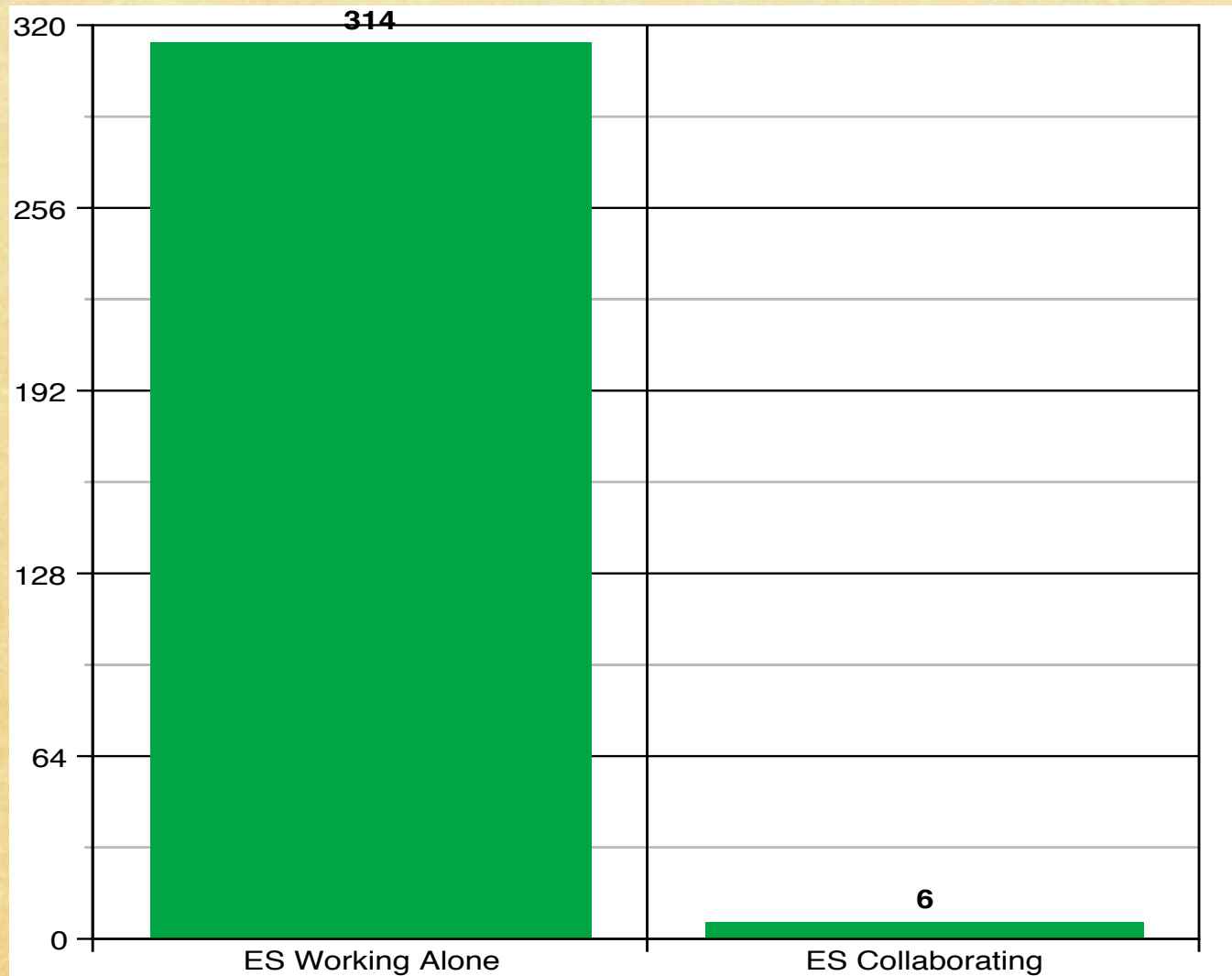
FINDINGS FROM THE DAEST

- ♦ 125 male ES (39.1%) versus 65 female ES (20.3%)
- ♦ Working in a lab 142 (44.4%), outdoors 111 (34.7%), both in and outdoors 3 (.9%).
- ♦ Work: experimenting 114 (35.6%), observing 65 (20.3%), picking up trash, recycling 37 (11.6%).
- ♦ Less common: collaborating 6 (1.9%) caring for animals 6 (1.9%) or sharing knowledge 10 (3.1%).
- ♦ 208 (65%) of ES were smiling; frowning 4 (1.3%); no expression 108 (33.8%)
- ♦ Symbols of research 147 (45.9%); technology 49 (15.3%); eyeglasses 44 (13.8%); lab coat 32 (10%); indications of danger 30 (9.4%)

