DISSERTATION

DEVELOPMENT AND EVALUATION OF A BILINGUAL NUTRITION EDUCATION COMPUTER PROGRAM FOR LATINO CHILDREN

Submitted by

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In partial fulfillment of the requirements
For a Doctorate of Philosophy
Fort Collins, Colorado
Spring 2001

COLORADO STATE UNIVERSITY

March 19, 2001

WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY ELENA SERRANO ENTITLED DEVELOPMENT AND EVALUATION OF A BILINGUAL NUTRITION EDUCATION COMPUTER PROGRAM FOR LATINO CHILDREN BE ACCEPTED AS FULFILLING, IN PART, REQUIREMENTS FOR A DOCTORATE OF PHILOSOPHY.

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ABSTRACT OF DISSERTATION

DEVELOPMENT AND EVALUATION OF A BILINGUAL NUTRITION EDUCATION COMPUTER PROGRAM FOR LATINO CHILDREN

Interactive computer technology and multi-media have advanced in the past ten years as growing opportunities for nutrition education. Few nutrition education computer programs exist for school-aged children, particularly for Latinos. The overarching purpose of this research was to develop a computer nutrition program for low-income Mexican American children in Colorado. This research project spans all levels of software development –with formative evaluation, product development, and evaluation.

Development of the CD-ROM program was driven by several theoretical models and results from the formative evaluation. The formative evaluation included focus groups with children and surveys with classroom teachers and media teachers in order to determine preferences for computer programs, particularly in classroom settings. We also sought to address dietary acculturation in the program. Food frequency questionnaires and acculturation scales were administered to children in largely Hispanic areas of Colorado. Several foods were found to be sensitive to change with increasing acculturation -- such as posole, corn tortillas, fresh corn, mangoes, Mexican cream, and beans – and sensitive to adoption.

The final computer program contained a total of six components -- including educational modules, games, songs, and infomercials -- focusing on the Food Guide Pyramid and related topics. Foods included in the program were representative of different levels of acculturation (as determined by the dietary acculturation study). Online evaluation was used to measure gains in knowledge, attitudes, and behavior intentions, as well as dietary choices. The program was implemented in a total of four schools -- two intervention schools and two matched control schools -- in southern Colorado.

The computer nutrition education program proved to be highly effective in improving knowledge about the Food Guide Pyramid. The intervention group's knowledge of the Food Guide Pyramid increased by over 50% and was considered significantly higher than the control group at the $p<.01$ level. Self-efficacy related to using the Food Guide Pyramid to plan meals and snacks also increased significantly. Our findings demonstrated that games and songs were effective in strengthening knowledge about nutrition and the Food Guide Pyramid, regardless of acculturation level. Online data about dietary patterns confirmed findings from the preliminary dietary acculturation study.

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Spring, 2001

ACKNOWLEDGEMENTS

First and foremost, I'd like to thank my parents for their unending support and love --

Jon and Virginia Jedda

I am indebted to my adviser, who had faith in me,
even when I had doubts --

Jennifer Anderson

I would also like to acknowledge the following individuals for their help in conducting the research --

All Participants
Principals and Teachers at all of the Participating Schools
Barbara Chamberlin and Jeanne Gleason at New Mexico State University
Garry Auld
Janet Fritz
Susan Gould
Pat Kendall
Don Zimmerman

And finally, to all of my wonderful friends, but especially to the following, who have kept me grounded this past year (certainly a difficult task) by being supportive and by knowing how to make me laugh. I am very grateful and lucky --

Melissa Bardsley
Gretchen Buege (M.S.!)
Cindy Byfield (it's a good thing we don't share an office)
Lori Freese
Johanne Arteau and Dave Harms (Rifas!)
Tom-E Meier
Lori Nelander and Eric Helgoth (It ain't easy ...)
Jill Slansky
The Tavera Gang
Jess and Dave Wentworth
Karen Wilken

FUNDING AND/OR SUPPORT PROVIDED BY --

U.S. Department of Health and Human Services,
Administration for Children and Families

Colorado State University Cooperative Extension

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CHAPTER 1

Introduction and Project Overview

Since the Report of the Secretary's Task Force on Black and Minority Health in 1985, it has been recognized that distinct differences exist in health status among racial and ethnic minority groups (US Department of Health and Human Services, 1985). Numerous studies have investigated these differences further with the shift in demography setting the stage for these studies. The Hispanic population alone has altered the demographic profile of the U.S. It is estimated that by 2002 Hispanics will be the largest minority group in the U.S. (US Bureau of the Census, 2000). In the past ten years alone, the Hispanic population has grown by 73.4% in Colorado. It is expected that this "Hispanization" of America will continue, based on median ages and fertility rates.

This growing population foreshadows economic and health crises within the Hispanic community, however. Hispanics have higher levels of unemployment and lower levels of income, educational attainment, and English proficiency than non-Hispanic whites (US Bureau of the Census, 1998). They also comprise a smaller proportion of managerial, professional, and technical positions and dominate the production, labor, and agricultural occupations. Moreover, Hispanics living below the poverty level outnumber poor non-Hispanics by 2 to 1, a cause for great concern (US Bureau of the Census, 1990). Table 1.1 outlines significant differences in socio-economic variables between Hispanics and non-Hispanic whites.

