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***WIC Nutrition Education
Demonstration Study:
Child Intervention***



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WIC Nutrition Education Demonstration Study: Child Intervention

Authors:

Bonnie Randall
Kim Sprague
David B. Connell
Jenny Golay

Submitted by:

Abt Associates Inc.
55 Wheeler Street
Cambridge, MA 02138

Project Director: Bonnie Randall

Submitted to:

Office of Analysis, Nutrition and Evaluation
USDA, Food and Nutrition Service
3101 Park Center Drive, Room 503
Alexandria, VA 22302-1500

Project Officer: Boyd Kowal

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Executive Summary

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) was established to counteract the negative effects of poor nutrition on the prenatal and pediatric health of low-income individuals. WIC provides direct nutritional supplementation, nutrition education and counseling, and increased access to health care and social services to pregnant, breastfeeding, and postpartum women; infants; and children up to the age of five years. The program is administered by the Food and Nutrition Service (FNS) of the US Department of Agriculture (USDA).

To receive WIC benefits, an applicant must be categorically eligible (a pregnant woman or a two-year-old child, for example); must reside in the State in which the application is filed; must be income eligible (usually defined as equal to or less than 185 percent of the federal poverty income guidelines); and at nutritional risk as determined by a competent professional health authority.

Federal regulations specify content and amount of food items in WIC food packages that are designed for different categories of participants. These prescriptions contain foods that are good sources of the nutrients most likely to be lacking in the WIC population's diet - protein, iron, calcium, and vitamins A and C. The food packages are grounded in the developmental needs of infants as well as in pediatric recommendations about infant feeding. Food package designers also incorporated the recommended eating patterns for preschool children and the additional nutritional requirements of pregnant and breastfeeding women.

Nutrition education is an integral part of WIC and its provision is considered a key WIC benefit. Federal regulations require WIC service providers to offer participants at least two nutrition education sessions during each certification period. Certification tends to occur every six months. State WIC agencies and their local WIC service providers design educational programs that are appropriate for their participant caseloads. Whatever the delivery mechanism, this education must stress the relationship between proper nutrition and good health.

In 1994, FNS initiated the *WIC Nutrition Education Demonstration Study*. The demonstration had two components: a comparison of the effects of innovative and traditional WIC nutrition education for prenatal participants; and a study of the feasibility and effectiveness of providing nutrition education to preschool (three-and-four-year-old) WIC participants. The report

summarized here describes the design and implementation of the child nutrition education demonstration and presents findings describing the effectiveness of the demonstration.

Designing the WIC Preschool Nutrition Education Demonstration

The developmental phase of the demonstration involved the preparation of two products for use with three- and four-year-old WIC children: a nutrition education lesson and a child test.

The Preschool Lesson

A key element of the design of this demonstration was the formulation of clear and specific learning objectives. The three learning objectives for the demonstration incorporated concepts from the Food Guide Pyramid, a colorful graphic developed by USDA and the US Department of Health and Human Services to illustrate the recommendations of *Dietary Guidelines for Americans*. Two primary factors were taken into account when objectives were defined: the developmental appropriateness of the goals for preschool WIC children; and the feasibility of successfully covering the objectives in a thirty-minute, one-time class. In addition, it was important to create a lesson that could be taught by WIC staff who are unlikely to be trained in preschool education. The demonstration objectives are listed below.

Objective 1 Food Pyramid

Children will be able to identify the Food Pyramid.

Children will be able to distinguish the different food groups on the Food Guide Pyramid.

Children will be able to identify and name foods in the food groups on the Food Guide Pyramid.

Children will understand that they should eat more food from the bottom segment of the Food Pyramid and less food from the top.

Objective 2 Variety

Children will understand that they need to eat a variety of foods to stay healthy and grow.

Objective 3 Food Choices

Children will be able to correctly identify "anytime" foods and "sometimes" foods.

Children will understand that "anytime" foods should be eaten more often than "sometimes" foods.

Children will understand that "anytime" foods promote growth and health better than "sometimes" foods.

Working with these objectives, FNS chose to adapt lessons from the *Kid's Club* curriculum, developed by child educator Barbara Mayfield. Material was drawn from three *Kid's Club* components: variety, the food pyramid, and healthy versus junk foods. The demonstration lesson involved activities which address a child's cognitive, affective, and behavioral domains. It also incorporated different learning strategies such as self-learning, meaningful learning, and concrete learning. Lesson content was drawn from the principles behind the Food Guide Pyramid. Children were told how eating well helps them to grow and stay healthy-topics in which they are interested. Finally, materials were colorful and appealing to capture a child's immediate interest.

The Preschool Test

Designing the test of nutrition knowledge required generating and validating a test composed of items that are directly related to the educational objectives of the demonstration and that are also appropriate for the developmental levels of children ranging from thirty-six to fifty-nine months of age. The nutrition education lesson was limited to thirty minutes; the time for the test was limited to ten-to-fifteen minutes to ensure that the single contact would last no longer than forty-five minutes. The time was limited to avoid fatigue in children and to limit additional time families spent at the WIC agency.

FNS and Abt developed a child test composed of nine items directly related to the educational objectives identified earlier in this chapter. Test items were constructed to maintain a child's interest in a one-to-one interview during a ten-to-fifteen-minute testing period. Pilot-testing occurred in two stages: the item development stage and the final pilot test stage. The purpose of the first stage was to establish that children in the target age group could respond appropriately to test items and that their ability to respond would be enhanced following a brief educational intervention. During this phase, in which forty-seven children were tested, the nutrition education lesson was modified, and some test items were added while others were revised or discarded.

The final pilot-testing phase focused on establishing reliability and validity of the overall test as well as for the items comprising the test. This phase involved fifty-three children: thirty were

pretested and twenty-three were post-tested. Results of the pilot-testing demonstrate that three- and-four-year-old children in the post-tested group - that is, the children who were tested after attending the nutrition education lesson - scored higher on most test items than children in the pretest group. Item-specific results indicate that the individual test items are valid measures for preschoolers.

Implementing the Preschool Demonstration

The demonstration took place in two local WIC agencies Site A and Site B. With grants from USDA, each demonstration site employed an individual to teach the preschool classes. Demonstration lessons were offered several times each week during the data collection period which began in February 1996 and ended in November 1996. Child WIC participants were scheduled for either morning or afternoon sessions and were tested on the days they attended classes. Children were randomly assigned to either pretest or post-test. Preschool classes were scheduled to coincide with WIC certification appointments. Parents completed most certification activities during the lessons. Children in the pretest group were tested prior to attending nutrition education; children in the post-test group were tested after the lessons.

The child testers observed fifty-one nutrition education lessons across the two demonstration sites. Using a standardized observation protocol, specific information about the process and content of the classes was recorded. Information was collected about session length, attendance, amount of time devoted to each nutrition topic, disruptions, environmental considerations, and the quality of interactions between nutrition educators and children.

Very few differences were observed across sites. Attendance, usually two children per lesson, was the same at both sites. The entire lesson was, on average, six minutes longer at Site B because, at that agency, the nutrition educator chose to incorporate the snack into the lesson. At the other agency (Site A), children received snacks after they were told the lesson had ended. Site B - with longer class times - also experienced more disruptions during lessons because that agency did not have an available and separate room to assign to the demonstration. We do not know the effects of these differences on child testing. The lower test scores of Site B may have been affected by these disruptions. Nonetheless, we found higher post-test scores for children at Site B.

Impact of the WIC Preschool Demonstration

As noted earlier, a concern-during-the evaluation’s development phase was minimizing burden on three- and-four-year-Old WIC participants and their parents. The goal was to design a research approach which would allow WIC preschoolers to participate as much as their developmental stages permitted. The final research design was a quasi-experimental design—separate-sample pretest-post-test design. Much of the strength of this design was in its randomization which provided us with equivalent groups of children for pre- and post-testing. Immediate post-testing of children was another design benefit because observed effects can more reliably be attributed to the educational intervention which has just occurred. Moreover, this design provided data for overall and subgroup analyses and also reduced burden on children and their parents or caretakers.

Across the two demonstration sites, the final sample was comprised of 497 children who were tested at two test points. Exhibit E.1 contains information on overall sample size by site and by test point. There were about 10 percent more total tests at Site A than at Site B.

Exhibit-E.1

Sample Size by Test Point by Site

	Site A	Site B	Total
Pretest	133	145	278
Post-test	126	93	219
Total	259	238	497

The random assignment resulted in equivalent groups of WIC children by test point. There were no-significant differences in age or gender across the groups of children. The average age for all pretested children was 46 months; for post-tested children, the average age was 47 months.

Child tests were scored using standardized protocols, and item scores were scaled to permit calculation of a total score for each child test. Using scaled scores, we calculated average (mean) scores by test point, site, age, gender, and race-ethnicity and then compared pretest with post-test scores. Findings are presented only by site.

At both sites, there were significant differences between test scores for the pretest and post-test groups (Exhibit E.2). Overall, WIC preschoolers had significantly higher post-test scores than pretest scores. At post-test, children at Site A correctly answered 48 percent of the items as compared with 34 percent at pretest; at Site B, children answered 45 percent correctly as compared with 34 percent. Children, at Site A, who attended the nutrition education lesson scored 14 percentage points higher on the test of nutrition knowledge than did children tested before the lesson. At Site B, the difference was 11 percentage points. Analyses by site, age, and gender suggested that results (mean test scores and pretest-post-test differences) were consistent across these categories. Four-year-old children had significantly higher test scores at both test points because four-year-olds are developmentally more advanced than three-year-olds. (Note that our analyses controlled for the effects of age on test scores.) The correlation between age and total score was high, accounting for 14 percent of the variation in total score. Analyses of variance and covariance indicated that test point (pretest versus post-test) and age were the important predictor variables of child performance.

Item-specific analyses supported the overall findings. Five of the nine test items showed statistically significant differences at the $p < .001$ level for pretest-post-test differences; seven were significant at the $p < .05$ level. For both three- and four-year-olds, four items showed statistically significant differences. Three additional items were significant only for four-year-olds. Again, item-by-item variance analysis indicated that for seven of the nine items, age was the important predictor of whether or not a child will correctly answer the question.

Exhibit E.2

Mean Total Test Scores for WIC Children by Test Type and by Site

	Mean Score for All Children		Mean Score by Age			
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
<i>Pretest</i>						
Site A	3.73 n=133	1.38	3.40 n=78	1.13	4.21 n=55	1.57
Site B	3.75 n=145	1.26	3.55 n=87	1.11	4.06 n=58	1.42
<i>Post-test</i>						
Site A	5.31*** n=126	2.16	4.19* n=62	1.72	6.39*** n=64	1.99
Site B	4.96*** n=93	1.62	4.19* n=46	1.45	5.72*** n=47	1.43

* Difference between pre- and post-test significant at the p<.05 level.
 *** Difference between pre- and post-test significant at the p<.001 level.

NOTES: Mean is for total score.
 Highest possible total score is 11.0.
 Exhibits F.2 and F.3 in Appendix F contain more detailed calculations of these test results.

Conclusions

The objective of this evaluation of the *WIC Nutrition Education Demonstration Study* was assessing the viability and effectiveness of a nutrition education intervention for preschool WIC participants. The findings summarized above indicate that preschool nutrition education may be a viable strategy for the WIC Program. Overall results are summarized below.

- Nutrition education is feasible for three- and four-year-old children in WIC settings.
- The demonstration's nutrition education lesson improved children's knowledge (as evidenced in statistically significant differences between pretest and post-test scores) about certain nutrition topics such as the Food Guide Pyramid, food groups, and eating food that makes them healthy and strong.
- Some nutrition education concepts may be too difficult for three- and four-year-old children to learn. These topics include: eating a variety of foods, selecting companion foods, and identifying "anytime" foods.
- Short interventions appear to be practical strategies for teaching WIC preschoolers about nutrition.
- More information is needed on the cost and sustainability of preschool nutrition education in the WIC Program.

Chapter One

Introduction

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) was established to counteract the negative effects of poor nutrition on the prenatal and pediatric health of low-income individuals. A combination of direct nutritional supplementation, nutrition education and counseling, and increased access to health care and social services is offered to pregnant, breastfeeding, and postpartum women; infants; and children up to the age of five years. Created in 1972 by an amendment to the Child Nutrition Act of 1966, WIC is administered by the Food and Nutrition Service (FNS) of the US Department of Agriculture.

To receive WIC benefits, an individual must meet four conditions. An applicant must be (1) a resident of the state in which s/he applies for WIC benefits; (2) categorically eligible (a child between the ages of thirteen and sixty months, for example); (3) income-eligible - most States set income limits as equal to or less than 185 percent of the federal poverty income guidelines; and (4) at nutritional risk. Determination of nutritional risk is based on medical or nutritional assessment by a competent professional authority (a registered nurse or a nutritionist, for example). Nutritional risks include such conditions as anemia, low weight for height, obesity, and inadequate nutrient intake.

Nutritional Supplementation. To improve the health of program participants, WIC provides supplemental foods that are good sources of the nutrients most likely to be lacking in the diet of low-income populations - protein, iron, calcium, and vitamins A and C. In most States, WIC clients receive WIC vouchers or checks with which they purchase specific food items at participating retail stores. The foods listed on these vouchers or checks meet the special nutritional requirements of pregnant and breastfeeding women; take into account the developmental needs of infants; and incorporate the nutrients in recommended eating patterns for preschool children.

Access to Health and Social Services. The local WIC service provider also serves as a link between participants and appropriate health-care providers or systems. Each WIC agency is charged with assisting WIC participants to obtain and use preventive health-care services.

Nutrition Education and Counseling. Finally, nutrition education plays a crucial role in the WIC Program and is viewed as an essential benefit directed toward achieving positive changes in participant knowledge, attitude, and behavior about food consumption. Federal WIC regulations require WIC service providers to offer participants at least two nutrition education sessions during each certification period. In WIC, certifications tend to occur every six months - with the exception of infants who may be certified for twelve months and prenatal women who may be certified for the duration of pregnancy. While WIC participants are not required to attend nutrition education, local service providers often schedule nutrition education to coincide with voucher or check issuance to encourage WIC clients to attend. Education on a variety of health and nutrition-related topics may be provided in individual counseling sessions, through group classes, or via films and videos. Whatever the delivery form, education must stress the relationship between proper nutrition and good health.

Overview of the Demonstration

Although good nutrition has long been recognized as related to optimal growth and development of children, only recently have we begun to appreciate the importance of teaching young children about good nutrition. The last twenty years have seen the development of numerous nutrition education projects for preschoolers. Some of these efforts are federally funded through the Nutrition Education and Training Program (NET) and Head Start (Contento *et al.*, 1995). These projects have created an expansive body of knowledge about how preschoolers learn, what they can learn, and the elements of effective nutrition education.

During the past dozen years, at national, State, and local levels, the WIC Program has focused on updating the content and enhancing the quality of its nutrition education offerings. Considerable emphasis has been placed on nutrition education for prenatal WIC participants, which includes such topics as smoking cessation, diet during pregnancy, and breastfeeding. In recent years, a few WIC service providers have

offered nutrition education directly to children in addition to educating their parents or other caregivers. In 1994, FNS initiated the *WIC Nutrition Education Demonstration Study*. The demonstration had two components: a comparison of the effects of innovative and traditional WIC nutrition education for prenatal participants; and a study of the viability and effectiveness of providing nutrition education to three-and-four-year-old WIC participants. The prenatal demonstration is the subject of a separate report. In this publication, we describe the child nutrition education demonstration and its results.

There is considerable information available on the positive outcomes of teaching preschoolers about nutrition and its relationship to good health. There is also a curriculum for educating WIC children – *Kid’s Club*, a nutrition education curriculum for preschoolers developed by Barbara Mayfield.¹ The educational intervention for this demonstration combined and modified several lessons from *Kid’s Club*, merging this information with some new material to create a single, thirty-minute lesson on the Food Guide Pyramid.

Research Design

A concern during the planning phase of this evaluation was minimizing burden on three-and-four-year-old participants and their parents. We focused on designing a research approach which would allow WIC children to participate as completely as their levels of development permitted. A key element was ensuring that the innovative lesson could be easily taught in thirty or fewer minutes. A second was minimizing total time the child and parent(s) spent in the WIC clinic. The evaluation design incorporated assistance from WIC staff in scheduling three-and-four-year-old certification appointments in morning and afternoon clusters so that the project’s child testers could recruit sufficient numbers of children in local WIC waiting rooms.

¹ This curriculum is described and referenced in detail in Chapter Two of this report.

Half of these children were randomly assigned to pretesting and were pretested when they were recruited into the demonstration. All children attended the educational intervention. Then, children who were *not* pretested were post-tested.

The final research design is a quasi-experimental design -separate-sample pretest-post-test design (Campbell and Stanley, 1963).² The design can be shown as:

Treatment	R		X	O
Control	R	O	(X)	

where,

- R represents randomized assignment to either pretest or post-test.
- X is the nutrition education intervention for post-tested children.
- O indicates administration of the child test.
- (X) is the nutrition education intervention for pretested children.

Much of the strength of this design is in its randomization which provided us with equivalent groups of children for pre- and post-testing. Immediate post-testing of children was another design benefit because observed effects can more reliably be attributed to the educational intervention which has just occurred. Moreover, this design provided data needed for overall and subgroup analyses and also reduced burden on children and their parents or caretakers.

The Demonstration Sites

The demonstration took place in two large local WIC agencies. These agencies received grants from FNS to defray the costs of hiring staff to teach the innovative lesson to WIC children. Size was necessarily a factor in choosing demonstration sites because of the need to enroll and test a significant number of WIC children in a reasonable amount of time. Child testing began in February 1996 and ended in November 1996.

² A true experimental design would require a control group of WIC children who are randomly assigned to that group and who would not receive the educational intervention but who would be post-tested.

Site A, in a mountain State, is one of three WIC service delivery sites comprising a WIC agency sponsored by the city-county health department. The character of the town is more suburban than urban due in part to the presence of a large university. The agency's total caseload is close to 11,000 persons of which 49 percent are children. The demonstration site accounts for half of the agency's participants, serving about 2,500 children. Nutrition education for adults is provided in group settings; class times range from twenty to twenty-five minutes. This service site is open until 7:30 in the evening every Wednesday. Site A had experimented with *Kid's Club* prior to the demonstration. Staff nutritionists objected to some elements of the curriculum, such as singing and using puppets, so the local *Kid's Club* experiment was discontinued.

Site B is entirely urban, located in a downtown medical center in a large Midwestern city. It is one of twenty-seven service sites in this local WIC agency which provides WIC services to the entire county. The county WIC caseload is around 20,000 persons; the demonstration site has an active caseload of 4,300 persons of whom 36 percent are children. Adult WIC participants attend group nutrition education classes which last about twenty minutes. The site has office hours the second Saturday of every month and is open until 6:00 pm every weekday except Friday. At various times during the past five years, staff nutritionists have offered family nutrition education classes attended by both parents and children. WIC staff reported that these classes were very well-received by WIC clients.

