

Waste in the Cafeteria

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WR teacher training 2003-2004/Lessons for CD-Jan. 2004/Lesson—Waste in the Cafeteria

- **Grade level:**
Middle School, High School
- **Subject areas:**
Family and Consumer Science, Science, Math, Language Arts
- **Instructional strategies** (from *Classroom Instruction That Works—Research-Based Strategies for Increasing Student Achievement* by Robert J. Marzano, Debra J. Pickering, Jane E. Pollock)
Identifying similarities and differences
Summarizing and note taking
Homework and Practice
Nonlinguistic representations
Cooperative learning
Generating and testing hypotheses
Cues, questions, and advance organizers
- **Estimated duration:**
Preparation time: 60+ minutes depending on complexity of final product, and how much guidance you feel you need to give your students in terms of how to collect data, write up lab reports, design experiments. For example, sometimes teacher-generated worksheets that guide students to develop good procedures are helpful.
Part one: 30 minutes to introduce assignment, 30-60 minutes for groups to plan their strategies.
Part two: 50-90 minutes to perform data collection.
Part three: 30-40 minutes data analysis and begin to write lab reports/presentations.
Part four: 40-90 minutes (depending on number of presentations) presenting results to class.
- **Setting:**
Classroom for presentation of problem, planning, analyzing of data, discussions, and presentations; cafeteria for collection of data
- **Skills:**
Observing, inferring, formulating hypotheses, formulating procedures, collecting data, interpreting data, recording, calculating percentages, writing lab reports, presenting data and interpretations to a larger group

Summary

By conducting investigations, students will determine specific amounts of waste generated by students and/or school policies regarding the use of the cafeteria.

Objectives

Students will:

- Develop an understanding of waste reduction in a “real life” situation in which they could have a direct impact.

- Determine a plan to investigate some portion of waste in the school cafeteria.
- Carry out their plan, control as many variables as possible, and collect data.
- Return to the classroom, analyze their data, and prepare both lab reports, and a presentation including recommendations for changes that might reduce the amount of waste generated as determined by their study.
- Present their information to classmates and to an audience that has the power to help make any reasonable suggested changes.

Materials

- Notebooks and pens
- Any materials needed to help students generate ideas (lists), identify variables, formulate hypotheses, etc. This may include teacher-made worksheets and/or notes used to guide the students through the process. See some samples at the end of the lesson.
- Any materials needed to conduct the investigation, including but not limited to items such as measuring containers, data tables, survey sheets and gloves.

Background

Many school cafeterias have undergone significant changes in the past 30 years. Some schools no longer have kitchens, others use disposable utensils, and others have buffet lines. Students have opportunities to investigate the impacts of some of these changes. Have they impacted waste generation? What types of waste do we generate in our cafeteria? Could we reduce the waste? Often students have a good idea, or can more easily figure out where and why the waste is generated, and often also have very good ideas on how to reduce it.

In this exercise, students do just that. They identify a problem, develop hypotheses, test them, analyze their results, and then present them to an appropriate audience. The news can be good or bad or both. In some cases, reporting that the right things are being done—and that there is very little waste generated—can be a rewarding presentation. The other side—identification of waste that can be reduced—can empower students to be a catalyst towards change. It is also an education in how to go about change, and how slow the process can be at times.

Procedure

The Activity

1. Start with a discussion about the 3 R's (Reduce: to prevent generation of waste, Reuse: to use again in original condition, and recycle: to use again after re-processing). You may want to start with a discussion at first of recycling and reuse, as students are often familiar with these concepts. From there, you may discuss waste reduction and ask for examples.¹ Next, introduce the idea of waste

¹ At the website, <http://eetd.LBL.gov/EA/Buildings/BNordman/C/consmain.html>, p. 11 (retrieved on 6/3/03), is the following description of waste reduction: “Any action that avoids the creation of waste by reducing waste at the source, including redesigning of products or packaging so that less material is used; making voluntary or imposed behavior changes in the use of materials; or increasing durability or

in the school setting. Brainstorm a list of places where waste is generated, and items typically wasted. Hopefully the cafeteria will come to mind and, if it does not, use leading questions to get them there. One of the ways the students can be guided toward this idea is through the use of news articles or guest speakers (such as waste professionals), focusing on the issue. An Internet search could lead to articles; using a search engine like Google.com, input key words like cafeteria +waste +schools. In addition, the Waste Prevention Forum, a listserv about waste reduction, has entries from solid waste professionals about school waste. Check out <http://www.reuses.com/nwpcarchive/search.htm> and enter “waste and cafeterias.”