Table 1.1: Socio-economic Variables among Hispanics and non-Hispanics (US Bureau of the Census, 1998a)

Socio-demographic Variable	Hispanic	Non-Hispanic Whites
Total Earnings		
Loss or < $10,000	32.1%	25.5%
$10,000 - $24,999	43.2%	31.1%
$25,000 - $49,999	19.8%	29.9%
$50,000 or more	4.9%	13.5%
Educational Attainment		
Less than 5th	1,449 (9.4%)	1,392 (.90%)
5th to 8th grade	3,054 (19.7%)	7,418 (4.8%)
9th to 12th grade	2,503 (16.2%)	14,708 (9.5%)
High school graduate or more	8,471 (54.7%)	131,586 (84.8%)
Employment		
Male Unemployed	744 (5.5%)	3,558 (2.9%)
Female Unemployed	503 (3.7%)	2,742 (2.3%)
Occupation		
Managerial and Professional	1,800 (14.7%)	35,694 (30.9%)
Technical, Sales, and Admin. Support	2,943 (24.0%)	35,098 (30.4%)
Service	2,477 (20.2%)	14,862 (12.9%)
Precision Production, Craft and Repair	1,565 (12.8%)	12,169 (10.5%)
Operators, Fabricators, and Laborers	2,785 (22.7%)	15,118 (13.1%)
Farming, Forestry, and Fishing	2,478 (20.2%)	692 (.60%)

A recent report issued by the Center for Nutrition Policy and Promotion found that low income individuals across all ethnicities, in comparison to high income individuals, were less likely to be aware of diet-disease relationships, less likely to pay attention to food labels, and less likely to eat low fat and low cholesterol foods (Morton et al., 1997). In addition, access to health care among Hispanics is far more limited compared to non-Hispanic whites because of income (Trevino et al., 1991).

Children are most profoundly affected by poverty for a variety of reasons – namely access to health care, sufficient and healthy food, and education. In Colorado, the Annie E. Casey Foundation (Annie E.Casey Foundation, 1996) found that approximately 17% of Hispanic children living in Colorado live in "extreme poverty" (based on incomes below 50% of poverty level). The average percentage is 7% for all children living in Colorado.

Certain geographical locations also have magnified levels of poverty. In Colorado, the most economically-disadvantaged areas depend on agriculture, have low levels of educational attainment, and have a high population of Hispanics: the San Luis Valley, Pueblo area, and the Arkansas Valley. See Table 1.2 for comparisons between counties in these three regions and the average for Colorado.

Table 1.2: Socio-demographic Information for Selected Counties of Colorado

County	Median Household Income Estimate[2]	% Poverty Estimate for all ages in poverty[2]	% Poverty Estimate for children age 5-17[2]	% Hispanic[1]	Educational Attainment (high school graduates)[1]
Alamosa	$26,231	22.3	26.4	42.2	76.9
Bent	$24,124	22.3	25.8	30.0	72.7
Conejos	$20,321	29.2	31.4	63.5	63.7
Crowley	$20,403	31.0	30.3	26.2	70.3
Huerfano	$20,769	23.4	28.1	44.0	65.0
Las Animas	$22,506	23.6	26.8	47.7	67.6
Otero	$24,144	23.5	28.3	38.1	69.4
Prowers	$26,485	21.3	23.6	25.6	70.2
Pueblo	$27,589	18.3	22.8	39.0	73.9
Rio Grande	$23,646	23.8	24.0	43.3	69.7
Saguache	$21,364	28.9	29.9	48.8	65.9
Colorado	*$37,235*	*10.4*	*12.2*	*14.0*	*84.4*

[1] (US Bureau of the Census, 1998b)
[2] (US Bureau of the Census, 1996)

The overarching purpose of this research project was to develop a CD-ROM program on nutrition, which targeted Hispanic children from low-income regions of Colorado – those counties and areas specified above. The idea for this project initially grew out of a project titled *La Cocina Saludable* (The Healthy Kitchen). Abuelas, Hispanic grandmothers, were recruited and trained as nutrition educators. In turn, they taught classes on nutrition and food safety to limited resource Hispanics and migrant farm workers living in these areas of Colorado. The program was very successful and resulted in positive gains in knowledge, skills, attitudes, and behaviors among participants (Serrano et al., 2000; Taylor et al., 2000). The program was expanded to touch-screen computers (Gould and

Anderson, 1999). Despite the program's strengths, it became evident that children of these families also needed to be targeted for nutrition education. Interactive multi-media (IMM) seemed to be a viable approach, since few software programs existed for children, let alone Hispanic children. IMM also provides an avenue to teach nutrition in locations where nutrition education resources are limited, irrespective of teachers' nutrition training. The current education environment is also supportive of instructional technology.

Because few studies have explored interactive multi-media development in the area of nutrition, this research project spans all levels of software development – formative evaluation, product development, and evaluation. Figure 1.1 illustrates the different components of the entire program, along with the overall timeline.