Overall, the local agency operating Site B served about twice as many WIC participants as did the local agency operating Site A. However, at the demonstration sites themselves, Site A had a 16 percent larger caseload (5,100 persons) than did Site B (4,300 persons). The two sites were similar in their approach to adult nutrition education. They differed in their racial-ethnic mix. The caseload at Site A was 90 percent white. At Site B, 80 percent of the caseload was African-American.

Organization of This Report

In Chapter Two, we provide the rationale for offering nutrition education to preschoolers. We then describe the development of the child nutrition education lesson as well as design and validation of the child test of nutrition knowledge. The chapter concludes with a discussion of site-level implementation of the demonstration which is partially based on observation data collected by the child testers. The impact of the intervention is described in Chapter Three. Demographics of the sample are delineated. Test results are presented for all children as well as for subgroups by age, gender, and site. Test means and item-specific scores are reported. The final chapter appraises the overall effects of the intervention.

Chapter Two

The WIC Preschool Nutrition Education Intervention: Its Design, Implementation, and Feasibility

Developing the nutrition educational intervention for WIC children was an iterative process which included establishing specific educational goals for the intervention as well as correlating the lesson's content and objectives with the items comprising the test of nutrition knowledge. This chapter describes that process.

Nutrition Education in WIC

Nutrition education is one of WIC's three primary benefits—the other two are supplemental food and referrals to health and social services. Some local WIC agencies have offered nutrition education since the program's inception in 1972. PL 94-105, which, in 1975, made nutrition education an allowable administrative cost, formally incorporated nutrition education into WIC. In 1978, the role of nutrition education in the WIC Program was considerably strengthened by PL 95-627 which mandated the provision of nutrition education to all program participants.

In 1990, FNS issued regulations clarifying the goals of WIC nutrition education. Section 246.11 of these regulations delineates two broad goals.

Nutrition education should stress the relationship between proper nutrition and good health with special emphasis on the nutritional needs of pregnant, postpartum, and breastfeeding women, infants, and children under five years of age.

Nutrition education should assist the individual who is at nutritional risk in achieving a positive change in food habits, resulting in improved nutritional status and in the prevention of nutrition-related problems through optimal use of the supplemental foods and other nutritious foods.

Local agencies are required to make nutrition education available at no cost to the clients. However, receipt of food vouchers or checks is not contingent upon attendance at nutrition education. Nutrition education may be provided directly by local WIC agencies or through agreements with other agencies.

WIC service providers have considerable latitude in choosing the form and content of nutrition education. They may offer instruction on their choices of health and nutrition topics using appropriate education

strategies such as individual counseling, group classes, written materials, videos, or films. WIC nutrition educators are encouraged to consider the ethnic, cultural, and geographic preferences of participants as well as their educational and environmental limitations.

For adult participants, FNS regulations require WIC service agencies to offer at least two nutrition education sessions during each six-month certification period. The regulations also say that, when possible, nutrition education is to be offered directly to child participants as well as or in addition to their parents and caretakers.

Nutrition Education for Preschoolers

Health-care professionals believe that lifelong eating habits and risk factors for chronic disease begin in early childhood and that it is easier and more effective to teach healthy behaviors to preschoolers than to try to change the unhealthy nutritional habits of adults (Lenfant, 1995). Nutrition education for children is especially important today because, in two-career and single-parent families, many children frequently select food with little adult supervision (Crockett and Sims, 1995). Most health promotion organizations, including the American Heart Association, the National Institutes of Health, the Centers for Disease Control and Prevention, the Nutrition Education and Training Program, and the American Dietetic Association, now recommend that all children from preschool through twelfth grade receive education about healthful eating habits (Singleton *et al.*, 1992; CDC, 1996). Appendix A lists other research reports on nutrition education for preschoolers.

Developing the Intervention

The developmental phase of this project included preparing two products for use with three- and four-year-old WIC children: a nutrition education lesson and a child test.

The initial developmental stages of the preschool demonstration included a review of the most frequently used standards for evaluating the nutritional health of the US population—the *Dietary Guidelines for Americans* (USDA/HHS, 1995). The *Dietary Guidelines*, which recommend food choices to promote health and decrease the risk of chronic disease for people two years of age and older, include six recommendations that apply to children as well as adults. A seventh recommendation is for adults only (Exhibit 2.1).

Exhibit 2.1

Dietary Guidelines for Americans, 1995

Eat a variety of foods.

Balance the food you eat with physical activity—maintain or improve your weight.

Choose a diet with plenty of grain products, vegetables, and fruits.

Choose a diet low in fat, saturated fat, and cholesterol.

Choose a diet moderate in sugars.

Choose a diet moderate in salt and sodium.¹

¹The seventh Dietary Guideline applies only to adults: *If you drink alcoholic beverages, do so in moderation.*

It appears, however, that the diets of many young Americans do not meet the nutrition standards in the *Dietary Guidelines*. Several recent large-scale studies have noted declines in fat intake among American preschool and primary school children and adolescents, but currently reported fat intake—33 to 35 percent of total daily calories—still exceeds, by 3 to 4 percentage points, the recommendation in the *Dietary Guidelines* (Luepker *et al.*, 1996; Nicklas, 1995; Devaney *et al.*, 1995; CDC, 1996). The average diets of children and adolescents include too much fat, saturated fat, and sodium and too few servings of fruits, vegetables, and calcium [CDC, 1996; Federation of American Societies for Experimental Biology (FASEB), 1995]. National surveys indicate that overweight among America's children is a growing problem and that children from lower income, ethnically diverse populations are at greater risk—than are children of higher socioeconomic status—of obesity, increased serum lipid levels, and food intakes that fail to meet the *Dietary Guidelines* (Nicklas, 1995; FASEB, 1995; Bronner, 1996).

Objectives of the Intervention

Several expert nutrition educators worked with staff from FNS and Abt to formulate clear and specific learning objectives. During the process, factors that were taken into consideration included: the developmental appropriateness of objectives; the feasibility of successfully covering the objectives in a thirty-minute, one-time class for three- and four-year-olds; and topics addressed by demonstration sites in their adult nutrition education sessions and materials. The thirty-minute time limit for the intervention was chosen to lessen burden on families by minimizing additional time in the WIC clinic. The parent or caretaker could complete certification while the child attended the nutrition education lesson. Also, thirty minutes is a maximum time frame for an educational intervention that takes into account the developmental levels of three- and four-year-old children.

The three learning objectives for the demonstration incorporated concepts from the Food Guide Pyramid, a colorful graphic developed by the USDA and USDHHS to illustrate the recommendations of the *Dietary Guidelines for Americans* (USDA, 1992).

Objective 1 Food Pyramid

Children will be able to identify the Food Pyramid.

Children will be able to distinguish the different food groups on the Food Guide Pyramid.

Children will be able to identify and name foods in the food groups on the Food Guide Pyramid.

Children will understand that they should eat more food from the bottom segment of the Food Pyramid and less food from the top.

Objective 2 Variety

Children will understand that they need to eat a variety of foods to stay healthy and to grow.

Objective 3 Food Choices

Children will be able to correctly identify “anytime” foods and “sometimes” foods.

Children will understand that “anytime” foods should be eaten more often than “sometimes” foods.

Children will understand that “anytime” foods promote growth and health better than “sometimes” foods.

Kid's Club

After clearly defining demonstration objectives, FNS chose *Kid's Club* as the basis for the educational intervention.¹

The goals of *Kid's Club* are consistent with widely applied educational techniques which emphasize learning through social interaction and reinforcement. *Kid's Club* goals include:

1. Providing an opportunity for children to learn one or more key ideas or concepts about nutrition and/or health topics.
2. Promoting positive attitudes about good nutrition and health.
3. Encouraging positive nutrition and health behaviors among *Kid's Club* participants.

At the end of each session, each participant will:

1. Know one or more ideas or concepts about food, nutrition, or health and be able to state this knowledge in answer to one or more question(s).
2. Feel good about what s/he learned and about the educational experience and be eager to come again.
3. Demonstrate a willingness to try a positive nutrition or health behavior.

Adapting the Lesson

To develop the preschool intervention, material was drawn from three *Kid's Club* lessons: variety, the food pyramid, and healthy versus junk foods. FNS, Abt Associates, and Barbara Mayfield cooperatively developed the demonstration's educational intervention.

The lesson was modified and refined during the course of pilot testing; revisions were based on children's responses to different activities. For example, the *Kid's Club* story *Treasures of the Pyramid* was initially shortened and then later omitted to hold the lesson to thirty minutes and to have more time for hands-on activities. The terms "everyday" and "sometimes" were used at the start of pilot testing, but

¹This educational program was developed by child nutrition educator Barbara Mayfield with funding from USDA. The complete *Kid's Club* curriculum is a series of twenty-six lesson plans with supplementary activities, a songbook and cassette tape of nutrition songs, a storybook, puzzle, and six hand puppets. Parents are viewed as partners in the learning experience and are provided with ideas to reinforce the lessons children learn from *Kid's Club*.

we found that children seemed to be confused by the term “everyday”—often applying the term to foods they wished to eat every day. Substituting “anytime”—to indicate certain foods could be eaten anytime—alleviated this problem. Our choices about the use of visual aids, such as hand puppets and food models, also changed as the lesson was revised.

Foodstuffs chosen for the lesson (and the child test) were items familiar to children and were also the foods most frequently consumed by three- and four-year olds (USDA, 1995). The foods discussed in the intervention include:

<i>Grains</i>	Cereal, bread, rice, spaghetti or macaroni, crackers
<i>Vegetables</i>	Lettuce, broccoli, tomatoes, carrots, green beans
<i>Fruits</i>	Apple, orange, banana, grapes, melon
<i>Meat</i> (protein)	Hamburger, chicken, fish, eggs, peanut butter
<i>Milk</i>	Milk, yogurt, cheese

General Characteristics of the Demonstration’s Educational Intervention

The educational intervention for this demonstration included seven topics plus an introduction and a closing. The seven topics are listed below. The educational objectives, defined earlier in this chapter, are noted for each topic.

Objective 1

- The Food Guide Pyramid
- The five food groups on the pyramid
- Identifying foods on the pyramid
- Classifying foods into the five food groups

Objective 2

- Eating a variety of these foods

Objective 3

- Eating appropriate proportions from each food group
- Moderation in eating—“anytime” and “sometimes” foods

Lesson components are described below. A copy of the final lesson appears in Appendix B.

Materials are colorful and appealing to capture children's immediate interest. Children are told how eating well helps them to grow and stay healthy—a topic in which they are interested.

Different learning strategies are incorporated into the lesson. Self-learning is promoted by allowing children to reach into WICCY Waccoon's Wonder Box and pull out a (surprise!) Food Guide Pyramid. Meaningful learning asks the children questions about the shapes of their names tags (triangle, square, circle) before “bridging” into the new concept (and shape) of the Food Guide Pyramid. Concrete learning includes building a Food Guide Pyramid puzzle and singing a song about the five food groups.

Learning activities involve cognitive, affective, and physical domains. There is more emphasis, in this demonstration, on the cognitive domain because our mission is to measure knowledge changes.

Information in the lesson is reinforced by a variety of means including the Food Guide Pyramid puzzle, a song about the five food groups, naming and classifying food pictures into food groups, and telling parents what children learned about the Food Guide Pyramid.

Each child is rewarded with a wooden puzzle of the Food Guide Pyramid which s/he may take home.

Expectations for the effectiveness of the demonstration lesson were based on previous experience with *Kid's Club*, as reported by its developer, as well as on a review of the literature describing preschool nutrition education. It was expected that both three- and four-year-olds would be developmentally ready to learn about the Food Guide Pyramid and about the five food groups. Four-year-olds would be more likely to grasp the concept of variety and were also expected to be more adept at classifying and categorizing foods into food groups and as “sometimes” or “anytime.” The longer attention span of four-year-old children should lead to that group displaying larger pretest-post-test differences than would occur for three-year-olds.

Developing the Preschool Nutrition Education Test

Designing the test of nutrition knowledge required developing and validating a test composed of items that are *directly* related to the educational objectives of this study and that are also appropriate for

developmental levels of children ranging from thirty-six to fifty-nine months of age. It was crucial that test and intervention development follow parallel, iterative paths.

It is also useful to underscore here that the educational intervention and the test had to occur during a single contact lasting about forty-five minutes and taking place at certification appointments. Scheduling the intervention to coincide with certification ensured that children would be present—WIC child participants are not required to pick up food vouchers or checks. The time limitation itself had two goals: avoiding fatigue in children and limiting additional time families spent at the WIC agency.

The challenges for this test development process were threefold. The first was creating items that are appropriate and useful across developmental ages ranging from thirty-six to fifty-nine months of age. Moreover, these items must address specific educational objectives and be sensitive to a single brief educational intervention. Finally, each item must interest children, and the test, in the aggregate, must sustain each child's interest.

FNS and Abt developed a child test composed of ten items which were directly related to the three educational objectives identified earlier in this chapter. A copy of the final testing instrument is in Appendix C. Test items were carefully constructed and pilot tested to maintain children's interest in a one-to-one interview during a ten- to fifteen-minute testing period.

Pilot Testing

A total of 100 children were tested in two stages: the item development stage and the final pilot test stage. During test development, eight test forms were created and assessed. Several tasks (items) were common to all test forms, but others were eliminated when they were found to be flawed.

The item development stage involved forty-seven children, twenty-one of whom were pretested and twenty-six of whom were post-tested. The purpose of this stage of test preparation was to establish that children in the target age group could respond appropriately to test items and that their ability to respond would be enhanced following a brief educational intervention. During this stage, the educational innovation was modified considerably, and some test items were added while others were revised or discarded. At the conclusion of this iterative process, ten items were aggregated into another form for

pilot testing where the primary focus was establishing reliability and validity of the overall test as well as for the items comprising the test.

The final pilot-testing phase involved fifty-three children: thirty were pretested and twenty-three were post-tested. Children were tested at three local WIC agencies, a Head Start program, and a publicly funded child care center—all in Massachusetts. A record was kept of the ages of children who were pretested and post-tested in an effort to evenly distribute the pre- and post-tests across children of different ages—young three-year-olds versus older four-year-olds, for example. Across all children tested, in both stages, the average ages were 47.1 months for pretested children and 47.8 months for post-tested children.

During the pilot test, nutrition education sessions for children were conducted by Abt staff with experience in early childhood education. Initially, these sessions were taught by two-person teams because we thought that children might be more comfortable in lessons with two adults. Working in teams was also helpful as staff refined and revised the nutrition lesson. However, as the pilot testing progressed, many of the sessions were taught by just one person. This approach was quite successful and a closer approximation of the nutrition education to be offered at the demonstration sites.

Children were tested by the same individuals who taught the nutrition education sessions and by a college student majoring in education. Children were usually engaged by the testing activities and seemed to enjoy them. There were a few young three-year-olds who were unable to focus on the testing.

Again, the entire educational intervention and all testing occurred during a single contact lasting about forty-five minutes. In the WIC agencies, the interventions coincided with certification appointments. While children participated in the pilot test, their mothers handled certification. The parent(s) of each participating WIC child received \$10. At the other social service agencies, incentive payments were given to the programs to use for special treats for the children. All pilot-tested children were given snacks (animal crackers and juice) and coloring sheets of fruit pictures to take home.

Results of the Pilot Test

Mean pretest and post-test scores for the pilot test are summarized in Exhibit 2.2. The pilot test results demonstrated that three and four-year-old children in the post-tested group could perform more capably on most of the items if they had participated in instructional sessions. The complete test involved nine items. One (item 4) had two parts, and one (item 9) had three alternative scoring

Exhibit 2.2

Pilot Test Results

Test Item	Number ^a	Mean Score	Standard Deviation
Item 1 Naming the food pyramid			
Pretest	51	0.22	0.46
Post-test	49	0.35	0.56
Item 2 Identifying the number of food groups			
Pretest	29	13.8	35.1
Post-test	23	69.6***	51.1
Item 3 Selecting a plate of foods representing “variety”			
Pretest			
Post-test	30	23.3	43.0
	23	43.5	50.7
Item 4n Naming foods from the five food groups			
Pretest	29	55.9	22.3
Post-test	23	75.7*	24.8
Items 4s Selecting companion foods from the same food group			
Pretest	29	35.9	21.6
Post-test	23	33.0	28.0
Item 5 Correctly placing foods in food groups			
Pretest	29	24.8	17.4
Post-test	23	33.9	29.2
Item 6 Selecting food groups			
Pretest	42	38.1	39.5
Post-test	42	53.6*	37.9
Item 7 Selecting “anytime” foods			
Pretest	50	44.3	27.8
Post-test	47	43.7	31.8
Item 8 Reasons for eating “anytime” foods			
Pretest	51	0.49	1.05
Post-test	49	1.47*	1.68
Item 9 Food pyramid puzzle			
Time on task (seconds)			
Pretest	28	121.3	44.3
Post-test	23	98.1*	45.9
Pieces completed			
Pretest	28	3.54	2.33
Post-test	23	4.65*	1.97
Time to complete (seconds) ^b			
Pretest	12	83.1	45.0
Post-test	15	70.5	30.8

*Difference between pretest and post-test significant at the $p < .05$ level.

***Difference between pretest and post-test significant at the $p < .001$ level.

NOTES See Appendix D for individual item analysis.

a Number of subjects varies because there were several rounds of pilot-testing using different versions of the test so that all subjects did not receive all items included in the final version of the test.

b Reported only for subjects who completed the puzzle.

methods. Post-tested children had higher scores for three of the seven single-score items, one of the parts of item 4, and for two of the three scoring methods applied to item 9. Only subitem 4S (selecting companion foods from the same food group as the tester) and item 7 (selecting “anytime” foods from a two-picture choice) failed to provide any evidence that the instruction was effective. Both items were retained in the final test, however, because they were important elements of the lesson, and it was felt that even failure to demonstrate effectiveness on these educational elements would be important to the evaluation. One additional item was added to the final test because the item requiring a verbal identification of the food pyramid was felt to be beyond the language skills of many of the younger children. The new item was a request that the child point to a picture of the food pyramid placed among a three-choice array. Content validity for the test items was assured because the items directly reflected the content of the nutrition education lesson; construct validity was demonstrated for those items through the pretest results reflecting the success of post-tested children relative to children tested prior to educational sessions. Detailed information on overall and item-specific pilot test results appears in Appendix D.

Implementing the Intervention

Using grant money from USDA, each demonstration site employed an individual to teach the preschool classes. In November 1995, Barbara Mayfield, the original developer of *Kid’s Club*, traveled to both sites to train the teachers and to demonstrate the lesson to other WIC staff. Staff from Abt and FNS also attended the one-and-one-half day sessions.