GENDER OF ES DRAWN BY STUDENTS

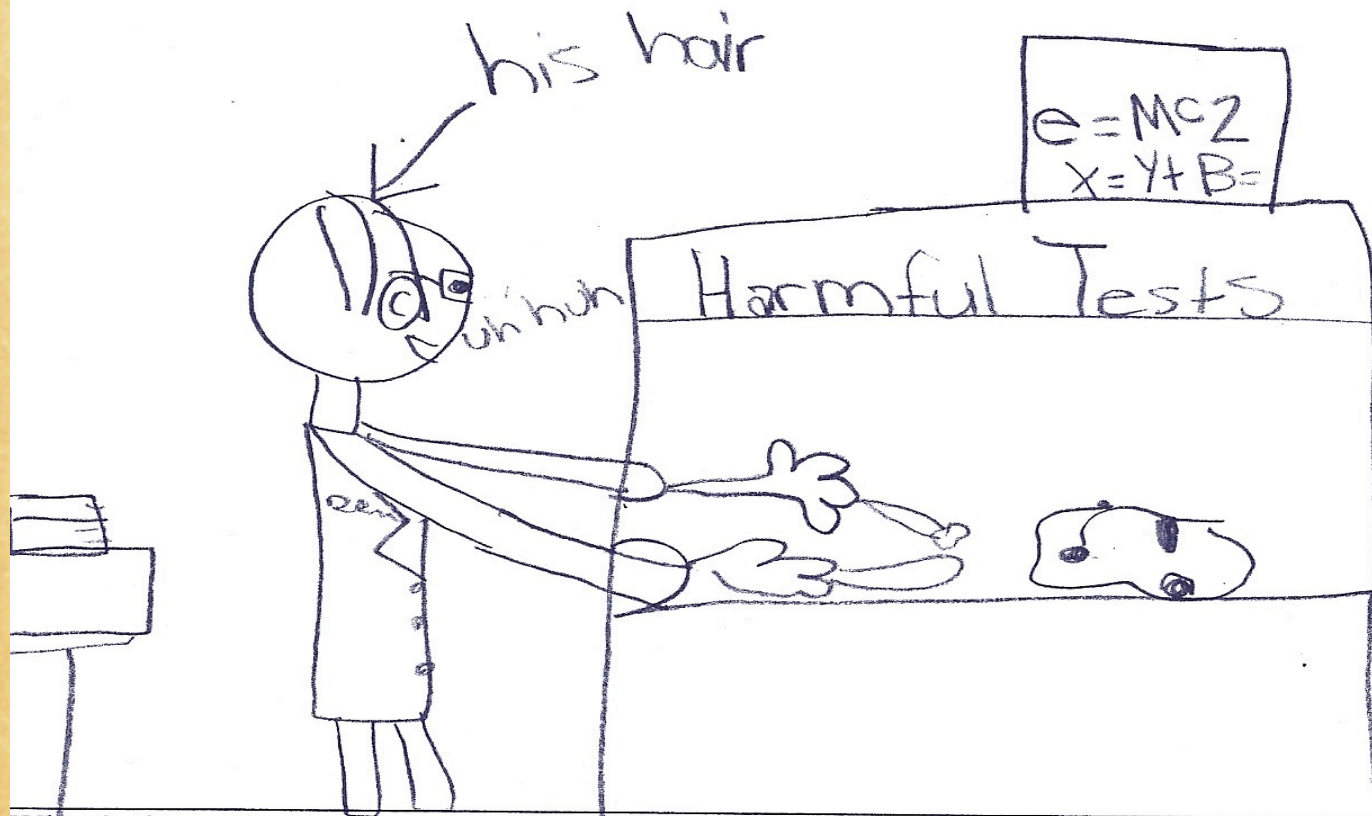


ES WORKING ALONE VERSUS COLLABORATING



STUDENT DRAWING OF AN ENVIRONMENTAL SCIENTIST

Draw a picture of an environmental scientist working.

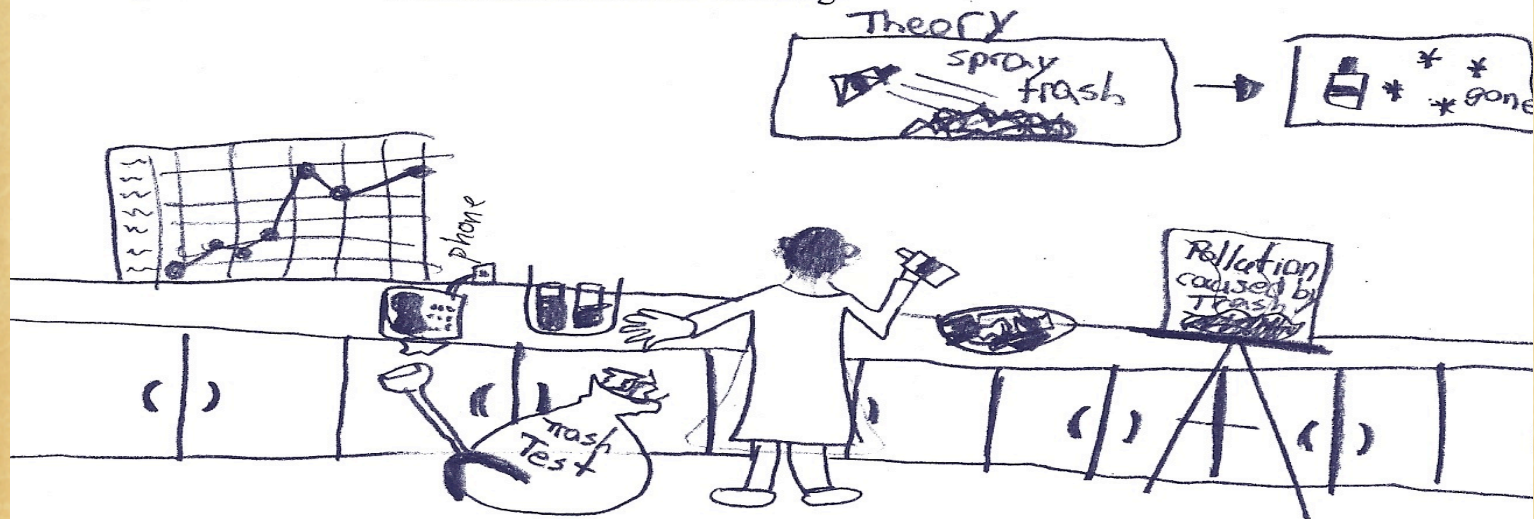


What is the environmental scientist doing in the picture you drew?