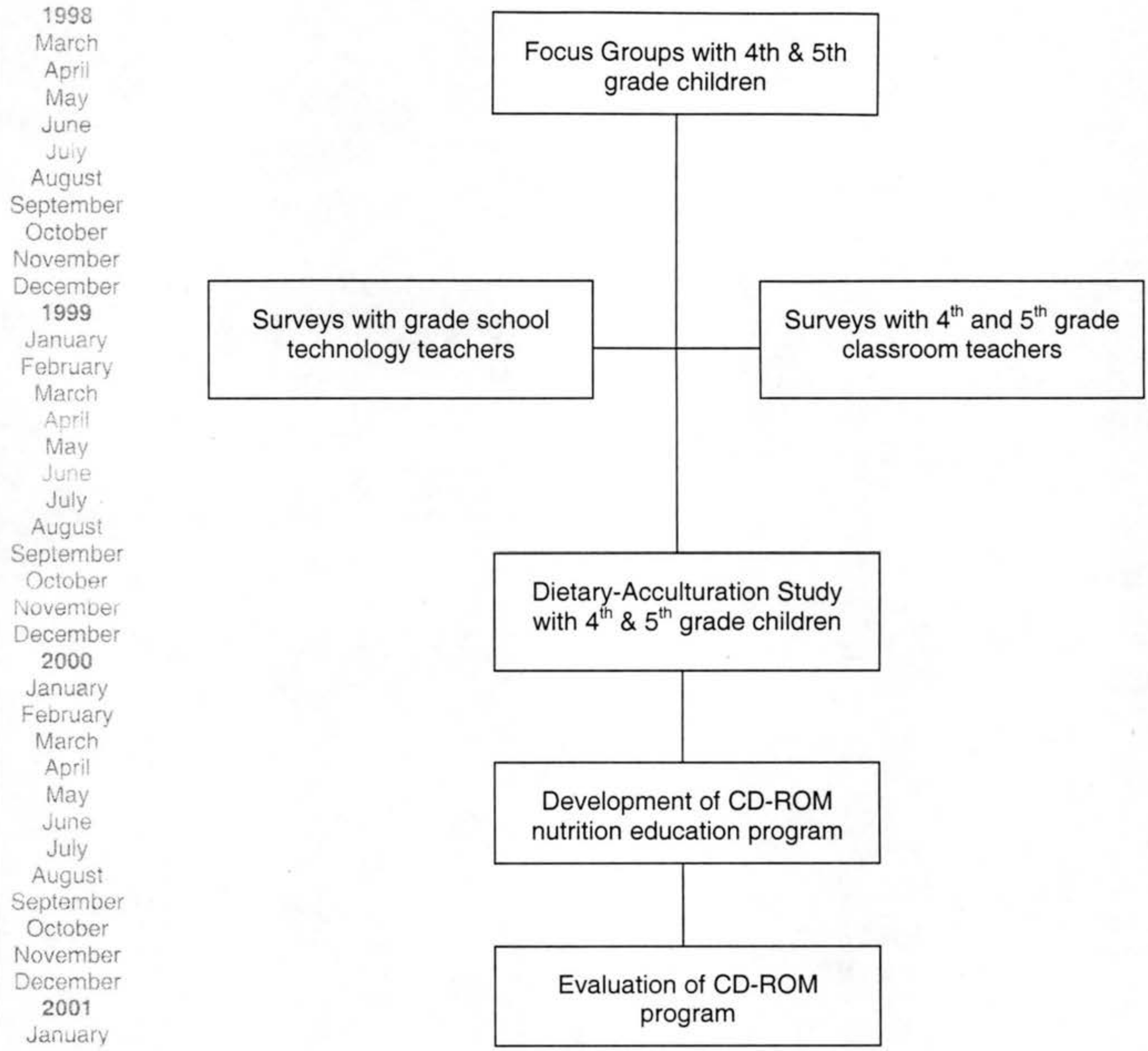
The program was conducted in several counties outlined earlier. Table 1.3 compares counties relative to research activities. See Appendices A-1 to A-6 for maps.

Table 1.3: Counties Relative To Research Activities

County	Focus Groups	Classroom Teacher Surveys	Technology Teacher Surveys	Dietary Acculturation Study	CD-ROM Evaluation
Bent		✓			
Conejos		✓	✓	✓	
Crowley		✓			
Huerfano			✓		
Las Animas			✓		✓
Otero			✓	✓	✓
Prowers		✓	✓		✓
Pueblo	✓	✓	✓	✓	
Rio Grande		✓	✓		
Saguache		✓	✓	✓	
Weld*	✓				

*Weld county is located in the northern part of the state, but has similar demographics to the other counties.

Figure 1.1: Timeline of Project



The main objectives of the program are outlined here by the respective project component:

<u>Focus Groups.</u>

- identify children's preferences (likes and dislikes) related to using and learning from computer software programs;
- understand features of computer programs -- such as format, characters, and voices – which increase children's receptivity to the computer program;
- determine children's previous exposure to and use of nutrition education computer programs;
- discover if Hispanic children respond differently than non-Hispanic children to computer programs and features of computer programs.

<u>Classroom Teacher Survey.</u>

- ascertain what subject areas and skills need to be integrated into the software program;
- identify barriers in teaching nutrition education (relative advantage of computers);
- evaluate teachers' perception to the receptiveness and effectiveness of children learning with computers;
- assess logistical issues related to program development, including length of a "typical" science class and perceived demand for Spanish materials.

<u>Media Teacher (Coordinator) Survey.</u>

- identify computer class characteristics – such as type and number of computers and accessories (speakers, CD-ROM drives) – to determine the most appropriate platform for a CD-ROM nutrition program;
- assess current use of software programs, including nutrition education programs;
- evaluate criteria for choosing software programs.

Dietary Acculturation Study.

- determine dietary patterns and "indicator" foods among 4^{th} and 5^{th} grade children based on acculturation level;
- ascertain whether three different computer programs should be developed, corresponding with the three levels of acculturation (low, moderate, high) or if one program should be developed which addresses all three levels.

Development of CD-ROM Nutrition Education Program.

- develop a nutrition education software program for 4th and 5th grade Hispanic and non-Hispanic children that incorporated findings from the formative evaluation (literature review, focus groups, teacher surveys, technology teacher surveys, dietary acculturation study)

Evaluation of Program.

- utilize on-line tracking to confirm and validate findings from the dietary acculturation study;
- track differences in food choices and examples within the computer modules to determine if acculturation affected decisions;
- evaluate the effectiveness of the software program in improving nutrition knowledge, skills, and behavior intentions;
- examine differences in computer usage and nutrition outcomes based on acculturation level.

The overall hypothesis was that a CD-ROM nutrition education program could be developed, which addressed preferences and concerns outlined by children and teachers, and which would yield improvements in knowledge, skills, and behavior intentions among all children, regardless of acculturation level.