Demonstration classes were offered several times each week during the data collection period which began in February 1996 and ended in November 1996 (Site A) and October 1996 (Site B). For most of the demonstration, child WIC participants were scheduled for either morning or afternoon sessions and were tested on the days they attended classes. At both sites, six to eight children were scheduled for each lesson to be sure that at least two children would attend. Upon arrival for the educational program (which was scheduled to coincide with WIC certification appointments), children were randomly assigned to either pretest or post-test. Children in the pretest group were tested prior to attending nutrition education; children in the post-test group were tested after the lesson. Parents were able to complete most certification activities during the lessons.

Observations of the Preschool Intervention

Across the two study sites, fifty-one lessons were observed by the child testers.² Using a standardized observation protocol, specific information about the process and content of the classes was recorded. Information was collected about session length, attendance, amount of time devoted to each nutrition topic, disruptions, environmental considerations, and the quality of interactions between nutrition educators and children. A copy of the observation checklist is found in Appendix E.

Data on these observations are displayed in Exhibit 2.3 and discussed below. It is important to note that these observations do not constitute a formally drawn sample of either total sessions or total minutes devoted to nutrition education. Rather, these data are descriptive, offering an overview of the actual conduct of the demonstration.

Session Length

Nutrition education sessions averaged 29 minutes in length, ranging from 21 to 45 minutes at the two project sites. As might be expected, sessions were longer when the groups were larger.

At Site A, sessions were about six minutes shorter, on average, than at Site B. This difference reflects Site B's inclusion of the snack in the lesson. At Site A, the snack was provided *after* the lesson was entirely finished, as in our original design. Test results indicate that this deviation did not affect the educational content of the lesson. This approach merely reflects the personal teaching style of the nutrition educator at Site B.

Attendance

During most observed sessions, classes were composed of two or three children. Occasionally, only one child attended. The largest class size was five. Usually, four-to-six children were scheduled for certification and class attendance. Child testers reported that some of the unobserved sessions included as many as eight children.

²Observations of lessons were included in FNS' design for the demonstration. Child testers began observations about eight weeks into the demonstration. The original goal, which was slightly exceeded, was twenty observations in each site—about one class per week of the data collection period.

Exhibit 2.3**General Characteristics of *Kid's Club* Sessions**

Characteristic	Site A	Site B
<i>Session length</i>		
Mean	26 min.	32 min.
(Range)	(21-34)	(26-45)
<i>Attendance</i>		
Child participants		
Mean	2.72	2.54
(Range)	(1-5)	(1-5)
Other children		
Mean	0.96	0.11
(Range)	(0-7)	(0-2)
Adults		
Mean	0.44	0.35
(Range)	(0-2)	(0-2)
Attendance rate ^a	84%	50%
<i>Number of sessions observed</i>	25	26

^a This rate is calculated by dividing the number of child participants who attended *Kid's Club* sessions by the number scheduled to attend.

More “extra” people attended the nutrition education sessions at Site A than at Site B, including adults and other, often older, children who were friends or relatives of tested children. Site A averaged at least one extra person per session while Site B had about one extra person at every other session. Individuals had to attend the entire nutrition education session to be included in these counts. Parents who joined in at the end of the each class were not counted as attending sessions.

Site A’s 84 percent show rate for certification appointments is substantially higher than the 50 percent rate at Site B. A consequence of Site B’s higher no-show rate for certification appointments was the need to overschedule children so that teaching-testing goals could be met.

Duration of Nutrition Topics

The nutrition education lesson was divided into seven topics plus a welcome and a closing. During the sessions, child testers timed (using stopwatches) and recorded the time spent on each component. Time devoted to each topic was similar across the two sites (Exhibit 2.4). In fact, there were only four topics with differences of more than one minute. The nutrition educator at Site B spent about one minute longer on the sections covering the Food Guide Pyramid and the five food groups and, as explained earlier, additional time was spent in the last two sections of the lesson at Site B because the snack was served *before* the instructor ended the lesson.

Involvement of Children

All of the children were attentive for the duration of the entire class in 57 percent of observed sessions (64 percent in Site A and 50 percent in Site B). Observation data indicated that children were attentive at least some of the time in 89 percent of the sessions. There was only one observation of one topic where no child was attentive.

It seems reasonable to conclude, based on the observation data, that children were engaged by the intervention. As just noted, in a majority of the observed classes, children were attentive throughout the sessions. In the remaining observations (43 percent of the fifty-one observed classes), children were attentive for about 80 percent of the topics.

Disruptions and Environment

Disruptions to the sessions were not a problem at either site, but, as might be expected in a program for young children, some disruptions did occur. For both sites, 57 percent of nutrition education sessions had at least one disruption and 35 percent had more than one. Interruptions occurred most often at the start of lessons while adults were leaving and children entering the classrooms. Some predictable disruptions for a group of young children are bathroom breaks, children missing their parents, and parent interruptions to instruct their children.

Site A had disruptions in fewer sessions (40 percent) than Site B (73 percent). Site B had more disruptions from people walking through the room, probably because of the room's location. At Site B, teaching and testing took place in separate parts of the only available classroom. Sometimes

Exhibit 2.4

Duration of Lesson Topics

Topic	Site A (minutes)	Site B (minutes)
Welcome and introduction	2:24	1:46
Food pyramid	2:54	3:54*
Five food groups	4:32	5:43*
Food identification	3:00	3:06
Food classification	2:34	1:52
Variety review	2:29	2:52
Proportionality	2:33	2:58
Moderation	4:05	5:50* **
Closing	1:30	3:22* **
Total session length	25:52	31:32

* More than one minute difference in duration of topic between sites.
 ** Moderation, closing, and total session length are longer at Site B because the snack was distributed *between* the moderation and closing sections at Site B and *after* the class at Site A.

individuals or child care classes walked through the room to locations in other parts of the building. In contrast, Site A had two separate classrooms so that the nutrition education sessions and child tests were conducted in separate spaces. Also, the rooms were not used as passageways. Although the limited space at Site B complicated the logistics of teaching and testing, care was taken to maintain the quality of the educational sessions and the testing process. As test results reported in Chapter Three clearly indicate, Site B’s space constraints did not diminish the effectiveness of the lesson.

Child testers at both sites recorded adequate space, privacy, comfortable temperature, and bearable noise levels during all nutrition education sessions.

Interactions Between Nutrition Educators and Children

Observers gave high ratings to the quality of the interactions between nutrition educators and WIC children. In 96 percent of the sessions, the pace of presentation was considered appropriate for the children. The following indicators of the quality of the interaction between nutrition educators and WIC children were positive in all observed classes at both sites:

Educator provides opportunity for children to actively participate.

Educator maintains an enthusiastic attitude.

Educator is supportive of children during interaction.

Pace of presentation is appropriate to material.

Chapter Three

Impact of the WIC Preschool Intervention

Before turning to demonstration results, it is helpful to review our quasi-experimental research design—a separate-sample pretest-post-test design (Campbell and Stanley, 1963). The brevity of the intervention followed by immediate post-testing strengthens the design’s internal validity so that we can attribute knowledge differences to the education intervention and not to other factors or experiences intervening between instruction and testing.¹ For most of the demonstration period, child WIC participants were scheduled for either morning or afternoon lessons and were tested on the days they attended the lessons which were held in conjunction with WIC certification. Using an automated program on laptop computers, child testers randomly assigned children to either *pretest* or *post-test*. Randomization increases the likelihood of equivalency across the two groups of children. Children assigned to pretest were tested in one-to-one interviews before the lesson; children in the post-test groups remained after the lesson for one-to-one testing. All children attended the educational intervention.

Sample

A total of 503 children were tested across the two sites at two test points. The final sample size was 497 children. We excluded from the analysis three pretests and three post-tests. The six tests were removed from the final database because the individuals tested failed to respond to nine or more items either verbally or non-verbally.

Exhibit 3.1 displays information on overall sample size by site and by test point. Slightly more child tests were completed at Site A. Also, there is a considerable drop in number of post-tests at Site B. The space problems described in Chapter Two accounted for this difference. At Site B, although there were only two child testers, there was only one private space for testing. Children had to be tested sequentially. This protocol was not a problem for pretests when one child could be tested while another was certified. Then, all children attended the demonstration lesson. However, after the lesson, a number of families could not stay for sufficient time for their children to be tested.

¹In Chapter Two, we discussed implementation of the demonstration and noted the similarities in implementation of the nutrition education intervention across the two sites.

Exhibit 3.1

Sample Size by Test Point by Site

	Site A	Site B	Total
Pretest	133	145	278
Post-test	126	93	219
Total	259	238	497

Demographics

Exhibit 3.2 displays demographic data on the demonstration’s child WIC participants. These data were obtained from WIC application and certification forms at the two local agencies participating in the demonstration.

The average age for all pretested children was 46 months; for post-tested children the average age was 47 months ($t = -1.61, n.s.$).² Overall, 55 percent of the tests were conducted with children under four years of age—273 tests for under-fours versus 224 for children at least four years of age.³ The majority of the three-year-olds were closer to four years of age than to three. Males accounted for 57 percent of the sample at Site A and for 50 percent of the sample at Site B.

Neither site had large proportions of persons of other races or ethnicities. For this analysis, information on race/ethnicity is aggregated into three categories: white, black, and other. The “other” category included ten American Indians/Alaskan Natives, eleven Asians or Pacific Islanders, twenty-six Hispanics, five children listed as other on WIC certification forms, and seven respondents for whom race/ethnicity was not reported. At Site A, 17 percent of tested children were reported as other; that category accounted for only 4 percent of Site B’s tested children.

²All t-tests are two-tailed—the more stringent default in SAS.

³The division is absolute year of age. That is, at forty-eight months, children were classified as four-year-olds.

Exhibit 3.2

Demographic Characteristics of WIC Children in Nutrition Education Demonstration by Test Type and by Site

Test Type	Age in Years				Gender				Race/Ethnicity					
	Three ¹		Four ²		Male		Female		White		Black		Other ³	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Pretest														
Site A	78	58.7	55	41.4	70	52.6	63	47.4	113	85.0	0	0	20	15.0
Site B	87	60.0	58	40.0	79	54.5	66	45.5	16	11.4	120	85.1	5	3.6
Post-test														
Site A	62	49.2	64	50.8	77	61.1	49	38.9	100	79.4	3	2.4	23	18.2
Site B	46	49.5	47	50.5	43	46.2	50	53.8	16	17.8	70	77.8	3	4.4

¹Includes children aged thirty-six through forty-seven months.

²Includes children aged forty-eight through fifty-nine months.

³Other includes American Indian or Alaskan Native (ten children); Asian or Pacific Islander (eleven children); and Hispanic (twenty-six children). In addition, four children were reported as "other" race/ethnicity on WIC application and certification forms, and race/ethnicity was not reported for eight children. Because of these missing data, the totals for race/ethnicity for Site B are 141 for pretest and 89 for post-test.

NOTES There was enough evidence to reject the hypothesis of independence for the following: race by site, race by test type, and site by test type. These results were expected because delayed post-tests were conducted almost exclusively in Site A and because the caseload at Site A is predominantly white.

Total sample size is 497 children.

Results of statistical tests comparing demographic variables indicate age was independent of site ($X^2 = .17$, n.s.) but not of test point ($X^2 = 4.99$, $p < .05$) because more three-year-olds were pretested. Gender was independent of both site ($X^2 = 1.51$, n.s.) and test point ($X^2 = .07$, n.s.).

Hypotheses of independence were rejected for race and site ($X^2 = 336.64$, $p < .01$) but not for race and test point ($X^2 = 5.42$, n.s.) when the “other” race category was included. We noted in our general descriptions of the two demonstration sites that Site A had a predominantly white caseload while Site B’s caseload was primarily African-American. Race/ethnicity was almost completely confounded by site.

Finally, site was not independent of test point ($X^2 = 4.61$, $p < .05$) because fewer post-tests were conducted in Site B.

Analysis and Test Scoring

Child tests were scored using standardized protocols, and item scores were scaled to permit calculation of a total score for each child test. The total maximum score for the child test is 11.0. Three items, 1b (identifying the Food Guide Pyramid non verbally), 2 (identifying the number of food groups in the Food Guide Pyramid), and 3 (selecting a plate of foods representing “variety”), are scored as *correct* or *incorrect*. The open-ended responses required for Items 1a (identifying the Food Guide Pyramid verbally) and 8 (reasons for eating “anytime” foods— verbally) are scored to measure the quality of the child’s response. For example, for Item 1a, a respondent receives full credit (score of 1.0) for answering *food pyramid* versus partial credit (scaled score of 0.667) for saying *pyramid*. Scores for Items 4n (naming foods from the five food groups), 4s (selecting companion foods from the same food group), 5 (placing foods in the correct food group), 6 (selecting food groups from which to eat most often), 7 (identifying “anytime” foods), and 9 (completing the Food Guide Pyramid puzzle) are based on the proportions of the subitems answered correctly. In addition, for Item 9, a separate *Time to Complete* this task was computed in seconds. Finally, the time to complete the entire testing session was computed by subtracting the start time from the end time; child testers routinely recorded start and end times. Exhibit 3.3 displays scoring protocols for each item.⁴

⁴Most exhibits in this chapter present mean scores computed from the scaled test scores. In the text, we frequently report percentage of correct answers. These percentages were calculated by dividing the mean score by the possible maximum score.

Exhibit 3.3

Item Scoring for Preschool Nutrition Education Test

Test Item		Scoring	
1A	Identifying the Food Guide Pyramid verbally	Food Pyramid	1.0
		Pyramid	0.667
		Food or food triangle	.0333
		Any other response	0.0
1B	Identifying the Food Guide Pyramid non-verbally	Pointing to Food Pyramid	1.0
		Any other response	0.0
2	Identifying the number of food groups in the Food Guide Pyramid	Five—verbal or non-verbal	1.0
		Any other response	0.0
3	Selecting a plate of foods representing “variety”	Selection of variety plate	1.0
		Any other response	0.0
4n	Naming foods from the five food groups	Correctly names five foods	1.0
		Correctly names four foods	0.8
		Correctly names three foods	0.6
		Correctly names two foods	0.4
		Correctly names one food	0.2
		Names no foods	0.0
4s	Selecting companion foods from the same food group	Correctly selects five foods	1.0
		Correctly selects four foods	0.8
		Correctly selects three foods	0.6
		Correctly selects two foods	0.4
		Correctly selects one food	0.2
		Selects no foods	0.0
5	Placing foods in the correct food group	Correctly places five foods	1.0
		Correctly places four foods	0.8
		Correctly places three foods	0.6
		Correctly places two foods	0.4
		Correctly places one food	0.2
		Places no foods	0.0

Exhibit 3.3

(Continued)

Test Item		Scoring	
6	Selecting food groups from which to eat most often	Correctly selects three food groups	1.0
		Correctly selects two food groups	0.667
		Correctly selects one food group	0.333
		Selects no food groups	0.0
7	Identifying “anytime” foods	Correctly selects six “anytime” foods	1.0
		Correctly selects five “anytime” foods	0.833
		Correctly selects four “anytime” foods	0.667
		Correctly selects three “anytime” foods	0.050
		Correctly selects two “anytime” foods	0.333
		Correctly selects one “anytime” food	0.167
		Selects no “anytime” foods	0.0
8	Reasons for eating “anytime” foods	“Anytime” foods help children grow strong <i>and</i> healthy	1.0
		“Anytime” foods help children grow strong <i>or</i> healthy	0.6
		“Anytime” foods are good for you	0.4
		Child indicates preference for “anytime” foods	0.2
		Any other response	0.0
9	Completing the Food Guide Pyramid puzzle	Correctly places all (six pieces) puzzle pieces	1.0
		Correctly places five puzzle pieces	0.833
		Correctly places four puzzle pieces	0.667
		Correctly places three puzzle pieces	0.050
		Correctly places two puzzle pieces	0.333
		Correctly places one puzzle piece	0.167
		Places no puzzle pieces	0.0

Using scaled scores, we calculated average (mean) scores by test point, site, age, gender, and race-ethnicity and then compared pretest with post-test scores.⁵ These analyses included consideration, using correlation coefficients, of the interactions between and among variables.⁶ These analyses controlled for test point, age, gender, and race-ethnicity. As might be expected from our descriptions of site and sample demographics, race/ethnicity was almost completely confounded with site. Site A was virtually all white, while Site B was predominantly African-American. Findings are presented by site.

All other group performance differences are described in terms of statistical significance and in terms of the proportion of the pooled standard deviation. Typically, if an observed performance difference is smaller than 20 percent of the standard deviation, it is considered too small to be meaningful. Differences between 40 and 60 percent of the standard deviation are considered medium; differences greater than 80 percent of the standard deviation are considered large (Cohen, 1969).

Child Test Results

We found a significant difference between the test scores for the *pretest* and the *post-test* groups (Exhibit 3.4). Children in both sites had basically the same pretest scores—mean scores of 3.73 in Site A and 3.75 in Site B—both representing 34 percent correct answers. On post-test, children correctly answered 48 percent of the items (Site A) and 45 percent of the items (Site B). Average differences between pretest and post-test scores were similar across sites (14 percent at Site A and 11 percent at Site B). Children who attended the nutrition education lesson scored, between 11.0 and 14.0 percentage points higher on the test of nutrition knowledge than did children tested before they attended the lesson. Respondents required only slightly longer times to complete pretests than they needed to complete post-tests—14.75 minutes versus 14.02 minutes.⁷ Nonetheless, this difference was statistically significant. These results were similar to the pilot test results described in Chapter Two.

⁵All tests of statistical significance (t-tests and chi-squares) were at the .05 significance/95 percent confidence interval.

⁶SAS procedures GLM (analysis of variance for unbalanced data) and REG (multivariate regression) were used for these analyses.

⁷This calculation excludes fourteen children for whom test times were not obtained.

Exhibit 3.4

Mean Total Test Scores for WIC Children by Test Point

	Mean Score for All Children		
	Number	Mean	Standard Deviation
Pretest			
Site A	133	3.73	1.38
Site B	145	3.75	1.26
Post-test			
Site A	126	5.31***	2.16
Site B	93	4.96***	1.62

* Difference between pre- and post-test significant at the p <.05 level.
 *** Difference between pre- and post-test significant at the p <.001 level.

NOTES Mean is for total score.
 Highest possible total score is 11.0.
 Exhibit F.1 in Appendix F contains more detailed calculations of these test results.

Further analyses by site, age, and gender suggest that results were consistent across these disaggregations (Exhibit 3.5). Differences between pretest and post-test scores were statistically significant for both age and gender and by site.