2. Ask students to develop research questions, hypotheses and procedures regarding waste in the cafeteria. Have them identify the various variables (independent variable – the one they will be manipulating, dependent variable – the one that will be responding to the manipulation, and the control variables – the ones that need to be kept the same in order to ensure the data gathered is due to the independent variable being manipulated) and come up with a viable procedure. Before carrying out their procedure, they will need to have their materials ready, as well as their data tables. They may also need to obtain permission from the administration and/or cafeteria staff to carry out their plan. Sometimes a group will come up with a plan that cannot be carried out due to OSHA (Occupational Safety and Health Administration) standards or other district/school policies. In this case, they will need to come up with another investigation.

It is helpful to have an alternative plan written up that can be used in such a case. If you have more than one class working on the project, ideas for the back-up plan may be easily generated from another class. Other times, students can “piggy-back” onto other investigations.

For example, one group might look into the placement of the plastic ware (Independent Variable or IV) to see if the amount used is affected by its placement (Dependent Variable or DV). In other words, is there a difference in the plastic ware used if it is placed before the food is selected versus after the food is selected? In this case, a second group could gather the baseline data during the first lunch period, while the plastic ware is moved for the second lunch period when the second group gathers data. Or the same investigation can be repeated with other grade levels to increase the amount of data collected.

Possible investigations include but are not limited to:

- Comparing the amount of _____ taken to amount thrown away
Ranch dressing, ketchup, milk (chocolate, white, skim, 2%), main dishes, sides, fruit, desserts

- Comparing the amount of plastic-ware taken vs. used and the placement of it in the line (i.e. before selecting food vs. after).
 - Comparing the amount of napkins taken vs. unused.
 - Surveying whether or not students would prefer or use sporks vs. plastic spoons and forks.
 - Surveying main dish preferences.
 - Tracking food thrown out and types thrown out.
 - Determining whether one grade level or gender wastes more of any of the first bullet's food and non-food items above, and develop hypotheses to figure out why it is happening.
 - Finding out whether an awareness campaign (such as posters in the cafeteria encouraging students to take only what they eat) might reduce waste.
 - Investigating whether the amount of food waste differs if students serve themselves vs. if someone dishes food onto their tray.
3. Have students carry out their procedure during the next class period – or the next lunch period. They need to make sure that they have all of the equipment to follow through with their plan. For instance, if they are determining the amount of ketchup used vs. thrown out, they will need to gather data about how much ketchup was put out initially *and* gather the discarded as students clear off their trays. Bowls, scrapers and measuring cups or beakers would be essential in this investigation. Note: This will be an unusual procedure for the cafeteria, and students who are participants in the investigation will need to know of the special project. So as to not skew results, the announcement to participants should inform them that a study is underway, but not disclose its purpose.
 4. Next, students will need to analyze their data and ensure that they got all of the needed data. This will take at least one class period. In some cases, the procedure may need to be done again if data is missing. For example, if the students forgot to gather the data regarding the amount of ketchup that was put out, and how much there was at the end, the students have no way of knowing how much ketchup was taken, rendering the data invalid. They would not be able to record their data, and would have to repeat their procedure.

In the analysis, students should calculate and graph their data, and then decide how accurate their data was, and if it is significant. They should also figure out if there were variables that were not controlled which should have been that might invalidate their data. This information would be included in the written lab report.

Students should also figure out what the data tells them in terms of any recommendations or changes the school could or should make. They should be directed to note that if their data shows that there is little waste, they should also report this, and report that no changes should be made.

5. Finally the students should develop a report containing all of the following elements:
 - a. Title
 - b. Independent, Dependent, Control Variables
 - c. Hypothesis
 - d. Procedure
 - e. Data tables/graphs
 - f. Conclusions
 - g. Recommendations

From this, they should develop a presentation of their data, determine the appropriate audience (other than their classmates, on whom they should practice) and follow up with a presentation. Often, cafeteria and custodial staff, as well as school administrators, are appropriate target audiences.

Assessment

The assessment in this case can be the report and presentation. Presentations could be videotaped, so that students can self-evaluate their efforts. In addition, peers may evaluate presentations. This serves two purposes, as it provides feedback to the groups presenting and focuses the audience on the presentations. A peer evaluation tool might look like the following:

Put a check in the blank that most accurately describes the group’s presentation.

Names of presenters: _____ _____ _____	4-Clear, concise, above and beyond in terms of explanations. Very easy to understand	3-Enough to understand but nothing extra is included	2-Not quite enough information presented. Somewhat difficult to understand	1-Most or all of the information is missing
IV, DV, CVs				
Prediction and Hypothesis				
Procedure				
Data tables and graphs				
Conclusions				
Recommendations				
Overall presentation				

Evaluator’s name: _____

Extensions

There are a number of extensions that could be generated from this activity.