CHAPTER 2

Literature Review

CHILDREN'S NUTRITION

Children and the Importance of Nutrition. Nutrition is key for development, growth, and overall health in childhood. Proper and adequate nutrition during infancy and childhood helps ensure optimal cognitive and physical development. It can also prevent sickness and illness and promote overall well-being (Centers for Disease Control, 1996). While poor dietary habits during childhood do not necessarily equate with adverse long-term health outcomes, it is important to foster healthy behaviors at a young age (before lifelong patterns are well established) because of the strong link between nutrition and disease. Diet plays a key role in the prevention and, in some cases treatment, of heart disease, cancer, osteoporosis, diabetes, and obesity (National Research Council, 1989; US Department of Health and Human Services, 1989). These diseases and conditions account for over half of all deaths in the US (Hoyert et al., 1999). Further, it is estimated that if Americans ate healthier, $71 billion per year could be saved in medical costs, lost productivity, and the "value of premature deaths" (Frazao, 1999). Childhood is a critical time to promote healthful eating patterns, attitudes, and lifestyles in order to prevent the onset and/or progression of these diseases.

Given the importance of nutrition in overall health and cognitive development, children's dietary behaviors have become a national priority. In the recently released national health promotion initiative, *Healthy People 2010*, eleven of the 18 objectives of the "nutrition and overweight" goal directly relate to children (US Department of Health and Human Services, 2000). (See Table 2.1.) These recommendations are based on existing data that show discrepancies between dietary behaviors and dietary recommendations. Many of the objectives included in Healthy People 2010 have been echoed by other national organizations, such as the American Dietetic Association, the American Cancer Society, and the American Heart Association (American Cancer Society, 1999; American Heart Association, 2000; Johnson et al., 1999).

Table 2.1: Healthy People 2010 Nutrition and Overweight Goals
(US Department of Health and Human Services, 2000)

No.	Objective	Current Level (%)[1]
19-3c	Reduce the proportion of children and adolescents who are overweight or obese.	11 (age 6 – 11)[2]
19-4	Reduce growth retardation among low-income children under age 5 years.	8[3]
19-5	Increase the proportion of persons aged 2 years and older who consume at least two daily servings of fruit.	28
19-6	Increase the proportion of persons aged 2 years and older who consume at least three daily servings of vegetables, with at least one-third being dark green or deep yellow vegetables.	3 (meeting both recommendations) 49 (3 servings/day)
19-7	Increase the proportion of persons aged 2 years and older who consume at least six daily servings of grain products, with at least three being whole grains.	7 (both recomm.) 51 (6 servings/day)
19-8	Increase the proportion of persons aged 2 years and older who consume less than 10 percent of calories from saturated fat.	36
19-9	Increase the proportion of persons aged 2 years and older who consume less than 30 percent of calories from fat.	33
19-10	Increase the proportion of persons aged 2 years and older who consume 2,400 mg or less of sodium daily.	21[2]
19-11	Increase the proportion of persons aged 2 years and older who meet dietary recommendations for calcium.	46[2]
19-12	Reduce iron deficiency among young children and females of childbearing age.	9 (ages 1-2)[2] 4 (ages 3-4)
19-15	Increase the proportion of children and adolescents aged 6 to 19 years whose intake of meals and snacks at schools contributes proportionally to good overall dietary quality.	N/A

Data Sources: [1]Based on 1994-96 Continuing Survey of Food Intakes by Individuals (CSFII) (2-day average) (US Department of Agriculture, 1997). [2]National Health and Nutrition Examination Survey (NHANES), CDC, NCHS, reported in Healthy People 2010 (US Department of Health and Human Services, 2000). [3]Pediatric Nutrition Surveillance System, CDC, NCCDPHP (Centers for Disease Control,1998).

Under-Nutrition. One of the first consequences of under-nutrition during infancy is retardation of growth and psychomotor development (Levitsky et al., 1997). Undernourishment – even at moderate levels -- can also have profound effects on a child's concentration, cognitive development, and performance (Center on Hunger, 1995; Levitsky et al., 1997). In fact, chronically undernourished children have been shown to attain lower scores on standardized achievement tests (American Dietetic Association, 1998). They also are less attentive to stimuli than well-nourished children (US Department of Health and Human Services, 1989).

Undernutrition affects a child through a variety of mechanisms. For example, iron deficiency has been associated with mental and motor delays in children and infants (Lozoff et al., 11991; Pollitt, 1995) and vitamins A, C, D and E and iron, zinc, selenium, copper, and magnesium have been found to affect immune status (Kubena et al., 1996). In addition to its effects on cognition, undernourishment may result in a higher susceptibility to infection and illness causing children to miss school and fall behind in class (Mainous et al., 1994). As the American Dietetic's Association statement on hunger states, "These effects of undernutrition have implications for the child's ability to develop the intellectual, interpersonal, emotional, and social skills he or she will need to function effectively in society" (American Dietetic Association, 1998).

Although chronic under-nutrition is less common now, it is estimated that about 8% of 12-year-olds in the United States experience food insecurity, "limited or uncertain *access* to enough safe, nutritious food for an active and healthy life" (American Dietetic Association, 1998; Economic Research Service, 1998). State prevalence rates range from 5.6 to 15.1%, with the average rate being 9.7%. In Colorado, the rate is 8.8%. A slightly different approach to under-nutrition is to measure food insufficiency. Food insufficiency refers to an "inadequate *amount* of food intake due to lack of resources" (Alaimo et al., 1998). Based on NHANES III findings, children, younger adults, and Mexican Americans had higher prevalence rates of food insufficiency. At any one time between 1988 and 1994, Alaimo and colleagues estimated that between 2.4 and 3.2 million children under 12 years of age old were living in food insufficient households (Alaimo et al., 1998). These data suggest that although under-nutrition is not widespread, many of its ramifications, as described earlier, may be more visible among children and Mexican American populations.

Over-Nutrition. Eating patterns have changed significantly over the past few decades within the US. Under-nutrition was once considered the largest nutrition-related problem facing adults and children in the US. Now over-nutrition or over-consumption is a far greater problem (Kennedy et al., 1997). This shift is reflected in changes in the nutrient content of the U.S. food supply over time and the increasing rate of overweight and obesity among Americans (US Department of Agriculture, Center for Nutrition Policy and Promotion, 1998; Centers for Disease Control and Prevention, 1997).