My scientist is tinkering with a high efficient car motor (eco friendly).

STUDENT DRAWING OF AN ENVIRONMENTAL SCIENTIST

Draw a picture of an environmental scientist working.



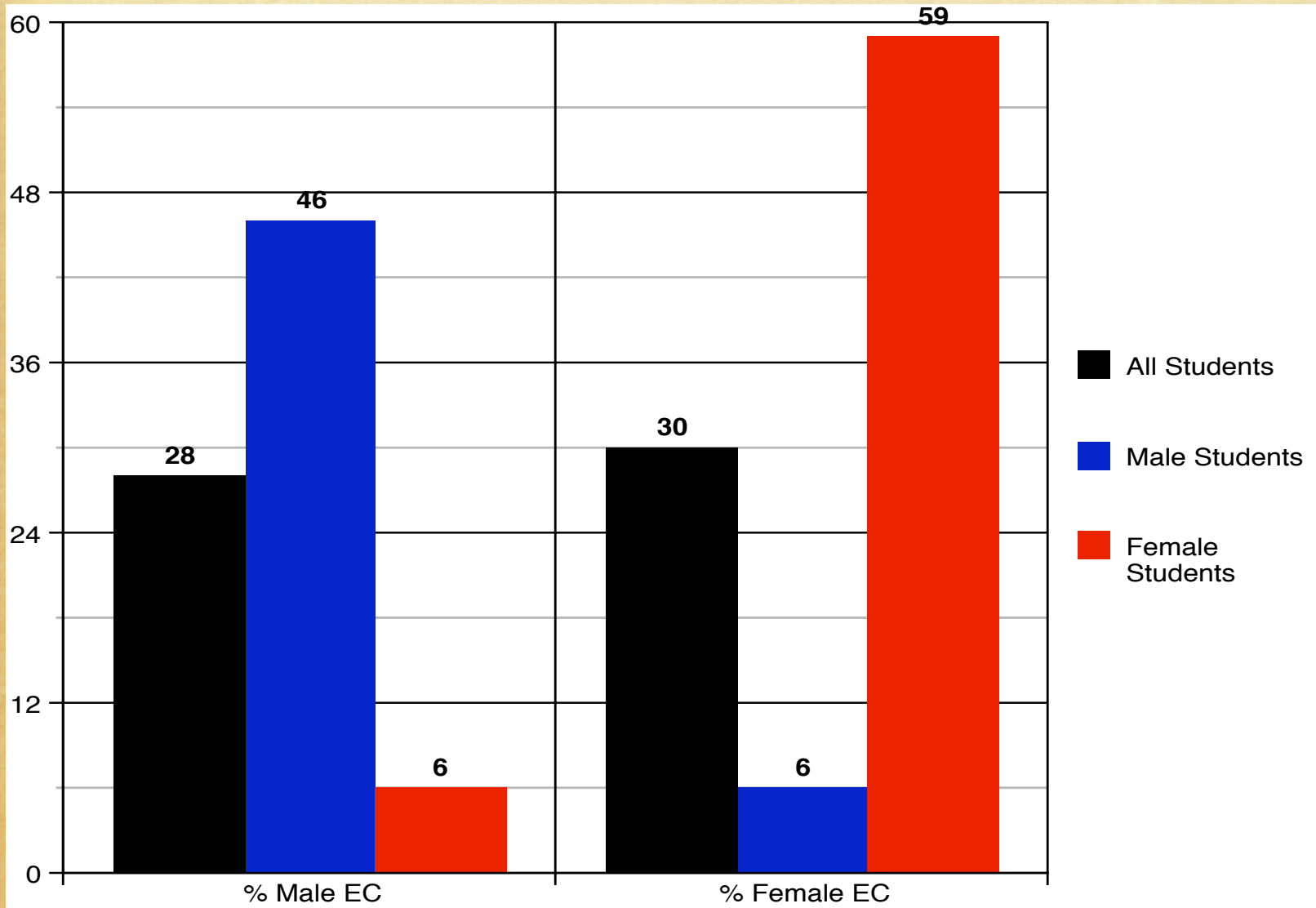
What is the environmental scientist doing in the picture you drew?

He is testing a product to get rid of trash. Trash causes pollution which hurts the environment. He's creating an acid to dispose of trash. It will be 100% recycled.