As expected, four-year-old children had significantly higher scores at every test point because four-year-olds are developmentally more advanced than three-year-olds. There was some correlation between age and total score, accounting for 14 percent of the variation in total score ($r = .38$).⁸ Among four-year-old WIC children the average difference between pretest and post-test was higher than for three-year-olds—1.98 points versus 0.71 points. Within site, four-year-olds scored slightly higher on the post-test in Site A ($t = 2.06, p < .05$). On average, male and female scores differed significantly on post-tests compared with pretests. Females scored higher in general, but not significantly higher, than males with the exception of three-year-olds in Site A.

⁸Bonferroni (Dunn) t -tests and Tukey Studentized Range (HSD) tests were also conducted with similar overall findings.

Exhibit 3.5

Mean Total Test Scores for WIC Children by Test Point, for Age and Gender by Site

	Mean Score by Age						Mean Score by Gender					
	Three Years			Four Years			Male			Female		
	Number	Mean	Standard Deviation	Number	Mean	Standard Deviation	Number	Mean	Standard Deviation	Number	Mean	Standard Deviation
Pretest												
Site A	78	3.40	1.13	55	4.21	1.57	70	3.74	1.43	63	3.73	1.34
Site B	87	3.55	1.11	58	4.06	1.42	79	3.63	1.39	66	3.90	1.09
Post-test												
Site A	62	4.19*	1.72	64	6.39***	1.99	77	5.06***	2.25	49	5.71***	1.97
Site B	46	4.19*	1.45	47	5.72***	1.43	43	5.05***	1.59	50	4.89***	1.66

* Difference between pre- and post-test significant at the p <.05 level.
 *** Difference between pre- and post-test significant at the p <.001 level.

NOTES Mean is for total score.
 Highest possible total score is 11.0.
 Exhibit F.1 in Appendix F contains more detailed calculations of these test results.
 Exhibit F.2 and F.3 in Appendix F provide item-by-item mean scores disaggregated by gender.

Item-Specific Results

In this section, we present results for each item on the child test of nutrition knowledge. Average scores are presented for each test point (pretest and post-test). Exhibits include mean scores by site and by age. Item scoring is explained in Exhibit 3.3 and below.

Item 1a **The tester shows the child a Food Guide Pyramid poster and asks: “What is this called?”**

The opening segment of the child nutrition lesson was an introduction to the Food Guide Pyramid which identifies the shape and discusses graphic representations of the pyramid. The term food pyramid recurred throughout this introductory section. For this item, the answer, “Food Pyramid,” received a score of 1.0; “pyramid” a score of 0.667; and “food” or “food triangle” a score of 0.333. Any other response received a score of zero. Mean scores appear in Exhibit 3.6.

For this item, for all children at both sites, average differences in pretest and post-test scores were extremely large. Statistically significant differences occurred for both three-year-olds and four-year-olds.

Item 1b **The tester shows the child a poster with three separate representations (including the Food Pyramid) and asks: “Which one of these is the Food Pyramid?”**

This item was added after the pilot test was completed. During pilot-testing, it became clear that, after the intervention, many children recognized the Food Guide Pyramid but could, or would, not say the word pyramid. This item allowed non-verbal identification of the pyramid. If the child pointed to the picture of the Food Guide Pyramid, s/he received a score of 1.0. Any other response was scored zero. Average correct percentages appear in Exhibit 3.7.

The average differences between pretest and post-test were 20.1 percentage points ($p < .001$) for Site A and 16.8 percentage points ($p \leq .01$) for site B. Surprisingly, the average difference between pretest and post-test scores was statistically significant only for four-year-olds. This item was originally added to provide younger children with opportunities to respond correctly if their verbal abilities were hindering their responses. More three-year-old children answered correctly at post-test but differences were not statistically significant.

Exhibit 3.6

**Mean Test Scores for WIC Children in Nutrition Education Demonstration Study by Test Point and by Site by Individual Test Item
Item 1a Identifying the Food Guide Pyramid (verbally)**

	Mean Score for All Children			Mean Score by Age					
	Number	Mean	Standard Deviation	Three Years			Four Years		
				Number	Mean	Standard Deviation	Number	Mean	Standard Deviation
Pretest									
Site A	133	.09	.15	78	.07	.14	55	.12	.16
Site B	145	.12	.20	87	.09	.19	58	.16	.21
Post-test									
Site A	126	.49***	.42	62	.35***	.38	64	.62***	.42
Site B	93	.44***	.41	46	.35***	.39	47	.53***	.41

* Difference between pre- and post-test significant at the $p < \text{or} = .05$ level.

*** Difference between pre- and post-test significant at the $p < \text{or} = .01$ level.

NOTES Mean is for item score.
Highest possible item score is 1.0.

Exhibit 3.7

**Test Scores for WIC Children in Nutrition Education Demonstration Study by Test Point and by Site by Individual Test Item
Item 1b Identifying the Food Guide Pyramid (non-verbally)**

	Score for All Children		Score by Age			
	Number	Percent Correct	Three Years		Four Years	
			Number	Percent Correct	Number	Percent Correct
Pretest						
Site A	133	63.2	78	62.8	55	63.6
Site B	145	55.2	87	58.6	58	50.0
Post-test						
Site A	126	83.3***	62	74.2	64	92.2***
Site B	93	72.0**	46	63.0	47	80.9***

* Difference between pre- and post-test significant at the $p < \text{or} = .05$ level.
 ** Difference between pre- and post-test significant at the $p < \text{or} = .01$ level.
 *** Difference between pre- and post-test significant at the $p < \text{or} = .001$ level.

Item 2 The tester asks: “How many food groups are there?”

The number of food groups was a recurring theme in the educational session. If the child’s response was “five” or if the child held up five fingers, s/he received a score of 1.0. Any other response was incorrect and scored zero.

Test results appear in Exhibit 3.8. Differences of 38.2 (Site A) and 42.3 (Site B) percentage points can be observed between pretested and post-tested children ($p = .001$). It appears that exposure to the lesson reliably increased the proportion of children who knew there were five food groups.

Item 3 The tester shows the child three plates of food—one containing five different fruits, one with five different foods from the bread group, and one with representatives of each of the five food groups, and asks: “Which of these plates has different foods from *all of the food groups*?”

A segment of the lesson dealt with the concept of variety using food pictures (not models). The final version of the pilot test adapted the three-plate question above. Selection of the variety plate scored 1.0; all other responses were scored zero.

Three-and-four-year-old children did not seem to grasp the concept of variety (Exhibit 3.9). Research indicates that kindergartners have difficulty understanding this complex concept. This finding applies to variety within food groups *and* between food groups (Murphy *et al.*, 1995), so it is not surprising that we found no significant differences between pretest and post-test groups. In fact, the percentage of correct answers across test points was so similar that it appears children randomly chose their answers.

Item 4n The tester shows the child a felt food picture and asks: “What is the name of this food?” REPEAT FOR A TOTAL OF FIVE FOODS, ONE FROM EACH FOOD GROUP.

Naming foods was part of the lesson. A child received 1.0 for correctly naming all *five* foods; 0.8 for naming *four* foods; 0.6 for naming *three* foods; 0.4 for naming *two* foods; and 0.2 for naming *one* food correctly. If a child failed to correctly name any of the foods, s/he received a score of zero.

Exhibit 3.8

Test Scores for WIC Children in Nutrition Education Demonstration Study by Test Point and by Site by Individual Test Item
Item 2 Identifying the Number of Food Groups (verbally)

	Score for All Children		Score by Age			
	Number	Percent Correct	Three Years		Four Years	
			Number	Percent Correct	Number	Percent Correct
<i>Prefest</i>						
Site A	133	15.0	78	16.7	55	12.7
Site B	145	17.9	87	17.2	58	19.0
<i>Post-test</i>						
Site A	126	53.2***	62	37.1*	64	68.8***
Site B	93	60.2***	46	41.3*	47	78.7***

* Difference between pre- and post-test significant at the $p < \text{or} = .05$ level.

*** Difference between pre- and post-test significant at the $p < \text{or} = .001$ level.

Exhibit 3.9

**Test Scores for WIC Children in Nutrition Education Demonstration Study by Test Point and by Site by Individual Test Item
Item 3 Selecting a Plate of Foods Representing “Variety”**

	Score for All Children		Score by Age			
	Number	Percent Correct	Three Years		Four Years	
			Number	Percent Correct	Number	Percent Correct
Pretest						
Site A	133	29.3	78	29.5	55	29.1
Site B	145	46.9	87	50.6	58	41.4
Post-test						
Site A	126	23.0	62	21.0	64	25.0
Site B	93	55.9	46	54.4	47	57.5

* Difference between pre- and post-test significant at the $p < \text{or} = .05$ level.
 *** Difference between pre- and post-test significant at the $p < \text{or} = .001$ level.

NOTE For four-year-olds, at site B, difference for age is significant at the .10/significance/90 percent confidence level.

Not unexpectedly, three-and-four-year-old children were able to correctly identify many foods (Exhibit 3.10). Other researchers have reported similar results (Hertzler *et al.*, 1993). However, differences between pretest and post-test groups were not significant at the .05 significance/95 percent confidence level.

Item 4s The tester, while presenting felt food pictures introduced in Item 4n, says: “This food is from the GROUP NAME group. Can you find another food that goes in this group?” REPEAT FOR EACH OF THE FOODS PRESENTED IN ITEM 4N.

Although naming foods was a part of the nutrition education intervention, matching foods within specific food groups was not included in the lesson. The instructor merely identified several foods from each food group. The test items had five subtasks. An answer was scored 1.0 when the child selected foods from the same group for each of *five* foods presented; 0.8 for *four* foods; 0.6 for *three* foods; 0.4 for *two* foods; 0.2 for *one* correct selection. If a child did not correctly select any of the matching foods, s/he received a score of zero.

No significant difference was observed between pretest and post-test scores. Average scores across all test points were almost exactly the same, which likely indicated random responses by children (Exhibit 3.11). This lack of effect certainly reflected the omission of some of this material in the nutrition education intervention. It also revealed the developmental levels of the children. Other researchers have reported difficulties experienced by three- and four-year-old children in classifying foods by food group (Gorelick and Clark, 1985).

Item 5 The tester, using a felt Food Guide Pyramid and an array of felt food pictures, selects a food picture and says: “Put this food where you think it belongs on this Food Pyramid.” REPEAT FOR ONE FOOD FROM EACH FOOD GROUP.

The score was based on the response to five subtasks, which involved placing selected foods on the pyramid in the appropriate locations within food groups. This item was scored in the same manner as Items 4n and 4s. Mean test scores appear in Exhibit 3.12.

At Site A, children in the post-test group placed foods in the correct food group more frequently than pretest children ($p < .001$). These results indicated, that for both three-and-four-year old children, exposure to the demonstration’s intervention increased the proportion of correctly placed foods in the five food groups. It appears that preschoolers distinguished among food groups although they did not classify foods by group (Item 4s above).

Exhibit 3.10

**Mean Test Scores for WIC Children in Nutrition Education Demonstration Study by Test Point and by Site by Individual Test Item
Item 4n Naming Foods**

	Mean Score for All Children			Mean Score by Age					
	Number	Mean	Standard Deviation	Three Years			Four Years		
				Number	Mean	Standard Deviation	Number	Mean	Standard Deviation
Pretest									
Site A	133	.57	.25	78	.52	.24	55	.64	.25
Site B	145	.58	.23	87	.51	.22	58	.67	.22
Post-test									
Site A	126	.62	.23	62	.59	.24	64	.64	.25
Site B	93	.60	.22	46	.52	.20	47	.68	.22

* Difference between pre- and post-test significant at the $p < \text{or} = .05$ level.
 *** Difference between pre- and post-test significant at the $p < \text{or} = .001$ level.

NOTES Mean is for item score.
 Highest possible item score is one.
 For three-year-olds, at Site A, difference for age is significant at the .10/significance/90 percent confidence level.

Exhibit 3.11

**Mean Test Scores for WIC Children in Nutrition Education Demonstration Study by Test Point and by Site by Individual Test Item
Item 4s Selecting Companion Foods from the Same Food Group**

	Mean Score for All Children			Mean Score by Age					
	Number	Mean	Standard Deviation	Three Years			Four Years		
				Number	Mean	Standard Deviation	Number	Mean	Standard Deviation
Pretest									
Site A	133	.33	.29	78	.26	.24	55	.44	.31
Site B	145	.37	.26	87	.33	.23	58	.42	.29
Post-test									
Site A	126	.39	.28	62	.27	.23	64	.50	.28
Site B	93	.31	.23	46	.24	.20	47	.37	.23

* Difference between pre- and post-test significant at the $p < \text{or} = .05$ level.
 *** Difference between pre- and post-test significant at the $p < \text{or} = .001$ level.

NOTES Mean is for item score.
 Highest possible item score is 1.0.

Exhibit 3.12

**Mean Test Scores for WIC Children in Nutrition Education Demonstration Study by Test Point and by Site by Individual Test Item
Item 5 *Placing Foods in Correct Food Group***

	Mean Score for All Children			Mean Score by Age					
	Number	Mean	Standard Deviation	Three Years			Four Years		
				Number	Mean	Standard Deviation	Number	Mean	Standard Deviation
Pretest									
Site A	133	.24	.21	78	.20	.17	55	.31	.25
Site B	145	.28	.20	87	.25	.18	58	.32	.24
Post-test									
Site A	126	.42***	.31	62	.30*	.27	64	.54***	.31
Site B	93	.27	.22	46	.26	.22	47	.29	.22

* Difference between pre- and post-test significant at the $p < \text{or} = .05$ level.

*** Difference between pre- and post-test significant at the $p < \text{or} = .001$ level.

NOTES Mean is for item score.
Highest possible item score is 1.0.

Item 6 **The tester, using the felt Food Guide Pyramid, points to the *milk* group and the *bread* group and asks: “From which food group, should you eat more often?” REPEAT FOR MEAT/VEGETABLE AND SWEET/BREAD GROUP COMPARISONS.**

Identifying the larger food pyramid sections as the *foods we should eat more often* occurred throughout the lesson. This score was based on the response to three subtasks—a score of 1.0 for *three* correct selections; 0.667 for *two*; and .333 for *one*. An absence of correct selections was scored zero. See Exhibit 3.13.

We observed, at Site A, a statistically significant seven percentage point difference for the pretest-post-test comparison ($p < .05$). On this item, at both sites, four-year-olds outstripped three-year-olds by considerable margins. Results indicated that, after exposure to the lesson, more older preschoolers understood that they should eat more foods from certain food groups on the pyramid.

Item 7 **The tester, using cards containing two pictures (for example, candy bar/watermelon), says: “Each page has two pictures of food on it. One of the foods is a food that is OK to eat anytime, but the other food should be eaten only sometimes. Pick out the “anytime” food—the food that should be eaten more often.” REPEAT FOR A TOTAL OF SIX CHOICES BETWEEN “ANYTIME” AND “SOMETIMES” FOODS.**

Identification of “anytime” and “sometimes” foods was another component of the intervention. In this task, selection of the “anytime” food was the correct answer. Scoring for the six pairs of pictures was 1.0 for *six* correct answers; 0.833 for *five*; 0.667 for *four*; 0.5 for *three*; 0.333 for *two*; and, 0.167 for *one* correct answer. If a child failed to select the “anytime” food for any of the subtasks, s/he received a score of zero.⁹

No significant difference, at either site, was observed between pretested and post-tested children’s scores. Item results appear in Exhibit 3.14.

A review of the research indicates other studies reported young children tended to select foods they want to eat. Often, preschoolers did not apply their actual knowledge of appropriate dietary choices (Gorelick and Clark, 1985; Anliker *et al.*, 1990; Singleton *et al.*, 1992; and Murphy *et al.*, 1995). The

⁹An alternative scoring method would employ percent of correct answers.

Exhibit 3.13

**Mean Test Scores for WIC Children in Nutrition Education Demonstration Study by Test Point and by Site by Individual Test Item
Item 6 Selecting Food Groups**

	Mean Score for All Children			Mean Score by Age					
	Number	Mean	Standard Deviation	Three Years			Four Years		
				Number	Mean	Standard Deviation	Number	Mean	Standard Deviation
Pretest									
Site A	133	.44	.28	78	.46	.29	55	.41	.27
Site B	145	.38	.30	87	.39	.30	58	.36	.31
Post-test									
Site A	126	.51*	.32	62	.44	.29	64	.58***	.33
Site B	93	.44	.29	46	.38	.29	47	.50*	.27

* Difference between pre- and post-test significant at the $p < \text{or} = .05$ level.
 *** Difference between pre- and post-test significant at the $p < \text{or} = .001$ level.

NOTES Mean is for item score.
 Highest possible item score is 1.0.

Exhibit 3.14

**Mean Test Scores for WIC Children in Nutrition Education Demonstration Study by Test Point and by Site by Individual Test Item
Item 7 Identifying “Anytime” Foods**

	Mean Score for All Children			Mean Score by Age					
	Number	Mean	Standard Deviation	Three Years			Four Years		
				Number	Mean	Standard Deviation	Number	Mean	Standard Deviation
Pretest									
Site A	133	.49	.28	78	.45	.25	55	.55	.31
Site B	145	.45	.21	87	.46	.21	58	.45	.21
Post-test									
Site A	126	.50	.33	62	.40	.29	64	.60	.33
Site B	93	.44	.25	46	.41	.23	47	.46	.26

* Difference between pre- and post-test significant at the $p < \text{or} = .05$ level.
 *** Difference between pre- and post-test significant at the $p < \text{or} = .001$ level.

NOTES Mean is for item score.
 Highest possible item score is 1.0.

cited researchers found open-ended questions to be more effective in measuring the “anytime-sometimes” concept, as were tasks that asked the child to select foods for a doll and used language asking which foods were “good” or “the right kind” to “help you grow.” Our objective in constructing this item was to avoid any negative connotation for food items. As a result, we used language that may have impeded our ability to capture children’s actual knowledge of moderation and appropriate dietary choices.

Item 8 **The tester, places two groups of food pictures in front of the child (three “anytime” and three “sometimes” foods), and says: “These are foods you can eat anytime. These three foods you eat sometimes. Why should you eat these foods POINT TO ANYTIME FOODS more often than these foods POINT TO SOMETIMES FOODS?”**

Responses indicating that “anytime” foods help one to grow strong *and* healthy were given a score of 1.0; responses that “anytime” foods help one grow strong *or* healthy were scored 0.6; responses that “anytime” foods are “good for you” were scored 0.4; and responses indicating children preferred “anytime” foods (such as, “I like them better”) were scored 0.2. Any other response was scored 0.

At Site A, post-tested four-year-olds performed significantly better than did pretest children ($p < .05$). Responses to this item (Exhibit 3.15) illustrated the point made in our discussion of Item 7. Preschoolers will more frequently offer correct answers about “anytime” foods when asked open-ended questions (Singleton *et al.*, 1992). These results indicated that the demonstration’s intervention can help preschoolers understand the concept of moderation as expressed by “anytime” versus “sometimes” foods.