Americans as a whole are consuming more calories than they have in the past and, in many cases, exceeding the recommended dietary allowances for energy calories each day. According to the National Center for Health Statistics (NCHS) Third National Health and Nutrition Examination Surveys (NHANES) conducted between 1988 and 1991, mean energy intakes were between 100 to 300 kcal higher among adolescents and adults than in NHANES II, which was implemented between 1976 and 1980. Over-consumption did not appear to be a problem with children in the NHANES study (McDowell et al., 1994). The mean energy intakes for children between 6 and 11 in the Third NHANES study was 1745 kcal versus 1725 for the Second NHANES study. The disparity between children's and adults consumption in the two NHANES studies could be accounted for by under-reporting (Briefel et al., 1997). In the 1996 Continuing Survey of Food Intake by Individuals Survey (CSFII) -- a national USDA survey designed to measure the dietary status of Americans – there was a significant difference in intakes between two similar timepoints (US Department of Agriculture, 1998). Six to eleven year old boys consumed an average of 96% of the RDA for energy calories and girls consumed 90%, compared with 87% and 82%, respectively for 1989-1991. (The 1989 RDAs were used for both studies.)

The importance of educational programs for children, especially prior to reaching adolescence is thus apparent and further underscored when the increasing rate of overweight and obesity is highlighted. Many also argue that the RDAs are set too high, pointing to an even larger problem (Goran et al., 1994).

Food Guide Pyramid and Dietary Guidelines. Most Americans – both adults and children -- do not meet the recommended intakes of food groups outlined in the Food Guide Pyramid (Lytle et al., 1996). Based on the Continuing Survey of Food Intakes by Individuals (CSFII), Table 2.2 illustrates the number of servings consumed by Americans, two years and older (US Department of Agriculture, 1997).

Table 2.2: Number of Servings Consumed by Americans
(US Department of Agriculture, 1997)

Food Group	Recommended Range of servings	Avg. Number of Servings Consumed (based on 2-day average)
Grain	6 – 11	6.7
Vegetable Group	3 – 5	3.3
Fruit Group	2 – 4	1.5
Dairy Group	2 – 3	1.5
Meat Group	5 – 7 ounces	4.7

The table seems to be representative of children's intakes as well. According to a study by Lytle and colleagues as part of the Child and Adolescent Trial for Cardiovascular Health (CATCH) Baseline Survey, only 64% of 2- to 19-year olds met the recommendations for vegetables, while approximately 70% met the suggestions for grains, fruits, meats, and dairy (Lytle et al., 1996). This trend has been well-documented, particularly the discrepancy in fruit and vegetable intake (Baranowski et al., 1997; Kirby et al., 1995; US Department of Agriculture, 1998). Ninety-one percent of children aged 6 to 11 years are not consuming the recommended minimum of 5 servings of fruits and vegetables per day. The average is 2.5 servings per day. In another study of Hispanic children, the mean number of servings of fruits and vegetables eaten per day was 2.8 (Basch et al., 1994).

Given these data, it is not surprising that children are exceeding general recommendations for nutrients. Results from the hallmark Bogalusa Study found that the macronutrient composition of children's diets were 49% carbohydrate, 13% protein, and 38% fat (Nicklas et al., 1989). According to the Daily Values on the Nutrition Facts food label, the recommended percentages are 60, 10, and 30, respectively (US Food and Drug Administration, 1999). Other studies support these findings, illustrating that children are exceeding requirements for fat and protein and not meeting recommendations for vitamins B_6, folate, A, and E and the minerals zinc and calcium (Devaney et al., 1995; Frank GC et al., 1977; McDowell et al., 1994; VanHorn et al., 1993; Wright et al., 1991; Kennedy et al., 1995). These data suggest the need to emphasize a "total diet approach" based on the Food Guide Pyramid, to encourage consumption of grains, vegetables, and fruits (Munoz et al., 1997).

<u>Eating Away from Home.</u> Part of this trend may be attributed to the fact that less Americans are preparing and eating food at home. In fact, the percentage of individuals who eat away from home has increased by almost 33% since the late 1970's (US Department of Agriculture, 1996b). Eating away from home was considered any meals,

snacks, or beverages eaten at a restaurant or someone else's home or food purchased from vending machines or carry-out restaurants, but not consumed at home.

It is estimated that on any given day 57% of Americans eat away from home. The increase is apparent for all age groups, but most notably for young children and for females older than 20 years. Of the roughly two-thirds of school-aged children that ate away from home, the school cafeteria, someone else's house and fast food restaurants were the most common locations (US Department of Agriculture, 1998). It has been estimated that one in three school-age children obtain more than 40 percent of total calories from outside food. Beverages – primarily carbonated soft drinks -- were the most popular item consumed away from home. Lettuce salads, french fries, and mashed potatoes were the most popular vegetable items eaten at home or away. Apples and bananas were the favorite fruits. French fried potatoes, pizza, lasagna, ravioli, and Mexican foods were popular combination foods eaten away from home.

Changes in Food Consumption. With this change in eating patterns and eating away from home, it is not surprising that changes in food consumption have also taken place. In the Bogalusa Heart Study (Nicklas, 1995), there was an overall decline in the total amount of milk, vegetables, soups, breads, grains, and eggs consumed. An increase in the amounts of poultry and cheese was also seen. Further, the percentage of total fat from milk, fats/oils, pork, mixed meats, eggs, and desserts decreased. The percentage of fat from poultry, cheese, and snacks increased on the other hand. Other shifts in food consumption include substitution of margarine for butter (US Department of Agriculture, Center for Nutrition Policy and Promotion, 1998; Borrud et al., 1997; Nicklas, 1995).