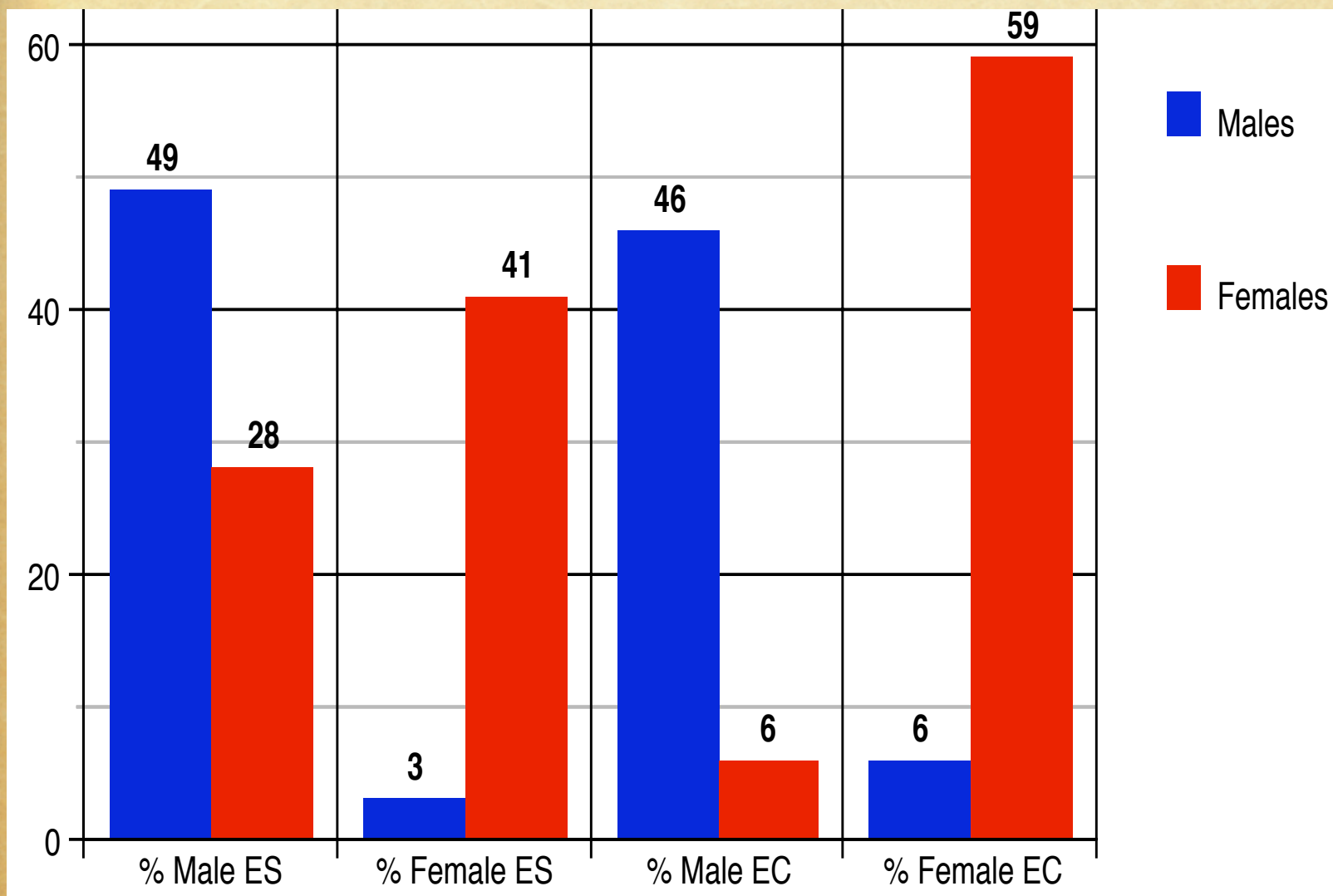
FINDINGS FROM THE DAECT

- ◆ Caretakers drawn as females 97 (30.4%) and as males 88 (27.6%).
- ◆ EC depicted working alone 244 (77%).
- ◆ Of the 23% of pictures with groups, 62 (19.4%) worked cooperatively and 12 (3.8%) worked against each other.
- ◆ EC in grassy area 176 (55%), urban area 64 (20%) and water environment 36 (11.3%).
- ◆ Wildlife was absent in 272 drawings (85%).
- ◆ Only 2.5% (8) drew more than one animals species.