- From the presentations there could be possibilities for implementations of change in the school. From here, students could extend the same procedure into the rest of the school and community.
- Students could do research to determine if any other school has investigated waste and what they found, what they decided to do, etc.? A good resource for this could be the Waste Prevention Forum (a project of the National Waste Prevention Coalition) listserv archives, available at <http://www.reuses.com/nwpcarchive>.

Resources

Environmental Energy Technologies Division, Solid Waste Terms and Definitions. Last Modified: December 1, 1998, by Bruce Nordman.

[<http://eetd.LBL.gov/EA/Buildings/BNordman/C/consmain.html>], p. 11.

Waste Prevention Forum Archive, a project of the National Waste Prevention Forum; moderated by Tom Watson. [<http://www.reuses.com/nwpcarchive>].

Sample student report form and rubric

10-Step Report

- 1) **Name, Date, Block** in upper right-hand corner (5 points):
- 2) **Title** (centered on top line of page 1; the title **MUST** describe your research briefly) (2 points):

Following the title, provide the following information (include the terms listed below before each answer). Note: For Items 3, 4, and 5 below, be sure to **name** your variables and **exactly how you are measuring them!**

- 3) **Independent variable** (the variable that is being manipulated) & OD (Operational Definition—how is it being measured) (5 points):
- 4) **Dependent variable** (the variable that is responding to the manipulation) & OD (how is it being measured) (5 points):
- 5) **Control variables** (the variables that are kept the same—name at least five) (5 points):
- 6) **Prediction & hypothesis** (10 points): This hypothesis will be a little different than the standard formula, because most investigations are looking at two categories. *Example hypotheses:*
 - a. If you measure the amount of salt wasted by boys and girls, then the boys will waste more;
 - b. If you move the position of desserts from the front of the line to the end of the line, then more desserts it will be wasted;
 - c. If you survey the 6th and 8th graders about the use of real flatware, the 8th graders will be more favorable to it than the 6th graders.
- 7) **Description of procedure/setup** (15 points): This must be written in a thorough and concise way, so that another person unfamiliar with the procedure could replicate it. Be sure to use complete sentences.
- 8) **Description of Data table/Results** (20 points): Use a data table. **Before** you do your investigation, you need to have your data table set up and ready to go **and** you should know how you are going to graph the information. When you are done gathering data, the first thing you will do is **graph the data**.
- 9) **Conclusions** (20 points) Was the hypothesis/prediction supported or not? Explain by answering the following questions:
 - a. What you were investigating—what/who were you testing? (We were trying to determine....) Note: This is restating information provided in Item 6 above.)
 - b. Restate briefly your procedure (We did this by....)
 - c. Look at the data you collected. Summarize it referring to your data table and graph. (Our data table and graph both show that... As you can see, this group...)
 - d. Did you answer your hypothesis? Restate your hypothesis, and say whether or not your data shows if it was supported or not. (Our

hypothesis stated that.... Our data supports/does not support this because it shows...)

- e. Were you surprised by your data. Why or why not? (We were [not] surprised because...)

10) **Recommendations for further study** (8 points): Answer all of the following questions for all of the points for this section.

- a. Identify any problems you had doing this investigation—*every* experiment has problems, and you *must* identify those in your investigation. (When we did this investigation, we... Ways we could have made it better include...)
- b. Based on your data, what recommendations can you make to the school or cafeteria staff about ways to reduce waste in the cafeteria? If you cannot make any recommendations, you must tell why and how you would redo this in such a way that you *could* produce a recommendation. In some cases, the recommendation will be not to change things. (What improvements could have been made in the procedures, investigation or other aspects of the research project to make it better and/or result in more accurate findings? What are ways the recommendation could be tested—make at least 2 suggestions. Be sure to use complete sentences!):

Tips for developing hypotheses, procedures and reports (for teacher use)

Consider explaining the following points to students throughout the lesson.

- 1) The idea of *doing* science is to ask questions and figure out answers in a process that ensures objectivity.
- 2) This exercise is about waste reduction—in other words, reducing the amount of waste by reducing the amount of a product used at the outset, rather than dealing with the end result (trash) and reusing or recycling.
- 3) Look at your idea—are you going to be able to make a recommendation about your study that will involve waste reduction?
- 4) When you look at your variables:
Is your Independent Variable (IV) looking at two or more groups, or something you can manipulate? Examples: girls vs. boys, 8th grade vs. 6th grade, main dish vs. sides, juice taken vs. juice consumed.

You *must* have a way to measure this that can be measured accurately by anyone. Use ML, numbers, or decide on a “standard.” For example, a way in which a % of a main-dish would be defined could be: 0-25%, 26-50%, 51-75%, 76-100%.

Is your dependent variable going to show result(s) that can be easily graphed and interpreted?

Will you be able to use your data to make a recommendation that could possibly reduce consumption of some item of food at school?