Item 9 **The tester, using a wooden puzzle of the food pyramid, says: “I have this puzzle for you to do. See, these pieces have pictures of different foods. This one has foods from the milk group, this one from the meat group, this one from the vegetable group, this one the fruit group, and this one has the bread group. These pieces fit into this puzzle board, and I’d like you to put the puzzle together for me. OK? You can start now.” AFTER TWO AND ONE-HALF MINUTES, THE TESTER DISCONTINUES THE ITEM AND COUNTS THE NUMBER OF PIECES PLACED CORRECTLY.**

Scoring for this item was 1.0 for *six* correctly puzzle pieces; 0.833 for *five*; 0.667 for *four*; 0.5 for *three*; 0.333 for *two*; and, 0.167 for *one* correctly placed puzzle piece. A score of zero indicated no correctly placed puzzle pieces.

Exhibit 3.15

**Mean Test Scores for WIC Children in Nutrition Education Demonstration Study by Test Point and by Site by Individual Test Item
Item 8 Reasons for Eating “Anytime” Foods (verbal)**

	Mean Score for All Children			Mean Score by Age					
	Number	Mean	Standard Deviation	Three Years			Four Years		
				Number	Mean	Standard Deviation	Number	Mean	Standard Deviation
Pretest									
Site A	133	.10	.18	78	.05	.12	55	.17	.22
Site B	145	.05	.11	87	.04	.09	58	.08	.14
Post-test									
Site A	126	.18*	.31	62	.08	.22	64	.28*	.34
Site B	93	.06	.14	46	.03	.07	47	.10	.17

* Difference between pre- and post-test significant at the $p < \text{or} = .05$ level.
 *** Difference between pre- and post-test significant at the $p < \text{or} = .001$ level.

NOTES Mean is for item score.
 Highest possible item score is 1.0.

At both sites, all post-tested children performed more efficiently on all indicators (score and time to complete) for the puzzle task (Exhibit 3.16). Post-test scores ($t = 6.63, p < .001$) were higher on average when compared with pretest scores.

Although not a test item, total time on task was calculated. On average, post-tested children completed the puzzle faster than pretested children ($t = 2.40, p < .05$).

Item Summary

Exhibits 3.17 and 3.18 summarize mean item pretest and post-test scores by site.

At Site A, item-by-item results indicated positive effects from the nutrition education lesson on the nutrition-related knowledge of three- and four-year-old children. Four of the nine items showed statistically significant differences overall at the $p < .001$ level; six of the nine showed differences significant at the $p < .05$ level. For both three- and four-year-olds, four items showed statistically significant differences. Two additional items were significant only for four-year-olds ($p < .05$). Test items that did not show statistically significant pre-post differences for either three-year-olds or four-year-olds are: recognizing variety in food; naming foods and selecting companion foods; and selecting “anytime” foods. At Site B, three item-by-item findings were statistically significant: verbally or non-verbally identifying the Food Guide Pyramid; identifying the number of food groups; and completing the Food Guide Pyramid puzzle. One item, selecting food groups, was statistically significant only for four-year-olds.

An item-by-item variance analysis indicated that, at both sites, for seven of the nine items, age is the important predictor variable. (See Exhibit F.4 in Appendix F.) Further item-specific analysis of age and test point indicated statistically significant interaction effects for three test items (verbal or non-verbal identification of the Food Guide Pyramid, identification of food groups, and selection of food groups). See Exhibit F.5 in Appendix F.

Exhibit 3.16

**Mean Test Scores for WIC Children in Nutrition Education Demonstration Study by Test Point and by Site by Individual Test Item
Item 9 Completing the Food Guide Pyramid Puzzle**

	Mean Score for All Children			Mean Score by Age					
	Number	Mean	Standard Deviation	Three Years			Four Years		
				Number	Mean	Standard Deviation	Number	Mean	Standard Deviation
Pretest									
Site A	133	.39	.38	78	.30	.33	55	.53	.40
Site B	145	.33	.31	87	.21	.23	58	.51	.33
Post-test									
Site A	126	.61***	.37	62	.44*	.35	64	.78***	.32
Site B	93	.52***	.34	46	.41***	.28	47	.62	.36

* Difference between pre- and post-test significant at the $p < \text{or} = .05$ level.
 *** Difference between pre- and post-test significant at the $p < \text{or} = .001$ level.

NOTES Mean is for item score.
 Highest possible item score is 1.0.
 For four-year-olds, at Site B, difference for age is significant at the .10/significance/90 percent confidence level.

Exhibit 3.17

Summary of Item-Specific Mean Test Scores

Site A	Pretest		Post-test	
	Mean Score or % Correct	Standard Deviation	Mean Score or % Correct	Standard Deviation
1a. Identifying food pyramid (verbally)	.09	.15	.49***	.42
1b. Identifying food pyramid (non-verbally)	63.2		83.3***	
2. Identifying food groups	15.0		53.2***	
3. Selecting variety plate	29.3		23.0	
4n. Naming foods	.57	.25	.62	.23
4s. Selecting companion foods	.33	.29	.39	.28
5. Placing foods	.24	.21	.42***	.31
6. Selecting food groups	.44	.28	.51*	.32
7. Selecting "anytime" foods	.49	.28	.50	.33
8. Reasons for eating "anytime" foods	.10	.18	.18*	.31
9. Completing puzzle	.39	.38	.61***	.37
Number of children		133		126

* Difference between pre- and post-test significant at the $p < \text{or} = .05$ level.

*** Difference between pre- and post-test significant at the $p < \text{or} = .001$ level.

NOTE Items 1b, 2, and 3 report the percent of correct answers. Items 1, 4n, 4s, 5, 6, 7, 8, and 9 are mean scores where a perfect score is 1.0.

Exhibit 3.18

Summary of Item-Specific Mean Test Scores

Site B	Pretest		Post-test	
	Mean Score or % Correct	Standard Deviation	Mean Score or % Correct	Standard Deviation
1a. Identifying food pyramid (verbally)	.12	.20	.44***	.41
1b. Identifying food pyramid (non-verbally)	55.2		72.0**	
2. Identifying food groups	17.9		60.2***	
3. Selecting variety plate	46.9		55.9	
4n. Naming foods	.58	.23	.60	.22
4s. Selecting companion foods	.37	.26	.31	.23
5. Placing foods	.28	.20	.27	.22
6. Selecting food groups	.38	.30	.44	.29
7. Selecting "anytime" foods	.45	.21	.44	.25
8. Reasons for eating "anytime" foods	.05	.11	.06	.14
9. Completing puzzle	.33	.31	.52***	.34
Number of children		145		93

* Difference between pre- and post-test significant at the $p < \text{or} = .05$ level.

*** Difference between pre- and post-test significant at the $p < \text{or} = .001$ level.

NOTE Items 1b, 2, and 3 report the percent of correct answers. Items 1, 4n, 4s, 5, 6, 7, 8, and 9 are mean scores where a perfect score is 1.0.

Chapter Four

Conclusions About Demonstration Findings

The principal objectives of the child component of the *WIC Nutrition Education Demonstration Study* were to assess: (1) the feasibility of providing nutrition education to three-and-four-year-old children in WIC settings; and (2) the effect of a selected intervention on their nutrition knowledge.

Nutrition education can be provided to three- and four-year-old children in WIC settings. Study results show that nutrition education can be provided to children while their mothers complete the WIC certification process. There appeared to be ample time and space in the clinics for the nutrition education intervention to take place. Data from standardized observation protocols indicate that children were, in general, attentive during the nutrition intervention which was conducted by local WIC clinic staff. The costs and sustainability of nutrition education interventions, without additional federal funding, remain open questions.

Short interventions appear to be practical strategies for teaching WIC children about nutrition.

Most local WIC clinics and participants have limited time available for nutrition education. A thirty-minute lesson, used in this demonstration, appears to satisfy this constraint. Moreover, it appears that one half-hour is approximately the length of time that children can be attentive to the instruction. Given this constraint, it is very important to select lesson content that is appropriate to three-and-four-year-old children. (See below.)

The nutrition education intervention increased children's knowledge on some WIC nutrition topics but not others. Results indicate that children participating in the demonstration showed an increase in their knowledge about the Food Guide Pyramid, food groups, and eating foods that help them grow healthy and strong. Although the differences between pre- and post-tests were consistently higher and statistically significant for the treatment groups, it should be pointed out that four of the eleven test items dealt with the Food Guide Pyramid. Knowledge of a variety of foods, selecting companion foods, and identifying "anytime" foods seemed to be unaffected by the intervention. As expected, four-year-old children performed better on the tests than three-year-olds.

These findings appear to indicate that nutrition education for young children in WIC settings has limitations and that the content of the interventions needs to be examined for appropriateness for this

age group. The test assessing children's nutrition knowledge should also be revisited.

Clinics may expect different levels of participation in nutrition education by children. The study found substantial differences in the percentages of children who participated at the two demonstration sites. This variation may have implications for resources needed to attract children and their parents to participate in nutrition education and to maintain sufficient levels of participation to justify the expenditure of funds.

More information is needed on the cost and sustainability of nutrition education for young children in the WIC Program. For a number of reasons, the study was not able to collect sufficient information to determine the cost and sustainability of the nutrition education intervention implemented in this study. It appears, however, that significant additional resources would be required to maintain such interventions at local WIC clinics. These resources include staff needed to schedule nutrition lessons and provide instruction and testing, instructional materials, and physical space to conduct the instruction.

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Appendix A

Research on Nutrition Education Theory and Practice

Author and Year	Description of the study	Findings/Theory/Recommendations
Anliker <i>et al.</i> (1990)	Questionnaire-based assessment of nutrition-related knowledge and attitudes of 104 Massachusetts 3-1/2- to 4-year-olds and the types of nutrition messages given to them by their parents.	<p>Findings</p> <ul style="list-style-type: none"> • Children displayed significant knowledge in the areas of food groups ("Which of these is a vegetable?"), food transformations ("Which is made from potatoes?"), food origins ("Which comes from a garden?"), and energy balance ("If you wanted the dolly to get fatter, which food would you give him?"). • Children displayed some ability to judge relative food values without relation to their own stated food preferences ("Which of these foods will help the doll to grow big and strong?")
Connell et al (1985)	Evaluation of a large school health education program.	<p>Finding</p> <ul style="list-style-type: none"> • The level of training received by teachers is related to the degree of implementation of the program and program effectiveness.
Contento <i>et al.</i> (1995)	Evaluation of the effectiveness of nutrition education in 217 intervention studies (23 intervention studies of preschoolers).	<p>Findings</p> <ul style="list-style-type: none"> • More effective programs are behaviorally focused and based on appropriate theory and prior research <p>Recommendation</p> <ul style="list-style-type: none"> • Behaviors to be addressed should be "identified from the needs, perceptions, motivations, and desires of the target audience as well as from national nutrition and health goals and science-based research findings."
Davis <i>et al.</i> (1983)	Evaluation of a self-instructional nutrition unit for preschool teachers and child care providers that was used in a 6-week education program about nutrient functions and food sources of nutrients.	<p>Findings</p> <ul style="list-style-type: none"> • Two post-tests were conducted, the first at the completion of the nutrition unit and the second six months after completion. Both tests showed knowledge gains of 35% or more in the areas of food sources and nutrient functions. With the six-month delay, decreases in knowledge from post-test 1 to post-test 2 were only 2% for food sources and 10% for nutrient functions.
Gorelick and Clark (1985)	Evaluation of a preschool nutrition education for 187 three- to five-year old children attending 14 child care centers in Southern California; post-test conducted 3-4 weeks after completion of a six-week nutrition program with lessons offered twice a week.	<p>Findings</p> <ul style="list-style-type: none"> • Greatest knowledge gains seen in food identification questions, indicating the readiness of preschoolers to learn this information. • Significant gains were seen in the ability to distinguish between foods that are "good for you" or "sometimes foods" (very sweet or salty foods) which supports Gelman's view "that children have some notion of causality early in the preoperational period." (Gelman, 1989) • Older children scored significantly higher on fruit identification and on food choices that were "good for the doll." • Classification tasks produced mixed results, consistent with "the Piagetian theory that

Author and Year	Description of the study	Findings/Theory/Recommendations
		<p>children do not master the subtleties of classification until they enter the concrete operational level at approximately age seven".</p> <ul style="list-style-type: none"> Food groups may be difficult to categorize because of similarities in shape, taste, or color of foods from different groups (grapes/peas, yams/melon, unpared potato/kiwi).
Guidelines for School Health Programs to Promote Lifelong Healthy Eating (CDC, 1996)	Synthesis of recent research, theory, and practice for report providing guidelines for a comprehensive, sequential school-based nutrition education program for preschool through grade twelve.	<p>Finding</p> <ul style="list-style-type: none"> Most nutrition education programs that result in behavioral change have been based on social learning theory which seeks to positively effect attitudes and behavior and not just knowledge. <p>Theory</p> <ul style="list-style-type: none"> Some social learning theory strategies include: promotion of positive attitudes and values about health and nutrition and identifying the short-term benefits, which may have more value to children and interest them more than the long-term benefits.
Hendricks <i>et al.</i> (1989)	Assessed pre/post knowledge differences in 214 children averaging 4.7 years of age in 9 preschools; post-tests conducted 8 months after introduction of health curriculum that included a nutrition component.	<p>Findings</p> <ul style="list-style-type: none"> Experimental group had significant knowledge gains on nutrition items. <p>Recommendations</p> <ul style="list-style-type: none"> Use age-appropriate subject matter. Involve parents. Provide inservice training for teachers. Activities should promote development of fine and gross motor, language, cognitive, self-help, and social skills as well as healthful behavior.
Hertzler <i>et al.</i> (1993)	Assessed ability of 30 preschoolers between age 2 years 11 months and 5 years 6 months to report food habits.	<p>Findings</p> <ul style="list-style-type: none"> 3-year-olds can name foods served daily and count to one or two foods. Four- and 5-year-olds should be able to name single foods served weekly, count to 8 or 10, and begin to deal with abstractions such as spatial volume and mixture names. Older preschoolers (i.e. 5-year-olds) can classify foods by food group and name foods in different forms.
Hertzler and DeBord (1994)	Four nutrition education lessons were tested with children between 2-6 years of age for developmental appropriateness	<p>Findings</p> <ul style="list-style-type: none"> 3-5-year-olds can learn the names of objects and begin to classify by size, color, shape, and other attributes 4-6-year-olds can group foods by the nutrients they contain (fat, vitamin A, iron, calcium) <p>Recommendations</p> <ul style="list-style-type: none"> Use a nutrition plan such as the Food Guide Pyramid as the basis of activities. Teaching methods and materials should be developmentally appropriate for child. "Telling" should only be used in emergencies. Parental involvement is vital for reinforcement.
Lawatsch (1990)	Two teaching strategies, <i>benefit appeal</i> and <i>threat appeal</i> , were investigated using modified fairy tales that	<p>Findings</p> <ul style="list-style-type: none"> Both groups had higher post-test knowledge scores than the control group, but the

Author and Year	Description of the study	Findings/Theory/Recommendations
	encouraged eating vegetables with 103 New Jersey preschoolers averaging 51 months of age.	<p>benefit appeal group had the highest scores.</p> <ul style="list-style-type: none"> The benefit appeal group had higher food behavior assessment scores for selecting snacks than children in the control group and higher scores for half of the snacks than the threat appeal group whereas the threat appeal group only had higher food behavior assessment scores for half of the snacks than the control group. <p>Recommendation</p> <ul style="list-style-type: none"> Benefit appeal appears to be more effective at promoting knowledge gains and desirable food choices than threat appeal, although threat appeal also produces a significant effect.
Mayfield (1992)	26-lesson preschool nutrition education curriculum designed for use in the WIC Program and pilot-tested in 33 Indiana local WIC agencies.	<p>Recommendations</p> <ul style="list-style-type: none"> Opportunities should be provided for different kinds of learning: <i>self-learning</i>, which is discovery or exploratory learning; <i>meaningful learning</i> that "bridges" between familiar and new information; and <i>concrete/active learning</i> that involves the five senses such as tasting new foods, songs, movement, and other hands-on activities Goal is to promote positive attitudes, increased knowledge and healthful food and nutrition behaviors. Activities should be developmentally appropriate and involve fine motor, gross motor, language, social, and cognitive areas. Parents should be involved in nutrition education activities.
Michela and Contento (1984)	Study of conceptions about nutrients and definitions underlying classification of foods into group in one hundred fifteen 5-11 year olds.	<p>Findings</p> <ul style="list-style-type: none"> Children in preoperational stage of cognitive development (5-6 year olds) generally divided foods into groups based on two characteristics: sweets versus non-sweet foods and liquids versus solids. Food groups selected by older children (mixed cognitive levels) included: sweets, meat and fish, fruits, vegetables, drinks, dairy, breads, grains, and meals. Food groups were based on characteristics such as traditional categories, functional categories (snacks, lunch, etc.), nutritional quality, taste/texture, food unknown or never tried, food preferences, and miscellaneous.
Murphy <i>et al.</i> (1995)	Evaluated 62 Michigan kindergarten students' understanding of the Dietary Guidelines in 12 focus-group interviews.	<p>Findings</p> <ul style="list-style-type: none"> Kindergartners understand the thrust of the Dietary Guidelines: increase the healthful foods you eat and decrease intake of less healthful foods. The term <i>variety</i> was not well understood by kindergartners. Students could classify or group foods that they should eat more or less of (that have lots of/or little fat, sugar, or salt). Students stated high fat or sweet foods when asked, "What foods are not good for you?" and responded that fruit, vegetables, and milk "are good for you". Food preferences were not consistent with children's knowledge of the Dietary Guidelines. In response to, "Are there any foods you like but think you shouldn't eat?" responses were primarily high-sugar foods such as candy, ice cream, gum, and pop. Children believe there are good and bad foods.