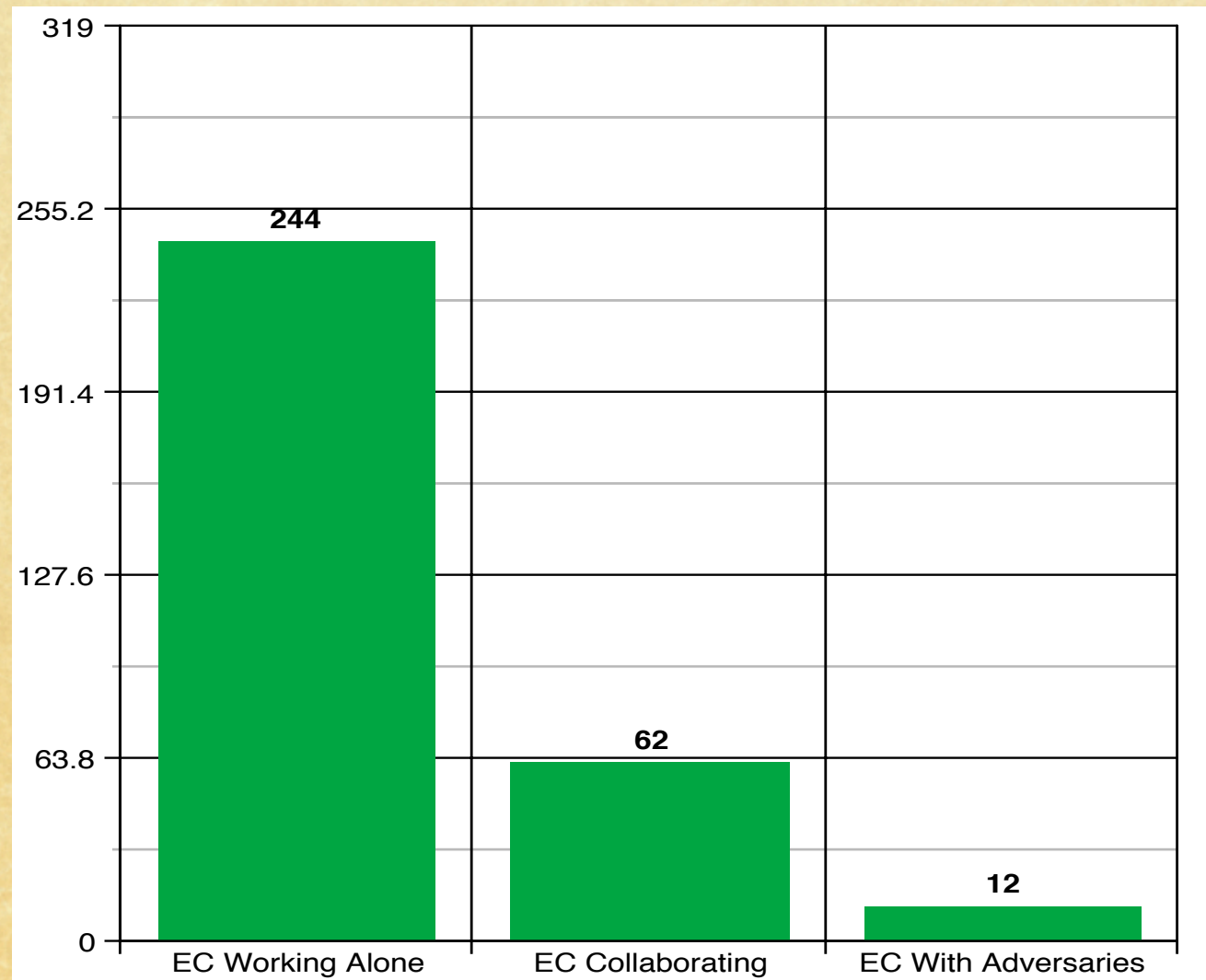
GENDER OF EC DRAWN BY STUDENTS



COMPARISONS FOR ES AND EC GENDERS BY STUDENT GENDER

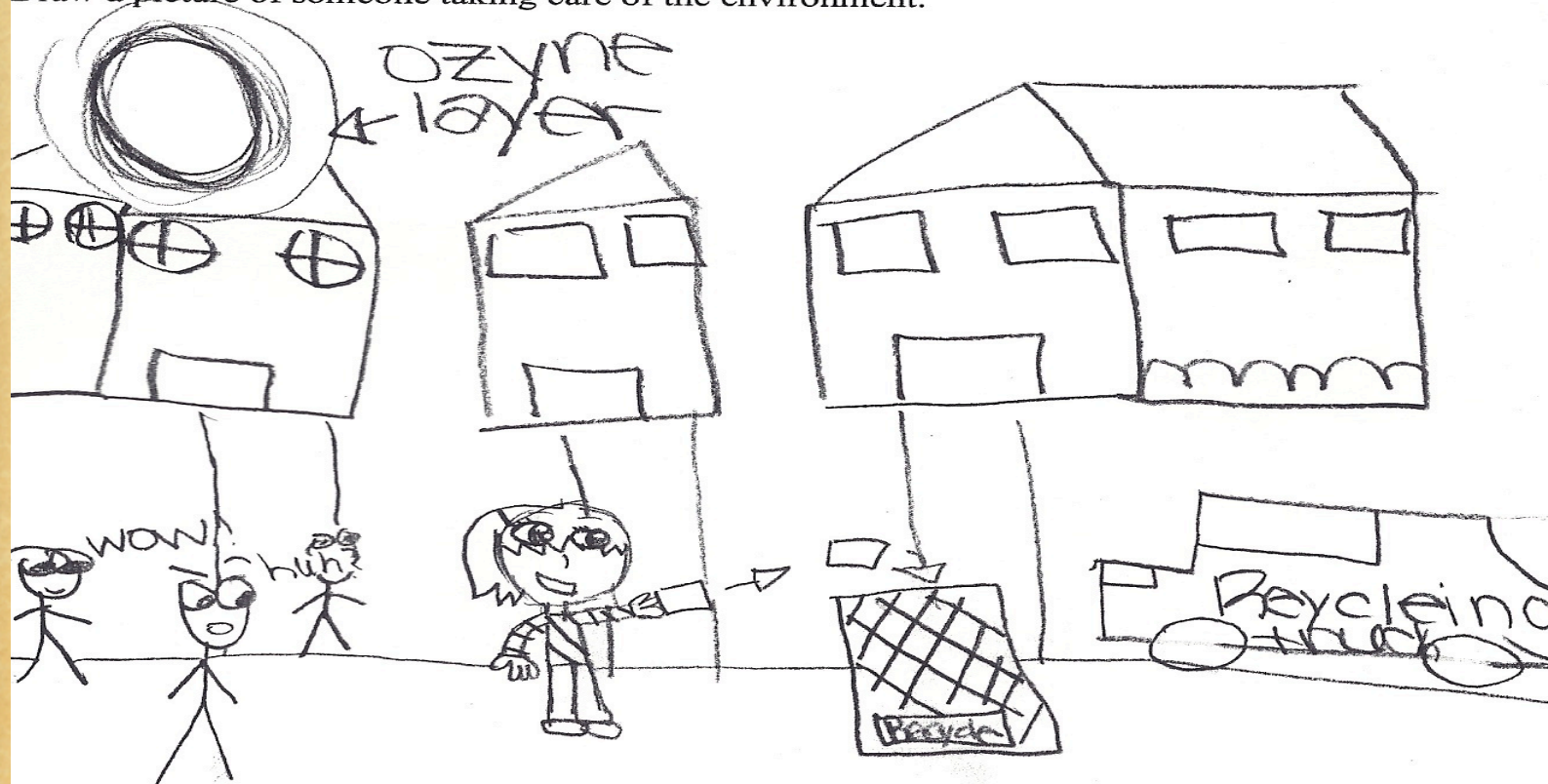


EC WORKING ALONE, COLLABORATING, OR WITH ADVERSARIES



STUDENT DRAWING OF AN ENVIRONMENTAL CARETAKER

Draw a picture of someone taking care of the environment.