Dietary Fat and Cholesterol. Research indicates that individuals with diets high in fat and cholesterol have increased risk for several diseases, particularly heart disease. This risk is in part due to the substitution of high fat items for nutrient dense low-fat items, such as whole grain products and fruits and vegetables (Dixon et al., 1997; Kennedy et al., 1999). The risk is also attributed to the fact that diets high in fat are often accompanied with diets that exceed the recommendations for energy calories (Kennedy et al., 1999). This could, in turn, lead to overweight or obesity, another risk factor for heart disease and Type 2 diabetes.

The CSFII demonstrated that 70% of children 6 to 11 years old were exceeding the RDAs for total fat and saturated fat (US Department of Agriculture, 1997). The mean percentage of calories from total fat was approximately 33% and for saturated fat 12.2%, compared to the recommended levels of 30% and 10%, respectively. These data are consistent among all income groups and racial/ethnic groups. NHANES data and the Bogalusa Study showed similar findings (McDowell et al., 1994; Nicklas, 1995). Saturated fat was found to be the prime source of fat, followed by monounsaturated, then polyunsaturated fat (McDowell et al., 1994). In the Bogalusa Study, meats were found to contribute 20.9% of calories and 31% of total fat to the diets of individuals consuming more than 40% of calories from fat. Breads/grains were the largest contributor of calories and fat to diets among individuals following the Dietary Guidelines – 24.5% and 23.4%, respectively.

The Bogalusa Study also found that children's mean cholesterol intakes -- 285 milligrams (mg) or 129 mg per 1000 kcal -- reached adolescent levels by two years of age (Hoyert et al., 1999; Nicklas et al., 1991). This exceeds the American Heart Association recommendations of consuming no more than 100 mg dietary cholesterol per 1000 kcal, even though the intake represents a dramatic decrease from the study's inception in 1973 (American Heart Association, 2000). At that time, the mean cholesterol intake was 150 mg per 1,000 kcal.

Vitamins and Minerals. Average intake of most vitamins and minerals in 2- to 11-year-olds exceed 100% of the RDA (Alaimo et al., 1994). After age 11, an increase takes place in the percentage of youth and adolescents who do not meet the RDAs. Teen-aged girls averaged 85 percent or less of the RDA for calcium, magnesium, zinc and vitamin E (Alaimo et al., 1994; US Department of Agriculture, 1998; Zive et al., 1996). The decrease reflects the decrease in calcium intake among Americans as a whole. These trends also appear to continue into adulthood. Adult females failed to meet the Recommended Dietary Allowances (RDA) for five nutrients--calcium, vitamin E, vitamin B-6, magnesium, and zinc. Adult males fell short of the RDA for vitamin E, magnesium, and zinc (US Department of Agriculture, 1997).

Calcium. The biggest source of calcium for Americans is milk. Among young children in the CSFII study, consumption of fluid milk decreased by 16 percent since the late 1970's, while consumption of carbonated soft drinks increased by 16 percent and consumption of non-citrus juices, including grape- and apple-based mixtures, rose by 280 percent (US Department of Agriculture, 1998). Another USDA study cited a decline of 24% among boys and 32% among girls aged 6 to 11 between 1977 and 1994 (Borrud et al., 1997). The type of milk consumed has also changed. The number of children drinking reduced-fat or fat-free milk doubled. By 1994 these types of milk were consumed more frequently than whole milk (US Department of Agriculture, 1996b). These studies show that milk consumption has decreased substantially since the 1970s. It appears that Americans are not compensating with other calcium-rich foods, since most Americans – particularly young women – are not meeting the recommendations for calcium and the recommended number of dairy servings per day.

Zinc. There are a number of health outcomes influenced by zinc status. Deficiencies can lead to impaired immune responses, inhibition of copper and iron absorption, and loss of appetite. According to findings from the Third NHANES, only 51.5% of children between four and six years old and 77.1 % between seven and 10, have an "adequate" zinc intake (Briefel et al., 2000). "Adequate" was based on a total zinc intake of 77% or above the 1989 RDA age/sex specific value. Males had significantly higher intakes. Fifty-nine percent of four to six year olds had "adequate" intakes and 86.9% between seven and ten, compared to 43.2% and 66.6% of females, respectively. Mean dietary zinc intakes were not statistically different among non-Hispanic whites, non-Hispanic blacks and Mexican Americans based on same sex and age.

Fiber. Dietary fiber is linked to important health benefits in children and adults – most notably, but not limited to, gastro-intestinal health and reduction of cholesterol level. For children, the recommended range in grams for fiber intake is calculated by adding between 5 and 10 to a child's age (Williams, 1995). Currently, mean dietary fiber intake among children between 6 and 11 years old ranges from 12.3 grams for females to 13.8 grams for males – on the low end of recommended intakes (US Department of Agriculture, 1997). It has been estimated that approximately half of children meet these recommendations (McClung et al., 1995). These levels have remained virtually the same since 1976 according to results from NHANES and the Bogalusa Study (Alaimo et al., 1994; Nicklas et al., 1995). Vegetables, soup, bread, and cereal appear to contribute 50 to 75% of dietary fiber to diets of 10 to 13-year olds in the Bogalusa Study (Nicklas et al., 1995).

Variety. Assessing variety of foods in a diet allows for a fuller understanding of diet quality. As part of the USDA Healthy Eating Index, "variety" is assessed by the number of foods that are consumed over a three-day period (Kennedy et al., 1995; Nicklas et al., 1995). A score of 0 is given if six or fewer food items are eaten over this period and a score of 10 for 16 different food items. Based on data from 7,463 individuals participating in the 1989 and 1990 CSFII, the mean score was 7.0 for individuals aged two and older. This number equates with about 13 different foods over three days or approximately four different foods each day. Portion sizes were determined by those outlined in the Food Guide Pyramid booklet. Concerns have been raised about the legitimacy of these criteria for determining "variety" (Chung et al., 1996). It has been estimated elsewhere that Americans on average consume 16.3 different foods per day (Pao et al., 1989).