Author and Year	Description of the study	Findings/Theory/Recommendations
Rickard <i>et al.</i> 1995	Play approach used in two different, integrated nutrition and fitness education programs for obese children aged 5-6 and 7-10 years.	<p>Findings</p> <ul style="list-style-type: none"> Children and parents were enthusiastic about a nutrition and activity program using the play approach with everyday activities related to active playing and happy, healthful eating. <p>Theory</p> <ul style="list-style-type: none"> Internal knowledge and intrinsic motivation are the primary determinants of healthful choices and life habits. The play approach is a process for learning that fosters intrinsic motivation for continued successful and healthful life habits. Play, the work of childhood, is pleasurable, freely chosen, an active process, nonliteral (no right or wrong), and safe. <p>Recommendations:</p> <ul style="list-style-type: none"> Learning should be child-centered (individualized) and education should be developmentally appropriate. Learning activities should include opportunities for play and self-discovery. Tasks should involve entire child; that is, the cognitive, physical, and affective domains. Peer interaction is an important source of learning.
Singleton <i>et al.</i> (1992)	Evaluation of the role of food and nutrition in the health perceptions in interviews of sixty 4-7 year olds using a pretest/post-test, treatment and control design.	<p>Findings</p> <ul style="list-style-type: none"> When children were asked, "What are the right kind of foods?" they named specific vegetables and fruits. Children responded that "unhealthy foods" were foods high in sugar. Analysis of open-ended questions showed a positive program effect, but analysis of closed-ended questions indicated no program effect. <p>Recommendation</p> <ul style="list-style-type: none"> Caution should be used if closed-ended, forced-choice evaluation procedures are utilized with young children because they may underestimate the children's knowledge and the program's effectiveness.
Weiss and Kein (1987)	Literature review of importance of teacher training, teaching strategies, parental involvement, curricular concerns, administrative support, and social/cultural factors on the impact of nutrition education.	<p>Recommendations</p> <ul style="list-style-type: none"> Teacher training should focus on teaching strategies in addition to nutrition content. Nutrition education is most effective with a planned, organized curriculum based on a theoretical framework. Nutrition instruction should involve children directly and actively in the learning process. Peer education and parental support and participation are important influences on learning and behavior.

Appendix B

Lesson Plan

The Food Guide Pyramid

WIC Nutrition Education Demonstration Study

THE FOOD GUIDE PYRAMID SHOWS YOU WHAT TO EAT!!

A KID'S CLUB LESSON PLAN
for USDA's WIC Nutrition Education Demonstration Study
BY BARBARA J. MAYFIELD, M.S, R.D.

PURPOSE:

Children learn that the Food Guide Pyramid shows them nutritious foods to eat to grow well and stay healthy.

OBJECTIVES:

1. **Food Pyramid:** The *Kid's Club* participant will be able to identify the Food Guide Pyramid (FGP) as the "Food Pyramid."
(They will be able to locate the FGP when shown several graphics and will try to say "Food Pyramid.")
2. **Variety:** The *Kid's Club* participant will know they need to eat many different kinds of foods to grow well and stay healthy.
 - a. **Five Food Groups:** The children will know they need to eat foods from all five of the food groups on the FGP.
 - b. **Food Identification:** The children will be able to correctly identify one or more foods (in each of the segments) on the FGP.
 - c. **Food Classification:** The children may be able to classify similar foods into appropriate food groups and may know the names of the food groups on the FGP.
3. **Proportionality:** The *Kid's Club* participant will know they need to eat more food from the bigger sections found at the bottom of the FGP and less food from the smaller sections at the top.
4. **Moderation:** The *Kid's Club* participant will know that the foods in the five food group sections on the FGP ("anytime foods") are better choices for growing and staying healthy and should be eaten more often than the foods found at the top of the FGP ("sometimes foods" such as candy and soft drinks).

WELCOME AND INTRODUCTION:

Attendance and name tags (use name tags cut in circle, square, and triangle shapes).

Sit in circle on the floor. May sit around small round plastic tablecloth or on carpet squares (one per child).

Introduce self and Wicky puppet, greet each child by name.

ASSESSMENT QUESTIONS:

“*Wicky’s Wonder Box*” contains a triangle and a blank 3-dimensional pyramid. Use the pyramid found on page 35 of the storybook (*The Kid’s Club Cubs and the Search for the Treasures of the Pyramid*) by making a photocopy and folding it inside-out.

Wicky: **“I have two shapes to show you in my Wonder Box today.”**

(Hold up triangle.)

“Does anyone know what this shape is?”

“Who has a name tag that is this shape?

What other shapes do you see on our name tags?”

(Hold up the pyramid.)

“Look at this shape. It isn’t flat like our triangle, is it?”

(Point out how each side of the shape is a triangle.)

“Does anyone know what it’s called?

Have you ever seen one?”

(allow for responses -- expect children to say:

“triangle,” “hat,” “tent,” “roof,” etc., or nothing.)

If no one knows what it is, say...

“This shape is a pyramid. Can you say that with me?”

(Have them repeat the word.)

“Today in Kid’s Club we’re going to learn about a special kind of pyramid that shows us what to eat to be healthy.”

CONTENT/PRACTICE ACTIVITIES:

Objective 1: Food Pyramid

“Do you like to eat? (yes!!) So do I! Do you know why we need to eat? (allow for brief response) We need to eat to... grow, and be healthy, and have plenty of energy to run and play. Have you ever felt really hungry? Like, when you forget to eat breakfast? Did you feel really tired and grouchy?”

Hold up 3-dimensional pyramid.

“This in a special pyramid called the Food Pyramid that shows us foods to eat so we can grow and be strong and healthy. To be really healthy we need to eat plenty of nutritious foods that will help us grow, don’t we? Can you see any other food pyramids in the room?”

Locate Food Pyramids around the room (posters, buttons, apron etc), and point to them with the children, reinforcing name.

“Do you like to go the grocery store? (yes) I got this bag at the grocery store and in it I have some foods that have food pyramids on them.” (Hold up grocery sack filled with food packages which have food pyramids on them.)

“Let’s see if we can find the food pyramids on them.” (If there are only a few children, allow them to each draw out one food package and have them find the food pyramids and show the other children, one at a time. With groups of 4 or more children work as a group to locate the food pyramids on several packages. Identify the foods and reinforce name of food pyramid frequently.)

“See how the Food Pyramid on this box is flat so it looks like it’s just a triangle. But we’re only seeing one side of it. (Compare to 3-D pyramid, pointing out one side.) Even though part of it is “hiding” and it looks like a triangle we still call it the Food Pyramid. Say that with me.”

“When you go to the grocery store see if you can find food pyramids on food packages, okay?”

“What do we call this (show 3-D pyramid), that shows us what to eat?... The Food Pyramid”!!

Objective 2: Variety

a. Five Food Groups

Place laminated poster of the Food Pyramid (cut around pyramid shape) on the floor in center of children.

“Do you see how the Food Pyramid has different sections like pieces in a puzzle? Foods that are alike are in the same food group. Let’s see what different pieces we have.”

(Using a second poster cut into sections and laminated, hold up each food group section, beginning with the bread group, naming the group, and having the children find the matching group on the poster. Lay “puzzle piece” over corresponding section on the poster. Talk about size and location of each piece.)

“There are lots of different kinds of foods we need to eat to grow and be healthy, aren’t there? Let’s count how many food groups there are.”

(Count to five and point to sections on FGP.)

“All of these foods on the Food Pyramid are healthy, but we can’t eat just one kind of food. We need to eat foods from all 5 food groups everyday to grow and be healthy. If we ate only foods from the ____ (name and point to a group) group we wouldn’t grow well and be healthy.”
(repeat for several groups)

“We need to eat a variety of different foods everyday. We need to eat foods from all the different food groups. Let’s count how many food groups we need to eat...”

Sing: “Five Healthy Food Groups”

Count with fingers as you sing. ‘Listen to talking on tape before and after songs:

“How many food groups are there? 1? 2? 3? 4? 5?”

(Shake head “no” to emphasize not 1, 2, 3, or 4.)

b. Food Identification

Game: “We’re Going On a Picnic”

Lay aside poster of the Food Pyramid and replace it with flannelboard of the Food Pyramid (mounted on foam core) in the middle of the circle of children; or place second pyramid on top of poster.

“Now let’s play a game to pick foods to help us grow. This pyramid doesn’t have pictures of foods on it. I’m going to put some pictures of foods in the different spaces and we’ll take turns picking foods to take on an imaginary picnic. Do you like to go on picnics? So do I? Everyone will get a turn to pick at least one food for our picnic, so please don’t pick up the pictures until it’s your turn, okay?”

Place food pictures in piles on appropriate sections of the pyramid (have them sorted so this can be done quickly). Teacher begins with a small “picnic basket” and says:

“We’re going on a picnic and I’m going to pack _____”
(pick up a food, name it, and put it in the basket).

Pass the basket to child on the left (if that child is shy may decide to start on the right). Help them repeat the phrase:

“We’re going on a picnic and _____ (child’s name) is going to pack.....”

Make sure children identify food they select before they place it in the picnic basket. Have children with good verbal skills name the foods they selected, saying something like:

“_____ (child’s name), what food did you pick?”

Ask children who are shy or have poorer verbal skills to agree with you as you name the food, saying something like:

“_____ (child’s name), did you pick (cheese) for our picnic?”

After they make their selection, teacher can say something like:

“_____ (child’s name) picked _____ (food), from the _____ (name of food group) group, that’s a food that will help you grow -- good choice!”

Continue around the circle until everyone has one or more turns. Then teacher takes the basket and removes all remaining foods off the pyramid and sets them aside.

c. Food Classification

Game continues...

“Let’s see what we packed for our picnic today.” Teacher pulls out a food, has the children name it and teacher places it on the pyramid where it belongs. If children are able to, allow them to tell you where to place the foods: **“Do you remember where this food belonged on the Food Pyramid?”** Reinforce names of food groups **“That’s right. We packed cheese from the milk group.”**

Emphasize desirable characteristics of foods: variety of pretty colors, shapes, sizes, tastes, etc. If a child says they don’t like/eat a food, respond by saying that you like the food and ask the group who else likes it. Mention that although they might not like it now they might like it the next time they try it.

When all foods have been named, teacher asks: **“Do we have foods from all five food groups?”** (If not, which foods do we need?)

“That’s great! We packed a variety of different foods, what a great picnic!” (leave food pictures from picnic on flannelboard)

Variety Review:

“How many food groups are there?” (5) **“We can’t eat just one kind of food to grow well and be healthy, can we?”**

“Let me introduce you to two puppet friends, Katie and Kevin. They like eating healthy foods but they don’t know about the Food Pyramid and that there are 5 different food groups...”

“This is Kevin. Everyday he eats lots of good food, but he only eats foods from the bread group. He has cereal, and bread, and waffles, and buns, and crackers... but no foods from any other group.” (show children a plate of food with five foods from bread group, set aside with Kevin puppet next to it)

“This is Katie. Everyday she eats lots of good food, but she only eats foods from the fruit group. She has cantaloupe, and oranges and grapes, and apples, and peaches but no foods from any other group” (show children a plate of food with five foods from the fruit group, set aside with Katie puppet next to it)

“Do you think Katie and Kevin will grow well and stay healthy by eating only fruit or only bread? ”

“Every food group gives us something different we need to grow and be healthy: so, if we don’t eat foods from all 5 food groups we’ll be missing something.”

“I like to eat foods from all 5 food groups: bread, and chicken, and milk, and corn, and an apple.”(show children a plate with one food from each food group, naming foods).

Place 3 plates in front of you. “Which one of these plates has a variety of different foods from all 5 of the food groups on the Food Pyramid?” (allow for responses, name foods and food groups)

“And doesn’t that look more fun and interesting to eat than just one kind of food?! You wouldn’t want to eat just one kind of food all the time. It would be so boring and you wouldn’t grow as well.”

Set plates and puppets aside.

Objective 3: Proportionality

“Which space on the Food Pyramid is the biggest?”

“That’s right. This big space at the bottom is the biggest food group.”

“That means we need to eat more food from the Bread group than any other food group.”

“Do you see how the space at the top of the Food Pyramid is the smallest?”

“That’s where we put sweet and fatty foods like candy and soda pop, butter and jelly, and rich-goey desserts. (Place examples in section.)

At this point children may express how much they like to eat these foods. Remind them not to grab the pretend foods. Compare “anytime” and “sometimes” foods avoiding “good food-bad food” comparisons. This will introduce the concept of moderation. Select comments based on what children say and do:

“These foods at the top of the pyramid do taste good. I like to eat them sometimes, too.”

“I wouldn’t want to eat them all the time, would you? If I eat too many sweet things, I get a tummy-ache.”

“The foods in the five food groups down here not only taste delicious but we need them to grow and stay healthy. We don’t need these foods up here to grow, do we?”

“These foods are okay to eat sometimes, but if we eat too much of them our tummies won’t have room for all of the wonderful kinds of food we need to eat everyday to grow well and stay healthy. Have you ever eaten too many snacks or sweets before lunch or supper and not felt like eating?”

“This little tiny section helps us remember that when we eat these foods we should eat just a little bit, or only eat them sometimes.”

“The size of every food group on the Food Pyramid helps us remember how much to eat...”

“So... which should we eat more of -- milk... or...breads? ” (Which is the bigger piece?)” (point to sections) **“We need to eat more food from the bottom of the Food Pyramid.”**

“Which should we eat more of -- sweets... or fruit? ” (Which is the bigger piece?)” (point to sections) **“We need to eat less food from the top of the Food Pyramid.”**

“Which should we eat more of -- meat... or vegetables? ” (Which is the bigger piece?)” (point to sections) **“We need to eat more food from the bottom of the Food Pyramid.”**

Objective 4: Moderation

Bring out Wicky puppet. **“Sounds like you know a lot about healthy eating. Maybe you can help my friend here, Picky Piggy (wear puppet on other hand). She likes to eat lots of foods like this ”** (point to samples of soda pop, candy, cookies, etc at top of FGP).

“Let’s help Picky learn about foods that help us grow. Let’s play a, little game to help Picky learn which foods help her grow well and stay healthy.”

“I’m going to put Picky here and Wicky here. (Place one puppet on each side in front of you.) I have some pairs of foods. I need you to help me show Picky which foods help her grow and stay healthy and can be eaten anytime. If it’s a healthy food that helps you grow, that you can eat anytime, put it near Wicky because he really knows about eating healthy foods. If it’s a food that you don’t need to grow and should just be eaten sometimes, put it next to Picky.”

(Use pairs of food pictures: candy bar and watermelon, cake and bread, cheese and cookies, hard candy and apple, orange juice and soda pop, and cereal and doughnut. Work as a group but direct questions to individual children giving everyone a chance to participate in the decision-making process.)

Sample dialogue:

(When holding up healthier “anytime food” choice in pair:)

“What’s this food called? Is it a food we can eat anytime?”

“To help Picky remember that this food helps her grow well and stay healthy, let’s reach our hands way up high (demonstrate) to show how big she’ll grow. Try that with me. Show Picky how big she’ll grow when she eats ____ (Hold up a healthy food) Since this is a food that helps us grow, let’s put it by Wicky.”

(When holding up less-healthy “sometimes food” choice in each- pair:)

What is this? Can we eat this anytime, or should we just eat this sometimes?

Why should we only eat this sometimes? (Place near Picky.)

At the end of game put on Picky puppet and have her look over the foods near Wicky saying something like:

‘I’ve never eaten ____ before. It looks ____ (pretty, tasty. etc.). Do you think I’ll like it?... Ok. I’ll try it. I think I’ll have a little taste. (Pretend to “feed” Picky) Mmm, I like that!

(Put on Wicky puppet.)

Wicky: “Thanks kids. Well. Picky, these kids have shown you some wonderful foods for you to eat that will really help you grow better and keep you healthier.”

Picky: “Thanks kids. Thanks Wicky. I’ll sure try to pick healthier foods to eat everyday now that I know all about the Food Pyramid.”

CLOSURE TO CLASS:

Let's show our mums (dads, grandmas, etc.) **some of the things we've learned about the Food Pyramid!** (Invite parents' to come and sit down.) Remove flannelgraph Pyramid and foods, set aside.

Have Wicky review the lesson:

A. **“What shows us what to eat?”**

(Hold up the 3-D Food Pyramid and/or poster. Have children find FGP around the room and on one or more food packages.) Show children stickers of FGPs. **“Would you like a sticker? I'll put one of these on each of you** (may place on nametag).” Have each child say “food pyramid” as you place a sticker on them.

2. Show the children each take-home gift as it is described. **“We have some special gifts for each of you to take home. We have pictures of the Food Pyramid for you to take home and color, and handouts for your parents so you can teach them the song we sang. We also have a puzzle of the Food Pyramid for each you. When you get home you can put all of the pieces of the food groups in the right places.”**
3. **“Can you tell your moms how many food groups there are? Just 1? Just 2? Just 3? Just 4? Five’? (hold up fingers) Can we eat food from just one food group, or do we need to eat foods from all 5 food groups?”**
(Review with plates.)
4. **“Which food group has the biggest space on the Food Pyramid? Where is the smallest space? Should we eat more foods from the bread group or from the little space at the top? (point to spaces on puzzle)**
5. **“Should we eat a lot of food from the top of the Pyramid? Why not? Do we need these foods to grow? They're okay to eat sometimes, right?”**

“You sure have learned a lot about good foods to eat today. Before you go home I have a snack for you.”

Children being post-tested will leave now. Be sure to tell them they will get their snack and gifts when they return.

Snack:

Select snack which allows children a small amount of food preparation experience and includes foods from several food groups. Provide small cups of water with snack.

Craft:

If children are finished eating before their turn to be post-tested, provide crayons and food pyramid handouts to color.

Pass out Message to Parents and other take-home gifts as they leave. Thank them for their participation.

TEACHING MATERIALS:

Shape name tags made from colored construction paper, equal number of squares, circles and triangles.

Wicky Waccoon, Kid's Club Cubs, and Picky Piggy puppets

Pyramid apron for teacher to wear.

Available for \$16.00 from the Columbus Dietetic Association. .

Write: Paula Ruzika, 128 Orchard Dr. Worthington, OH 43085

Wicky's Wonder Box

Triangle cut out of white poster board.

Three-dimensional Food Guide Pyramids:

Blank one copied from back of Pyramid storybook. page 35, folded blank side out, may be cut down smaller.

Printed one ordered from Dairy Council of Wisconsin, 999 Oakmont Plaza Dr., Suite 510, Westmont, IL 60559 (1-800-325-9121), (called the "Swinging Pyramid" available with milk or breakfast illustrations on other sides, cost \$5.50 each)

Posters of the Food Guide Pyramid to hang around room--

Use a variety from National Dairy Council, etc.

For laminated poster and "puzzle pieces" order from:

National Livestock and Meat Board

Box FGP-FN, 444 N. Michigan Ave., Chicago, IL 60611 (\$1.50)

Paper grocery sack with empty food packages with food pyramid graphic depicted on them. May fill with styrofoam peanuts to maintain shape.

Flannelgraph FGP (mount on foam core) from Little Folk Visuals

Can be purchased at school supply stores, or order from
Teacher's Delight 1-800-726-9516

Toy foods for "variety" plates and for "sweets" samples:

Bread, small cereal box, waffle, top of hamburger bun, crackers. Cantaloupe, orange, apple, red grapes, peach slice.

Milk, 2 chicken legs, corn, apple, banana, and slice of bread. Cupcake, cookie, hard candy, donut, small pop can.