What is the person doing in the picture you drew?

My cartoon is throwing away litter in the recycling can. So it can be made into a new product.

STUDENT DRAWING OF AN ENVIRONMENTAL CARETAKER

Draw a picture of someone taking care of the environment.



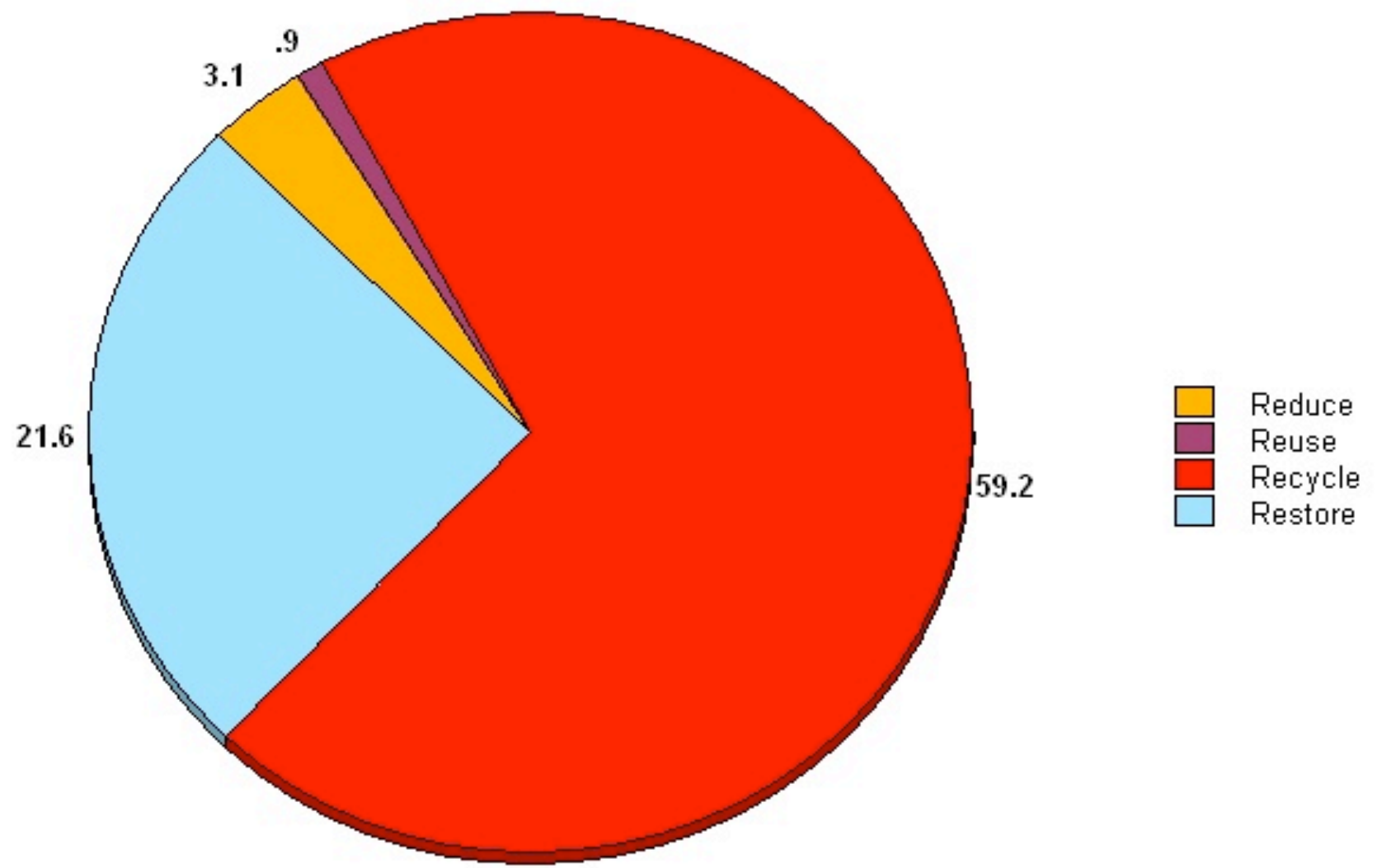
What is the person doing in the picture you drew?

They are picking up trash so the earth can be clean.

ENVIRONMENTALLY RESPONSIBLE BEHAVIORS

Preventative Actions	Corrective Actions
Reduce 3.1%	Recycle 59.2%
Reuse .9%	Respond/Restore 21.6%