Snacks. Approximately 82% of children aged 6 to 11 years consume snacks, accounting for 20% of total daily energy intake and 19% of total fat and saturated fat intake (Nicklas et al., 1995; US Department of Agriculture, 1997). Consumption of grain-based snacks such as crackers, popcorn, pretzels, and corn chips has increased by 200 percent since the 70s (US Department of Agriculture, 1997).

Overweight and Obesity. Obesity is a growing problem among U.S. children. Nationwide 1994 data show that one in five children in the United States between the ages of 6 and 17 is overweight, with the rate nearly doubled from 30 years ago (Centers for Disease Control and Prevention, 1997). In the study, children were considered overweight if they exceeded the 95^{th} percentile of BMI for those of their same age and sex. Among Hispanics, the rate of overweight is 35% among women and 24% among men. Data on Hispanic children are not available.

The impact of obesity on children's health is a major concern particularly since childhood obesity has been linked to adulthood obesity (Simic, 1983; Whitaker et al., 1997). In adults, obesity is associated with a wide range of diseases and conditions, such as heart disease, cancer, and diabetes. Another concern is that obese children have an increased chance of becoming obese adults, with all of the subsequent health, social, and psychological ramifications.

Research conflicts on whether obese individuals consume more energy (calories) than non-obese individuals. Gazzaniga, et al. (1993), found that the percentage of body fat was positively correlated with total fat, saturated fat, and monounsaturated fat intake, and negatively correlated with carbohydrate intake. This highlights the importance of dietary composition (higher fat intake and lower carbohydrate intake) as a contributor to obesity in children in addition to adults.

Preventing obesity is difficult since it is complex and multi-factorial (Dietz, 1998). Nevertheless it is clear that nutrition plays a key role. Heredity also has a strong influence. Healthier lifestyles are needed to treat this growing and serious problem.

Heart Disease. Heart disease is the number one killer of Americans (Hoyert et al., 1999). Research has shown that many of the risk factors associated with heart disease, such as high cholesterol, blood pressure, and triglyceride levels, track from childhood to adulthood (Knuiman et al., 1980; NCEP Expert Panel on Blood Cholesterol Levels in Children and Adolescents, 1992; Orchard et al., 1983). This points to a potential link between childhood health and long-term health status. To date it has been documented that children with triceps skinfolds greater than the 70th percentile have significantly higher blood pressures (Moussa et al., 1994). Research also indicates that aortic fatty streaks, the first stages of atherosclerosis, begin to appear in childhood, maybe even as early as three years of age (Ravussin et al., 1992).

To prevent the onset of heart disease, the American Heart Association recommends a diet high in whole grains, fruits, and vegetables, with no more than 30% of total calories from fat and 10% from saturated fat (American Heart Association, 2000). These are the same recommendations as the 1995 and 2000 Dietary Guidelines (US Department of Agriculture et al., 1995; US Department of Agriculture et al., 2000). Although heart disease death rates have declined over the past century, Americans – adults and children – still have room to improve their diets to meet the American Heart Association's guidelines, while following the Food Guide Pyramid.

<u>Cancer.</u> Although cancer is not the number-one killer in the U.S., like heart disease, people often view cancer with more fear than heart disease. Many forms of cancer can be prevented through diet. In fact, the American Cancer Society (American Cancer Society, 1999) cites that about one-third of the 500,000 cancer deaths each year in the U.S. is due to dietary factors. Although it is unclear what role childhood nutrition plays in adult cancer prevalence, according to the ACS, "The introduction of healthful diet and exercise practices at any time from childhood to old age can promote health and reduce cancer risk" (American Cancer Society, 1999). Their guidelines for cancer prevention are also aimed at people aged two years and over. They recommend choosing plant sources of foods, eating five or more fruits and vegetables a day, and limiting intake of high fat foods. Considering children's current levels of intake, improvements in diet are certainly warranted.

Diabetes. Recent reports show a new phenomenon among children and adolescents – Type 2 diabetes. This is a form of diabetes that is generally diagnosed among adults, however cases of Type 2 diabetes in four year olds have now been documented (American Diabetes Association, 2000). It has been estimated that eight to 45% of children with newly diagnosed diabetes have Type 2 diabetes. Researchers attribute this surge in Type 2 diabetes rates among youth to the increasing overweight and obesity problem. The American Diabetes Association claims that as many as 80% of children and adolescents who are diagnosed with Type 2 diabetes are overweight (American Diabetes Association, 2000). Individuals with diabetes have a higher predisposition to heart disease, blindness due to diabetic retinopathy, kidney disease due to diabetic nephropathy, and diabetic ketoacidosis.

Osteoporosis. Osteoporosis is a disease in which the bones become very fragile and more likely to break. It is a disease often associated with elderly women; however, osteoporosis actually begins at an early age and can inflict men too. By the age of 20, the average woman has acquired 98% of her skeletal mass showing the importance of "early" prevention (National Osteoporosis Foundation, 2000a). To prevent osteoporosis a balanced diet rich in calcium and vitamin D, along with weight-bearing exercise and a healthy lifestyle, are recommended (National Osteoporosis Foundation, 2000b). Given the fact that teenage girls do not meet the current RDAs for calcium, osteoporosis poses a significant problem to this population in the long-run.

Children's Attitudes towards Food. Children's attitudes toward food are influenced by their peers, messages on television, and through their parents' attitudes (Signorielli et al., 1997). Overall, children have dietary patterns which reflect those adults within their life, particularly parents who are role models and providers of food. It is not surprising that health assessments of school age children are similar to adults: low intake of fruits and vegetables; obesity; and difficulties in choosing foods low in saturated fat, total fat, and cholesterol (Kennedy et al., 1995).