Purchase at toy store such as 'Toys-R-Us' to include a variety. Suggested sets include: "Fisher Price Picnic Basket Super Set," "Mini Supermarket" Play Foods Set from Sky Kids, Inc. filling in with play sandwich sets and/or NASCO food models for cracker, etc. (NASCO 1-800-558-9595), a real package of cereal (such as a single-serve size of Cheerios), and a small can of soda pop (such as served to hospital patients).

Small basket (comes in Fisher Price picnic set)

Food Picture cards from "Delicious Decisions" set (order from Wisconsin Dairy Council, kit costs \$14.95, see phone number above) Be sure to include milk, yogurt, cheese, fish, chicken, egg, pasta, bread, cereal, tomato, corn, lettuce, bananas, apple, and orange in pictures used in picnic game. See pairs for moderation section

Full-size paper plates (attach pretend foods)

Food Guide Pyramid Stickers (100 cost \$3.00)

Washington State Dairy Council

4201 198th Street S.W., Suite 102, Lynwood, WA 98036

Phone 206-744-1616, Toll free fax 1-800-470-1222

Pyramid puzzles (from NASCO)

Ingredients for snack of choice and serving dishes as needed

Coloring sheets for children (photocopy page 37 in Pyramid storybook), crayons

Message to Parents

THE FOOD PYRAMID SHOWS US WHAT TO EAT!!

The Food Pyramid helps us make healthy food choices. When you're in the grocery store with your child look for it on food packages. When you're cooking or eating with your child talk about where different foods fit on the Pyramid. Teach your child that the foods they need to eat for health and growth belong in one of these five groups: breads, vegetables, fruits, milk, and meat. Compare the sizes of the different sections on the Pyramid. Remind your child they are to eat more foods found in the big spaces with the bread, vegetable and fruit groups.

Teach your child that foods like soda pop and candy do not belong in the five food groups, and are not an essential part of a balanced diet ("we don't need them to grow and be healthy"). They are found in the smallest space at the top of the Pyramid. Remind your child that this means they can eat these foods sometimes. Foods in the rest of the Pyramid can be eaten anytime. Enjoy eating healthier food choices with your child.

Talk about how important it is to eat foods from all five food groups to have a balanced diet. A recent survey of American eating habits revealed that most Americans (older children and adults) eat fewer than the recommended number of servings in every food group except the meat group, and eat too many fats and sweets (MRCA Information Services 1994). Preschool children generally eat too few servings in all groups except milk and eat too many sweets (JADA: Oct 1995).

Put your family ahead of the rest of the country by planning to have foods from all five food groups at lunch and supper, and foods from at least three food groups at breakfast, every day. Fix a snack with your child using foods from all five healthy food groups. See if your child can show you on the Pyramid what food group each part of the snack is in.

Here's an easy song to sing with your child at home to help them remember how many healthy food groups are in the Food Pyramid:

FIVE HEALTHY FOOD GROUPS

(Tune "Ten Little Indians")

One healthy... two healthy... three healthy food groups...

Four healthy... five healthy... all healthy food groups...

Eat healthy foods from the Food Pyramid -- YES!!

Eat healthy foods today!!

Song Lyrics: Copyright 1993, B.J. Mayfield, M.S., RD.
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Appendix C

**Test of Nutrition Knowledge
Educational Intervention for Children
WIC Nutrition Education Demonstration Study**

**PLACE
STICKER
HERE**

Test for WIC Children

Final Version

CIRCLE ONE

Pretest

Post-test

CIRCLE ONE

Male

Female

	YEARS	MONTHS	DAYS
Test date	_____	_____	_____
Date of birth	_____	_____	_____
Chronological age	_____	_____	_____

START TIME

_____ : _____

WIC Nutrition Education Demonstration Study

BEFORE BEGINNING THE CHILD TEST, EXPLAIN TO PARENT THAT IT IS VERY IMPORTANT NOT TO TALK TO CHILD DURING THE TEST. PLEASE USE THE FOLLOWING SCRIPT.

Thank you for agreeing to let NAME OF CHILD answer our questions about food and nutrition. I am glad you will be with us because I think NAME OF CHILD will be more relaxed if you join us. Please don't help him/her to answer any of the questions. It is very important that we find out what NAME OF CHILD thinks about the questions all on his/her own. I am sure he/she knows a whole lot about food already, and he/she can help us with our study.

SUGGEST THE PARENT/CARETAKER MAY WISH TO BRING READING MATERIALS TO THE TESTING SESSION.

IMPORTANT

IF A CHILD OFFERS NO RESPONSE TO ANY QUESTION, THAT IS, DOES NOT ANSWER AT ALL, BE SURE TO CIRCLE NO RESPONSE, OFTEN ABBREVIATED AS NR.

WIC Nutrition Education Demonstration Study

TASK 1A SHOW THE CHILD THE **FOOD PYRAMID POSTER**. SAY:

1A. *What is this* POINT TO POSTER *called?*

SCORE FOR TASK 1A CIRCLE RESPONSE

Food Pyramid

Pyramid

Food Triangle

Food

Triangle

Other SPECIFY _____

No response

TASK 1B SHOW THE CHILD THE **PICTURES OF THE FOOD PYRAMID, 4 FOOD GROUPS, AND FOOD BOWL**. SAY:

1B. *Which one of these is the Food Pyramid?*

SCORE FOR TASK 1B CIRCLE RESPONSE

Food Pyramid

4 Food Groups

Food Bowl

No response

WIC Nutrition Education Demonstration Study

TASK 2 LEAVE FOOD PYRAMID POSTER IN FRONT OF THE CHILD, BUT DO NOT DRAW ATTENTION TO IT.

2. ***How many food groups are there?*** DO NOT POINT TO POSTER.

SCORE FOR TASK 2 STATED NUMBER OF FOOD GROUPS _____

No response

TASK 3 TURN FOOD PYRAMID POSTER AROUND SO THE CHILD CANNOT SEE THE POSTER.

SHOW THE CHILD **THREE (3) PLATES OF FOOD:** ONE WITH FIVE FOODS FROM THE *FRUIT* GROUP, ONE WITH FIVE FOODS FROM THE *BREAD* GROUP, AND ONE WITH ONE FOOD FROM *EACH OF THE FIVE FOOD GROUPS*. SAY:

3. ***I have three plates of food here. Which one of these plates has different foods from all of the food groups?***

SCORE FOR TASK 3 CIRCLE PLATE SELECTED.

Variety Plate

Fruit Plate

Bread Plate

No response

WIC Nutrition Education Demonstration Study

TASK 4

LAY OUT **FIFTEEN (15) FELT FOOD PICTURES**, THREE (3) FROM EACH GROUP. FOR EACH TASK, CIRCLE THE CHILD'S RESPONSE.

PICK UP THE TOMATO AND SAY:

4A. *What is the name of this food? This food is from the vegetable group. Can you find another food that goes in the vegetable group? Good!*

SCORE FOR TASK 4A NAMED Y N NR SELECTED A VEGETABLE Y N NR

PICK UP THE PASTA AND SAY:

4B. *What is the name of this food? This food is from the bread group. Can you find another food that goes in the bread group? Good!*

SCORE FOR TASK 4B NAMED Y N NR SELECTED A FOOD FROM BREAD GROUP Y N NR

PICK UP THE BANANA AND SAY:

4C. *What is the name of this food? This food is from the fruit group. Can you find another food that goes in the fruit group? Good!*

SCORE FOR TASK 4C NAMED Y N NR SELECTED A FRUIT Y N NR

PICK UP THE YOGURT AND SAY:

4D. *What is the name of this food? This food is from the milk group. Can you find another food that goes in the milk group? Good!*

SCORE FOR TASK 4D NAMED Y N NR SELECTED A FOOD FROM MILK GROUP Y N NR

PICK UP THE FISH AND SAY:

4E. *What is the name of this food? This food is from the meat group. Can you find another food that goes in the meat group? Good!*

SCORE FOR TASK 4E NAMED Y N NR SELECTED A FOOD FROM MEAT GROUP Y N NR

TASK 5 LAY THE FELT PYRAMID FLAT ON THE DESK. SAY:

I'd like to play another game with you. On this big cloth, each section is different.

POINT TO THE FIFTEEN (15) FELT PICTURES OF FOOD. SAY:

These pictures fit onto the big cloth. I'll show you.

CORRECTLY PLACE THE FOLLOWING ITEMS FROM EACH OF THE FIVE FOOD GROUPS ONTO THE PYRAMID:

ITEM

Yogurt	(Milk Group)
Pasta	(Bread Group)
Tomato	(Vegetable Group)
Fish	(Meat Group)
Bananas	(Fruit Group)

PICK UP THE MILK FROM THE MILK GROUP. DO NOT NAME FOOD GROUP OR FOOD ITEM. SAY:

5. *Put this food where you think it belongs on this Food Pyramid.*

SCORE FOR TASK 5 REPEAT FOR THE REMAINING FOOD PICTURES IN THE ORDER LISTED BELOW. PLACE A CHECK BELOW FOR EACH CORRECTLY PLACED PICTURE. CIRCLE NR IF CHILD DOES NOT ANSWER AT ALL.

PLACEMENT

A.	Milk	_____	NR
B.	Bread	_____	NR
C.	Corn	_____	NR
D.	Chicken	_____	NR
E.	Apple	_____	NR

Great job! Let's play another game!

WIC Nutrition Education Demonstration Study

TASK 6 REMOVE THE FOOD PICTURES FROM THE PYRAMID EXCEPT FOR THE PICTURES LISTED BELOW.

Milk	Apple
Chicken	Bread
Corn	Cake

CALL THE CHILD'S ATTENTION TO THE FELT PYRAMID. DO NOT NAME THE FOOD GROUPS. KEEP HANDS IN PLACE WHILE AWAITING CHILD'S RESPONSE. SAY:

6A. *Do you see how the foods are in different sections on the cloth? From which food group should you eat more often? This group?* POINT TO MILK GROUP. *Or this group?* POINT TO BREAD FOOD GROUP.

SCORE FOR TASK 6A CIRCLE SELECTED GROUP.

Milk	Bread	NR
------	-------	----

POINT TO MEAT GROUP AND VEGETABLE GROUP. DO NOT NAME THE FOOD GROUPS. SAY:

6B. *Do you see these two sections? From which food group should you eat more often? This group?* POINT TO MEAT GROUP. *Or this group?* POINT TO VEGETABLE GROUP.

SCORE FOR TASK 6B CIRCLE SELECTED GROUP.

Meat	Vegetable	NR
------	-----------	----

POINT TO THE SWEETS GROUP AND THE BREAD GROUP. DO NOT NAME THE FOOD GROUPS. SAY:

6C. *Do you see these two sections? From which food group should you eat more often? This group?* POINT TO SWEETS GROUP. *Or this group?* POINT TO BREAD GROUP.

SCORE FOR TASK 6C CIRCLE SELECTED GROUP.

Sweets	Bread	NR
--------	-------	----

TASK 7 USE FIVE TWO-CARD SETS. SAY:

7. *Now, I'd like to play another game with you. Each page has two pictures of food on it. One of the foods is a food that is ok to eat anytime, but the other food should be eaten only sometimes.* FOR EACH SET, SAY: *This is a picture of a _____ and this is a picture of a _____. Pick out the anytime food—the food that you should eat more often.*

SCORE FOR TASK 7 CIRCLE SELECTED FOOD.

	A	B	
FIRST SET	Candy bar	Watermelon	NR
SECOND SET	Cake	Bread	NR
THIRD SET	Cheese	Cookies	NR
FOURTH SET	Hard candy	Apple	NR
FIFTH SET	Orange Juice	Soda	NR
SIXTH SET	Cereal	Doughnut	NR

WIC Nutrition Education Demonstration Study

TASK 8 PLACE THE FOLLOWING TWO GROUPS OF FOOD PICTURES IN FRONT OF THE CHILD.
POINT TO EACH FOOD PICTURE, NAMING EACH ONE. SAY:

This picture is juice, this picture is an apple... AND SO ON.

ANYTIME FOODS

SOMETIMES FOODS

Juice

Candy Bar

Apple

Piece of Cake

Crackers

Soda

POINT TO ANYTIME FOODS. SAY:

8. *These foods you can eat anytime.*

POINT TO SOMETIMES FOODS. SAY:

These foods you eat sometimes. Why should you eat these foods more often than these foods POINT TO ANYTIME FOODS *more often than these foods* POINT TO SOMETIMES FOODS?

SCORE FOR TASK 8 RECORD VERBATIM _____

No response

WIC Nutrition Education Demonstration Study

TASK 9 SHOW THE CHILD THE **FOOD PYRAMID PUZZLE** AND THEN REMOVE THE PIECES. SAY:

Now, I have this puzzle for you to do. See, these pieces have pictures of different foods. This one has foods from the milk group, this one the meat group, this one the vegetable group, this one the fruit group, and this one has the bread group.

POINT TO EACH PIECE AS GROUPS ARE IDENTIFIED. SAY:

9. *These pieces fit into this puzzle board, and I'd like you to put the puzzle together for me. OK? You can start now.*

BEGIN TIMING. ENCOURAGE IF NECESSARY. STOP TIMING WHEN PUZZLE IS COMPLETE. CIRCLE THE NUMBER OF CORRECTLY PLACED PIECES AND RECORD THE TIME TAKEN TO COMPLETE THE PUZZLE. IF CHILD DOES **NOT** COMPLETE THE PUZZLE **IN TWO AND ONE-HALF MINUTES**, CIRCLE THE NUMBER OF CORRECTLY PLACED PIECES AND RECORD 2.5 MINUTES FOR THE TOTAL TIME.

SCORE FOR TASK 9 CIRCLE THE NUMBER OF CORRECTLY PLACED PIECES:

1 2 3 4 5 ALL NR

TOTAL TIME TO COMPLETE PUZZLE _____

You've done a great job! Thank you for helping me.

END TIME _____ : _____

Appendix D
Results of Pilot Testing
WIC Nutrition Education Demonstration Study

The child tests of nutrition knowledge was pilot tested in two local WIC agencies in Massachusetts during July and August 1995. As we describe in this appendix, because of revisions to the child test, pilot testing on the child test continued into the early winter of 1995 at a Head Start program and in a publicly funded child care center. Both facilities are located in Boston, Massachusetts.

At local WIC agencies, most children were recruited when they appeared for certification appointments. Because some child-testing was combined with testing for the prenatal component of the WIC Nutrition Education Study, when prenatal volunteers brought their children to the pilot-testing sessions, Abt staff recruited and tested all eligible children. At the Head Start and child care programs, Abt arranged to test children on specific days of several weeks.

Half of the children were tested without receiving any nutrition education (pretests); the other half were tested after receiving nutrition education (post-tests). A record was kept of the ages of children who were pretested and post-tested in an effort to distribute the pre- and post-tests evenly across children of different ages—young threes versus old fours, for example.

Nutrition education sessions for children were conducted by four Abt staff persons with prior professional experience in early childhood education. One of the staff persons has a background in early childhood education, and another is a nutritionist with a background in preschool nutrition education. The nutrition education sessions were initially conducted by teams of two people working together because it was thought that children might be more comfortable in lessons with two adults. Working in teams was also helpful as staff refined and revised the nutrition lesson. However, as the pilot testing progressed, many of the sessions were taught by just one person. This approach was quite successful and a closer reflection of the nutrition education that was offered at the demonstration sites.

The nutrition education sessions were designed to teach the three objectives for children described in this report: identifying a variety of foods; food groups/the Food Pyramid; and food choices—*anytime* versus *sometimes* foods. We began pilot testing using the terms *everyday* and *sometimes*. Children seemed to be confused by the term *everyday*—often applying the term to foods they wished to eat every day. Using *anytime* and *sometimes* seemed to alleviate this problem. As described in Chapter Two of this report, the *Kid's Club* curriculum, developed by Barbara Mayfield, was used as a basis for the nutrition education session with ideas coming primarily from the lessons on variety, the Food Pyramid, and healthy versus junk foods. The *Kid's Club* story, *Treasures of the Pyramid*, was shortened to meet a

time limit of about thirty (30) minutes for the session. Two of the *Kid's Club* puppets, WICCY Waccoon and Picky Piggy, were used. Children seemed to enjoy the nutrition education sessions very much and often wanted to continue to play with the materials after the sessions were completed.

The tests for children were conducted by five Abt staff: the four individuals who taught the nutrition education sessions to children and a college student majoring in education. Testing occurred in one-to-one settings. The child test requires about fifteen (15) minutes to complete. Children were usually engaged by the testing activities and seemed to enjoy them. There were a few young three-year-olds who seemed to have difficulty focusing on the testing.

After each child's test was conducted, the child's parent signed a receipt and was given \$10.00 for participating in the study. All children were given a snack of animal crackers and juice and a coloring sheet of fruit pictures to take home.

Pilot-Testing Procedures

For all pilot testing, children were randomly assigned to either pretest or post-test. No child received a pretest and a post-test. In all, a total of 100 children were tested in two stages—item development stage and final pilot test stage. Eight test forms were developed. Several tasks (items) were common to all forms, but others were eliminated when they were found to be flawed. The analysis below includes data for all children who were exposed to individual items; discarded items are briefly described and the rationale for their rejection is discussed.

The item development stage involved forty-seven children—(twenty-one pretests and twenty-six post-tests). The purpose of this stage of test preparation is establishing that children in the target age groups could respond appropriately to test items, and ascertaining, at a preliminary level, that their ability to respond would be enhanced following a brief educational intervention. The intervention itself was substantially modified during this period. Test items were altered, discarded, and added as judged necessary by the test development team. At the conclusion of this iterative process, a set of items were aggregated into a final pilot test. The final pilot-testing phase involved fifty-three children—thirty pretests and twenty-three post-tests. Across all children tested, in both stages, the average ages were 47.1 months for pretested children and 47.8 months for post-tested children ($t=0.54$, not significant).

In the discussion which follows, each item (or task) in the child assessment battery is separately considered. Performance differences between children who were tested prior to instruction and those individuals tested following instruction are described both in terms of statistical significance and in terms of the proportion of the pooled standard deviation. Typically, if an observed performance difference is smaller than 20 percent of the standard deviation, it is considered too small to be educationally meaningful. Differences between 40 and 60 percent of the standard deviation are considered "medium," and those differences greater than 75 percent of the standard deviation are considered "large."

Child Pilot Test Results

A copy of the pilot-tested version of the child nutrition test appears in Appendix C. Shortened versions of test items appear in the discussion below.

Task 1 The tester shows the child the Food Pyramid Poster and asks: "What is this called?"

The opening segment of the child nutrition education intervention is an introduction to the Food Pyramid which identifies the shape and discusses graphic representations of the pyramid. The term "Food Pyramid" recurs frequently throughout the education period. We found, both during the intervention and testing, that children in the target age range have difficulty enunciating the word "pyramid." For this item, responses were scored three points for "Food Pyramid"; two points for "pyramid"; one point for "food" or "food triangle." Across all children tested, only one (post-tested) child received a score of two points, and no children received three points for this item.