DISTRIBUTION OF ENVIRONMENTALLY RESPONSIBLE BEHAVIORS

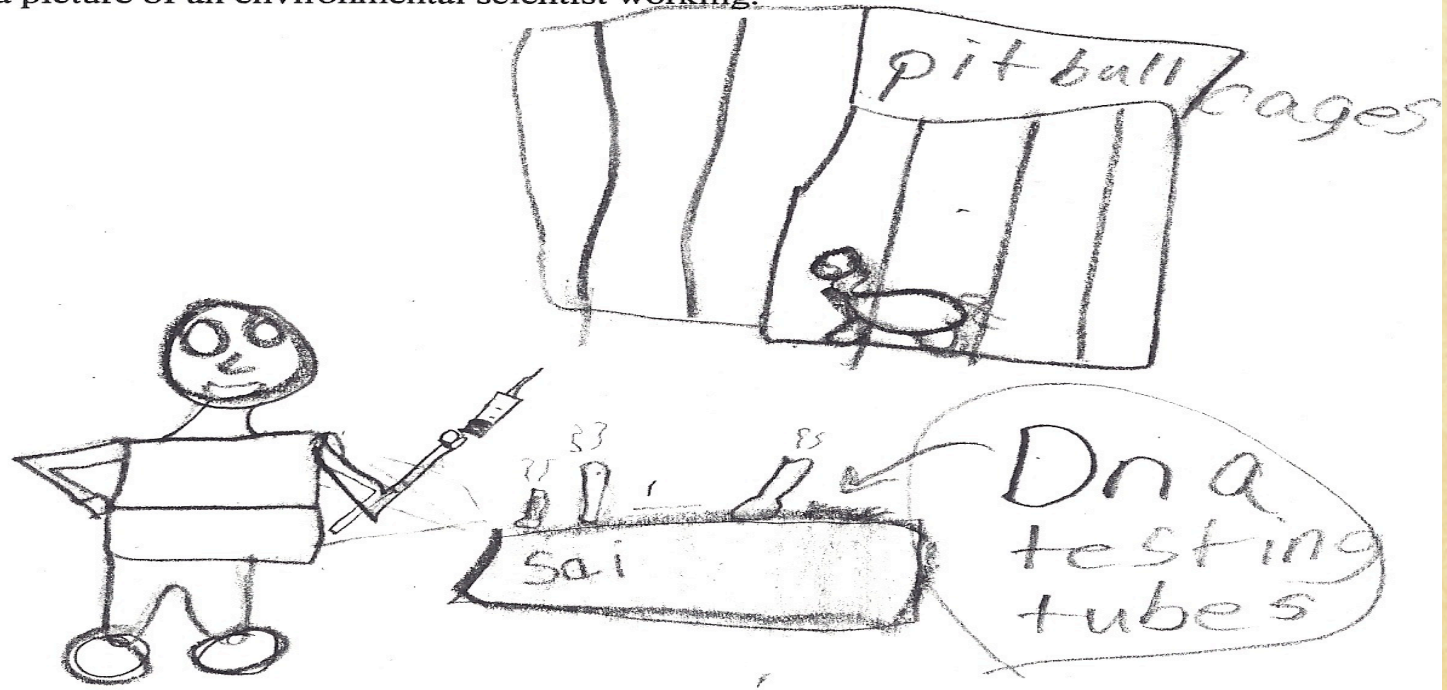


FINDINGS FROM SSI

- ◆ Students viewed ES and EC as different. Explanations often revealed misconceptions or stereotypes. Ex. *Charity said, “He’s research and she’s hands-on. A scientist is someone who is really smart and always working.”*
- ◆ Idealistic view of the work of ES and EC (mostly smiling).
- ◆ Easier for students to identify with EC than with ES. *Interesting response pattern by student gender when asked how they were like an ES. Males tended to cite actions: I recycle, help animals. Girls tended to cite personal attributes: I’m smart, curious.*
- ◆ Helping the environment tends to occur in a public place that’s really polluted.
- ◆ Helping the environment is about recycling and restoring.

- ◆ Students' illustrations lacked wildlife.
- ◆ Individuals were the only source of pollution in students' pictures.
- ◆ Students sometimes used the terms "trash can" and "recycling bin" interchangeably.
- ◆ Students viewed "helping" with "helping the environment". Had difficulty seeing that what people wanted was not always what was good for the environment.
- ◆ Students viewed environmental workers (ES and EC) as working alone.
- ◆ Students presented conflicting images of working with animals.

Draw a picture of an environmental scientist working.



What is the environmental scientist doing in the picture you drew?

A scientist is testing Dna on a Dog to see if he is the 2 year old pit bull.

To teach a child not to step on a caterpillar is as important to the child as it is to the caterpillar.—Margaret Mead

RESEARCH QUESTION 1: How do urban fifth grade students view environmental scientists?

Tend to view ES as:

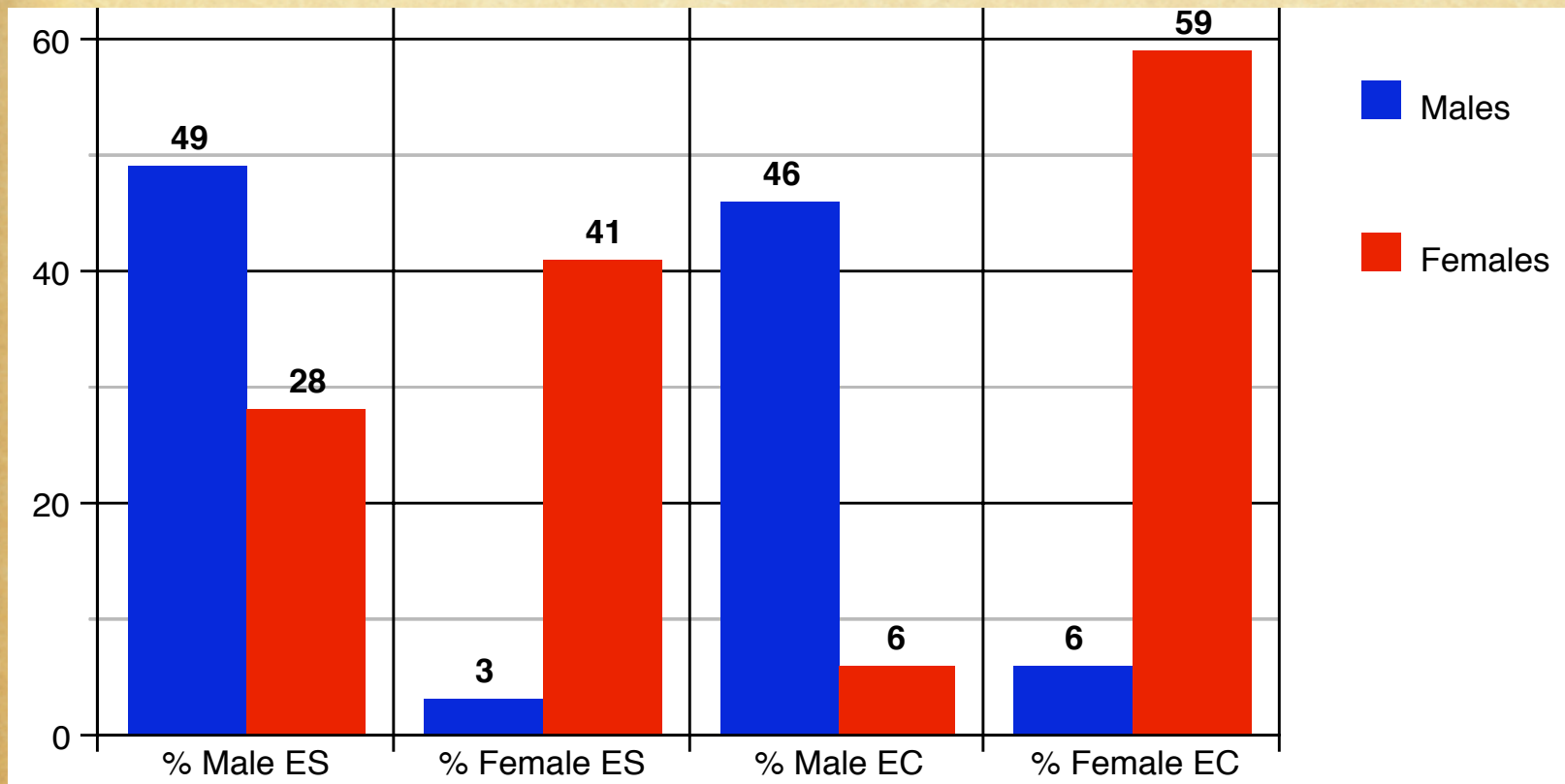
- ◆ More often a male
- ◆ Who works in a lab
- ◆ Experiments, observes, picks up trash/recycles
- ◆ Works alone
- ◆ Smiling

RESEARCH QUESTION 2: How do urban fifth grade students view environmental caretakers?

- ◆ More likely to be a female
- ◆ Works alone (77%), though more signs of collaboration than in ES pictures (19.4% versus 1.9%).
- ◆ Can be a child
- ◆ Mostly work in a grassy area, park, or urban area. Least likely to work in forest, mountains or indoors.
- ◆ Majority do not interact with animals.
- ◆ Pick up trash (from land), recycle, care for plants
- ◆ Mostly smiling

RESEARCH QUESTION 3: How do urban fifth grade students view their own roles regarding environmental responsibility?

COMPARISONS FOR ES AND EC GENDERS BY STUDENT GENDER



Research Question 4: Do male and female students' views of environmental scientists, environmental caretakers, and environmentally responsible behaviors differ?

- ◆ The predominant view is still a scientist is a male.
- ◆ Both genders were more likely to view females as EC rather than ES.
- ◆ Females were ten times more likely than males to draw an ES of the opposite gender.
- ◆ Females were more likely to draw ES in a lab. Also, more likely to include recycling and helping animals in their pictures.
- ◆ Males were more likely to draw EC reducing or reusing resources.
- ◆ For group pictures of EC: Females included collaboration in their EC pictures while males tended to include individuals working in opposition.

CONTRIBUTIONS OF THE STUDY

Adds to literature on students' perceptions of ES by extending use of DAEST to elementary students.

Adds to literature on students' perceptions of EC by use of researcher-created DAECT.

Identifies imbalances in environmentally responsible behaviors depicted in students' illustrations.

Supports that stereotypes and misconceptions about environmental roles are evident among many fifth grade students.

RECOMMENDATIONS FOR PRACTITIONERS

- ♦ Model
- ♦ Empower—Foster childhood agency. Blanchet Cohen identified 6 areas where EE could foster childhood agency: connectedness, engaging with the environment, questioning, belief in capacity, taking a stance, and strategic action.
- ♦ Variety of Actions
- ♦ Identify stereotypes early and challenge often
- ♦ Check curriculum and strategies for biases—check for evidence of deficits of identity for subgroups (gender, races)
- ♦ It's not just about empowering females or minorities, we need to challenge stereotypes that still exist among many male students and adults.
- ♦ Need to look at the current practice in many districts that requires students to work alone for science fairs. This is something I have spoken out against in the past. It is another message to students that scientists work in isolation.

RECOMMENDATIONS FOR RESEARCHERS

- ♦ What do images of ES and EC in the media look like? Genders, setting, working alone?
- ♦ Research on current EE programs that have shown promise in promoting positive images of scientists for all students.
- ♦ Research on interventions that could be implemented by parents and teachers to best challenge pervasive stereotypes in science.
- ♦ Studies on exemplary programs that partner young female students with older female students and practitioners in the field of science would be helpful.

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