As shown in Exhibit D.1, a difference of 0.13 (approximately 0.25 of the pooled standard deviation) points was observed between pre- and post-test groups. The most frequent scoring response produced by both pretest and post-test groups for this questions was "food." The results for this question suggest that we can expect a small increase (one-tailed $t=1.28$, $p=.10$) in identification of the Food Pyramid, despite the likelihood that very few children can accurately state that the graphic is the "Food Pyramid." The significance test for this item indicated marginal success in item development. The testers believe, however, that an alternate item might clarify whether or not children in this age group could successfully identify the Food Pyramid following an educational intervention. They suggest a task involving presentation of three pictures (the Food Pyramid, four food groups, and a food bowl) and asking: "Which of these is the Food Pyramid?" It is thought this approach will produce a response based on recognition rather than verbal production. We have developed that task (numbered 1B) for use in the evaluation.

Exhibit D.1

Identifying the Food Pyramid			
	Number	Mean Score	Standard Deviation
Pretest	51	0.22 points	0.46
Post-test	49	0.35 points	0.56

Task 2 The tester asks the child: "How many food groups are there?"

This item was introduced in the final stage of pilot testing. The number of food groups is a recurring theme in the educational session. Five is the only correct response.

A difference of over 55 percent in correct responses was observed favoring post-tested children (one-tailed $t=3.21$, $p=.001$). (See Exhibit D.2.) This result demonstrates that exposure to the intervention can reliably increase the proportion of children, in the target age range, who state the correct response.

Exhibit D.2

Identifying the Number of Food Groups			
	Number	Percent Correct	Standard Deviation
Pretest	29	13.8	35.1
Post-test	23	69.6	51.1

Task 3 The tester shows the child three plates of food (one containing five fruits, one with five examples from the bread group, and one with representatives of each of the five food groups) and says: "I have three plates of food here. Which one of these plates has different foods from all of the food groups?"

A correct response is selection of the variety plate. A segment of the intervention deals directly with the concept of variety and nearly duplicates this test item. During the item development stage, each child was presented with a display of food pictures and asked to give the examiner pictures "that you need to eat to grow and stay healthy." That task was rejected because the majority of both pre- and post-test

children simply gave examiners all the pictures that were presented.

A difference of over 20 percent (approximately 44 percent of the pooled standard deviation) in correct responses was observed favoring post-tested children (one-tailed $t=1.56$, $p=.06$). (See Exhibit D.3.) This result suggests that the correct response can be marginally increased for children in the target age range.

Exhibit D.3

Selecting a Plate of Foods Representing "Variety"			
	Number	Percent Correct	Standard Deviation
Pretest	30	23.3	43.0
Post-test	23	43.5	50.7

Task 4 The tester shows the child a felt food picture and asks: "What is the name of this food? This food is from the NAME OF GROUP. Can you find another food that goes in the NAMED GROUP?" (Repeat for a total of five foods, one from each food group.)

The two item components, naming foods and selecting foods from appropriate groups, are separately scored. Although naming foods is a part of the educational intervention, identifying other foods in the food groups is not. A different version of the "selection" task was included in the item development phase of the pilot test. Modifications represent efforts to clarify the item itself and to enhance scoring procedures.

Children in the post-test group named foods correctly 20 percent more frequently than pretest children (one-tailed $t=3.02$, $p=.002$). However, no pre-post-test differences were observed in selecting foods from the correct food groups (one-tailed $t=-0.41$, $p=.34$). Results for this task are summarized in Exhibit D.4.

Exhibit D.4

Naming Foods and Selecting Companion Food from the Same Food Group			
	Number	Percent Correct	Standard Deviation
<i>Naming foods</i>			
Pretest	29	55.9	22.3
Post-test	23	75.7	24.8
<i>Selecting foods</i>			
Pretest	29	35.9	21.6
Post-test	23	33.0	28.0

Task 5 The tester, using a felt Food Pyramid, gives the child a felt food picture and says: "Put this food where you think it belongs on this Food Pyramid."
(Repeat for a total of five foods, one from each food group.)

A response is scored correct when the child places the selected food in the appropriate location on the pyramid. As with Task 4, a different version of this task was included in the item development phase of the pilot test. The present task evolved from efforts to streamline testing procedures and to increase the clarity of the question and the scoring of the task.

Children in the post-test group placed foods in the correct group approximately 9 percent more frequently than pretest children ($t=1.39$, $p=.08$). Although the statistical significance level for this test suggests only marginally superior performance for the post-tested children, the observed difference is approximately 40 percent of the pooled standard deviation, demonstrating a small increase in children's understanding of the types of foods contained in the various food groups. Percentages of correct responses for this task are shown in Exhibit D.5.

Exhibit D.5

Placing Foods in Correct Food Groups			
	Number	Percent Correct	Standard Deviation
Pretest	29	24.8	17.4
Post-test	23	33.9	29.2

Task 6 The tester, using the felt Food Pyramid, points to the *bread* group and the *milk* group and asks: "Do you see how the foods are in different sections on the cloth? From which food group should you eat more often? This group? Or this group?" (Repeat for *meat/vegetable* and *sweets/fruit* group comparisons.)

This item was included in test forms for both stages of the pilot test. Identification of the larger Food Pyramid sections as the "foods we should eat more often" is practiced during the intervention. A correct response is naming or pointing to the food group from which more daily servings should be eaten.

As shown in Exhibit D.6, a difference of over 15 percent in correct responses was observed favoring post-tested children (one-tailed $t=1.97$, $p=.03$).

After the pilot test was completed, the sweets/fruit group comparisons was changed to a sweets/bread group question. The testing staff believe that this question is a better test of proportionality and provides the child with a clearer choice.

Exhibit D.6

Selecting Food Groups			
	Number	Percent Correct	Standard Deviation
Pretest	42	38.1	39.5
Post-test	42	53.6	37.9

Task 7 The tester, using a card with two pictures (for example, candy bar and watermelon), says: "This is a picture of a ____ and this is a picture of a _____. Pick out the anytime food—the food that you should eat more often." (Repeat for a total of five choices between "anytime" and "sometimes" foods.)

Identification of "anytime" and "sometimes" foods is included in the intervention. For this task, choices are scored correct when children select "anytime" foods.

Virtually no difference was observed between the responses of pretested and post-tested children (one-tailed $t=0.09$, $p=.46$). Results are shown in Exhibit D.7.

Exhibit D.7

Selecting Anytime Foods			
	Number	Percent Correct	Standard Deviation
Pretest	50	44.3	27.8
Post-test	47	43.7	31.8

Task 8 The tester, using cards with pictures of foods (three "anytime" and three "sometimes" foods), says: "These foods you can eat anytime. These foods you eat sometimes. Why should you eat these foods (points to anytime foods) more often than these foods (points to sometimes foods)?"

Responses indicating that "anytime" foods would help one grow strong and healthy were given five points; three points were given for responses that "anytime" foods would help one grow strong or healthy; two points were given for statements indicating the "anytime" foods were "good for you;" and one point was given for responses indicating the child preferred "anytime" foods—"I like them better."

A difference of approximately one full point (approximately 75 percent of the pooled standard deviation) was observed favoring post-tested children (one-tailed $t=3.51$, $p<.001$). (See Exhibit D.8.) Post-tested children were not more likely than pretested children to select specific "anytime" foods instead of "sometimes" foods. Nonetheless, the same children demonstrated an understanding of why "anytime" foods should be eaten more often.

Exhibit D.8

Reasons for Eating "Anytime" Foods			
	Number	Mean Score	Standard Deviation
Pretest	51	0.49 points	1.05
Post-test	49	1.47 points	1.68

Task 9: The tester, using a wooden puzzle of the Food Pyramid, says: “Now, I have this puzzle for you to do. See, these pieces have pictures of different foods. This one has foods from the milk group, this one from the meat group, this one from the vegetable group, this one the fruit group, and this one has the bread group. These pieces fit into the puzzle board, and I’d like you to put the puzzle together for me. OK? You can start now.” (Time to complete puzzle. After 2.5 minutes, discontinue and count correctly placed pieces.)

Four performance indices were scored, and differences between pretest and post-test groups were examined. First, the total “time on task” for *all* children was computed, using 150 seconds for those children who did not complete the puzzle. Second, the number of correctly placed pieces, for each child, was counted. Third, we calculated the proportion of each group who completed the puzzle. Finally, we examined time-to-complete for only those children who successfully placed all puzzle pieces.

Post-tested children performed more efficiently on all indicators for this task, including the proportion of children who completed the puzzle within 2.5 minutes—42.9 percent for pre-tested children versus 65.2 percent for post-tested children ($X^2 = 2.53$, $p = .06$). Also, the difference in number of correctly placed pieces was statistically significant (one-tailed $t = 1.82$, $p = .04$). For one time-on-task, the observed difference was significant (one-tailed $t = 1.83$, $p = .03$), amounting to approximately 50 percent of the pooled standard deviation. However, the difference in time-to-complete for those children who did complete the puzzle was not significant (one-tailed $t = 0.86$, $p = .20$). Results for Task 9 are summarized in Exhibit D.9.

Exhibit D.9

Performance Indicators for Food Pyramid Puzzle

	Number	Mean Score	Standard Deviation
<i>Time on task</i>			
Pretest	28	121.3 seconds	44.3
Post-test	23	98.1 seconds	45.9
<i>Pieces completed</i>			
Pretest	28	3.54 pieces	2.33
Post test	23	4.65 pieces	1.97
<i>Time to complete</i>			
Pretest	12	83.1 seconds	45.0
Post test	15	70.5 seconds	30.8

Pilot-Test Summary

The pilot test examining the effects of special nutrition education for WIC children provided evidence that three-and-four-year-old children tested after the intervention were, in most instances, better able to accomplish education-related tasks. Three test items fall outside this result. These items are: Task 4B-Selecting foods from the same food group as a sample selection; Task 7-selecting the “anytime” food from a pair of food pictures; and Task 9C-time to complete the puzzle for those children who were able to correctly place all pieces. Despite the lack of findings in the pilot test, these three items were retained, with the other items, in the test for demonstration study.

Exhibit D.10		
t-Statistics by Individual Test Item		
Test Item	t-statistic	p-value
Task 1 Naming Food Pyramid	1.28	.10
Task 2 Identifying number of food groups	3.21	.001
Task 3 Selecting a plate of foods representing “variety”	1.56	.06
Task 4N Naming foods from the food groups	3.02	.002
Task 4S Selecting companion foods from the same food group	.41	.34
Task 5 Placing foods in correct food groups	1.39	.08
Task 6 Selecting food groups	1.97	.03
Task 7 Selecting “anytime” foods	.09	.46
Task 8 Reasons for eating “anytime foods”	3.51	.001
Task 9 Time on Task	1.83	.03
Pieces completed	1.82	.04
Time to complete	.86	.20

Appendix E

**Observation Checklist
WIC Nutrition Education Demonstration Study**

OBSERVATION CHECKLIST

Child Session

WIC Nutrition Education Demonstration Study

SESSION IDENTIFICATION

1. Agency ID 2. Site ID 3. Field Observer ID

4. Date of Observation | |
Month Day Year

5. Start Time :

Attendance

6. Expected attendance 7. Actual attendance
8. Girls 9. Boys
10. Other children
11. Adults

EXCLUDING EDUCATORS, TESTERS, OBSERVERS

TOPICS COVERED

	Elapsed Time	Time for Topic	Involvement of Children*	Type of Disruption*	Not Covered
12. Welcome and Introduction (page 2)**					
13. Objective 1: Food Pyramid (page 3)					
14. Objective 2a: Five Food Groups (page 4)					
15. Objective 2b: Food Identification (page 5)					
16. Objective 2c: Food Classification (page 6)					
16a. Variety Review (pages 6 and 7)					
17. Objective 3: Proportionality (pages 7 and 8)					
18. Objective 4: Moderation (pages 8 and 9)					
19. Closing (page 10)					

Page numbers refer to script for *Kids' Club* lesson.

*Use codes listed below.

Codes

Involvement of Children

- 1 No children involved or attentive
- 2 More than one child not involved or not attentive
- 3 One child not involved or not attentive
- 4 All children involved and attentive

Disruption Type

- 0 No disruptions
 - 1 Entry of new participant(s)
 - 2 Entry of adult(s)
 - 3 Other
- SPECIFY IN MARGIN

ENVIRONMENT

	Yes	No
20. Space is of adequate size		
21. Space is private enough so that outside noise does not disrupt session		
22. Temperature is comfortable—not too warm or too cold		
23. Noise level in room is low enough that all children can easily hear instructor		

EDUCATOR/CHILD INTERACTION

	Yes	No
24. Educator provides opportunities for all children to actively participate		
25. Most children actively participate		
26. Educator maintains an enthusiastic attitude		
27. Educator is supportive of children during interactions		
28. Pace of presentation is appropriate to material		
29. Pace of presentation is appropriate for children in session		

30. **End Time** | | : | | |

COMMENTS

EXPLAIN ALL *NO* ANSWERS AND FURTHER DESCRIBE THE SESSION HERE.

Appendix F

**Detailed Tables of Mean Scores and Tests of
Statistical Significance
WIC Nutrition Education Demonstration Study**

Exhibit F.1

Mean Test Scores and Tests of Statistical Significance for All Test Types by Age, Site, and Gender

	Pretest			Post-test*				
	Number	Mean	Standard Deviation	Number	Mean	Standard Deviation	t-statistic	p <
Total	278	3.74	1.32	219	5.16	1.95	9.22	.001
Three years	165	3.48	1.12	108	4.19	1.60	4.02	.001
Four years	113	4.13	1.49	111	6.11	1.80	8.95	.001
Site A	133	3.73	1.38	126	5.31	2.16	6.95	.001
Site B	145	3.75	1.26	93	4.96	1.62	6.10	.001
Male	149	3.68	1.40	120	5.05	2.03	6.27	.001
Female	129	3.81	1.21	99	5.30	1.86	6.89	.001

* Difference between pretest and post-test.

** Difference between pretest and delayed post-test.

NOTES Mean is for total score.
Highest possible score is 11.

Exhibit F.2

Mean Test Scores and Tests of Statistical Significance by Item and Gender

	Pretest			Post-test*				
	Number	Mean	Standard Deviation	Number	Mean	Standard Deviation	t statistic	p value
Item 1a								
Male	149	.11	.20	120	.47	.42	8.59	.0001
Female	129	.10	.15	99	.47	.42	8.48	.0001
Item 4n								
Male	149	.57	.23	120	.61	.24	1.30	.193
Female	129	.58	.25	99	.62	.22	1.18	.238
Item 4s								
Male	149	.34	.26	120	.36	.26	0.68	.499
Female	129	.36	.28	99	.34	.26	0.57	.568
Item 5								
Male	149	.27	.23	120	.36	.28	2.94	.004
Female	129	.25	.18	99	.35	.29	2.98	.003
Item 6								
Male	149	.39	.30	120	.50	.31	2.95	.003
Female	129	.43	.29	99	.46	.30	0.69	.488
Item 7								
Male	149	.46	.24	120	.45	.31	0.49	.623
Female	129	.48	.26	99	.51	.27	0.78	.437
Item 8								
Male	149	.07	.14	120	.15	.28	2.98	.003
Female	129	.08	.16	99	.10	.22	0.86	.390
Item 9								
Male	149	.35	.35	120	.55	.36	4.64	.0000
Female	129	.37	.34	99	.59	.36	4.76	.0000

* Difference between pretest and post-test.

** Difference between pretest and delayed post-test.

NOTES Mean is for item score.
Highest possible item score is 1.0.

Exhibit F.3

Percent Correct and Tests of Statistical Significance by Item and Gender

	Pretest		Post-test*			
	Number	Percent Correct	Number	Percent Correct	Chi Square Statistic	p Value
Item 1b						
Male	149	59.1	120	80.8	14.67	.001
Female	129	58.9	99	75.8	7.10	.008
Item 2						
Male	149	14.1	120	49.2	39.13	.001
Female	129	19.4	99	64.7	48.23	.001
Item 3						
Male	149	39.6	120	30.8	2.24	.136
Female	129	37.2	99	44.4	1.22	.270

* Difference between pretest and post-test.
 ** Difference between pretest and delayed post-test.

Exhibit F.4**F-Tests for Significance of Age on Test Scores**

Item	F Value	p > F
1a Naming food pyramid (verbally)	23.65	.0001
1b Naming food pyramid (non-verbally)	1.94	.16
2 Identifying food groups	15.27	.0001
3 Selecting variety plate	0.05	.82
4n Naming foods	33.59	.0001
4s Selecting companion foods	46.72	.0001
5 Placing foods	30.24	.0001
6 Selecting food groups	1.77	.18
7 Selecting "anytime" foods	12.14	.0005
8 Reasons for eating "anytime" foods	39.85	.0001
9 Completing puzzle	84.13	.0001
Total Score	79.99	.0001

NOTES For individual items, the null hypothesis is that the coefficient on age is statistically significant.

For total score, the null hypothesis is that the coefficient on age is statistically significant controlling for gender, site, and test type.

Exhibit F.5

F-Tests for Significance of Age by Test Point Interactions on Test Scores

Item	F Value	p > F
1a Naming food pyramid (verbally)	8.04	.0048
1b Naming food pyramid (non-verbally)	6.38	.0118
2 Identifying food groups	21.92	.0001
3 Selecting variety plate	.74	.3885
4n Naming foods	.39	.5326
4s Selecting companion foods	1.58	.2097
5 Placing foods	1.02	.3126
6 Selecting food groups	10.03	.0016
7 Selecting "anytime" foods	2.19	.1399
8 Reasons for eating "anytime" foods	1.74	.1878
9 Completing puzzle	.05	.8231
Total Score	19.25	.0001

NOTES For individual items, the null hypothesis is that the coefficient on age is statistically significant.

For total score, the null hypothesis is that the coefficient on age by test type is statistically significant controlling for gender and site.

Analyses of variance and covariance¹ included test point (pretest versus post-test), age, gender, and site. Test point (F-value = 86.74, $p \leq .001$) and age (F-value = 79.99, $p \leq .001$) are the important predictor variables. When we control for test point (pretest versus post-test) and age, site (F-value = 1.06, n.s.) and gender (F-value = 2.46, n.s.) are not statistically significant. (See Exhibit F.4 in Appendix F for the significance of each item by age.) Further analyses of age and test point indicate a strong interaction between these two variables (F value = 19.25, $p \leq .001$). Mean pretest scores for three- and four-year-olds are statistically similar. However, mean post-test scores for four-year-olds are much higher than the mean scores for three-year-olds.

¹SAS procedure GLM (analysis of variance for unbalanced data) was used for these analyses.