Children's dietary patterns are also affected by skills necessary to perform a behavior. Today, children in the U.S. are given more responsibility in their meal and snack preparation due to the high number of working mothers, who have less time for food preparation. A survey found that over half of fourth and fifth graders reported that they prepare their own breakfast, lunch and dinners, with low-income children being responsible for more food preparation than their middle and high income counterparts (Baranowski et al., 1993; Crockett et al., 1995). Results from focus groups conducted with low income Hispanic and non-Hispanic fourth and fifth grade children in Colorado mirrored these finding (Buege, 1999). It was also found that few children actually have the actual skills necessary to take on these responsibilities.

<u>Children's Interest in Nutrition.</u> Several studies have shown that children are interested in learning about nutrition and generally believe nutrition is important to good health (Murphy et al., 1994). In one study, students rated "learning about nutrition" as very important for good health. Based on a one to ten scoring, with 1 not important and 10 extremely important, the average score among fifth grade students was 8.8. Overall children placed a high importance on good health, such as eating plenty of fruits/vegetables/grains (8.1), following the Food Guide Pyramid (7.7), and limiting sugar intake (7.4). Attitudes towards the importance of nutrition and the specific Dietary Guidelines (1996) on health decreased with age. Eighth graders in this same study rated "eating plenty of fruit/vegetables/grains" as 7.0 on a 10-point scale, following the Food Guide Pyramid 6.7, and limiting sugar intake at 6.3. Eleventh graders' attitudes

towards the Dietary Guidelines were even lower at 6.2, 5.8, and 5.9, respectively. For the most part, attitudes towards the importance of topics reflected areas that children wanted to learn about. When asked what they would like to learn about, this same study found that the top five topics of interest among fifth graders were the Food Guide Pyramid, "nutrition and disease," food safety recommendations, decreasing dietary fat, and decreasing dietary sugar (in that order) (Murphy et al., 1994).

Children's Knowledge about Nutrition. Enormous efforts have been made by nutrition educators and health professionals to inform the public about healthy eating and the Dietary Guidelines. Although dated, Levy and Derby (1995) found that only between 22 to 43 percent of surveyed individuals in 1994 and 1995 had heard about the Dietary Guidelines, the Food Guide Pyramid, or the Five-A-Day Program. (See Table 2.3.) Despite the huge disparity, significant progress was made in awareness about the Food Guide Pyramid, suggesting its effectiveness as an educational tool. (The Food Guide Pyramid is presented later in this chapter. See Figure 2.2)

Table 2.3: Awareness of Dietary Recommendations (Levy et al., 1995)

Have you heard anything about the following information on diet and health:	Percent Yes 1994 (n=1,001)	Percent Yes 1995 (n=1,001)
Dietary Guidelines for Americans	30	30
Food Guide Pyramid	33	43[1]
Five-A-Day Program	22	24

[1]Significantly higher at $p < 0.05$.

Other studies have supported these findings. Although ninety percent of the fifth graders from the Michigan study mentioned earlier were knowledgeable about the Dietary Guideline on sugar and 60% on the one about variety, less than 50% of students knew the recommended number of servings from all groups of the Food Guide Pyramid. Students were most familiar with the number of servings of fruit recommended per day and least knowledgeable about the number of meat servings: 41% knew the serving numbers for fruit, 36% for milk and calcium products, 27% for vegetables, 25% for grains, and 17% for meat. The study also found that very few of the fifth graders understood the concept of fiber.

Teachers Perceptions of Children's Nutrition. Teachers often act as indirect vehicles for assessing children's dietary intakes. Based on a Nutrition Education Training assessment conducted in Colorado, teachers were asked to give their "opinions" about dietary habits of students. Their primary concerns – not significantly different than existing data – were over-consumption of sugar, sweets, and fat, under-consumption of vegetables and fruit, and the lack of concern about nutrition (Colorado Department of Education, 1998). In Missouri, teachers top five preferred topics for additional teaching materials were the Food Guide Pyramid, "nutrition, health, and fitness," "food facts and fallacies," food selection based on sound nutrition information," and recognition of unfamiliar foods." In another study in Nevada, teachers were interested in learning more about balanced diets, nutrient sources, chronic disease prevention, and nutrition and academic performance in continuing education (Woodson et al., 1995).

Summary

Nutrition is key for development, growth, and overall health in childhood. Although undernourishment is a grave concern among certain populations, over-consumption is more prevalent now in the U.S. Americans as a whole are consuming more calories than they have in the past and are eating away from home more often. Most Americans – both adults and children -- do not meet the recommended intakes of food groups outlined in the Food Guide Pyramid. This is equated with inadequate levels of calcium, zinc, and fiber and excess amounts of calories, fat, saturated fat, and cholesterol among many children and teens. Lack of dietary variety is also an issue. Children's attitudes toward food are influenced by their peers, messages on television, and parents' attitudes. Children are interested in learning about nutrition and generally believe nutrition is important to good health. There is still a huge disparity in knowledge about the Dietary Guidelines and the Food Guide Pyramid, pointing to the importance of education in these areas.

NUTRITION EDUCATION

School Nutrition Education Programs. School-based programs can play an important role in promoting healthy lifestyles and diets among students and teachers alike – through "direct" and "indirect" avenues. These include formal health and nutrition curriculums and school lunch programs and other provisions of foods, respectively (Passmore, 1996). Every school day, 48 million young people attend more than 110,000 schools across the country -- 32.6 million of those are in elementary school (Centers for Disease Control, 1996; Current Population Reports, 1998; Centers for Disease Control, 2000a).

Because of the potential impact on long-term health in students, the U.S. Department of Agriculture's (USDA) Nutrition Education and Training (NET) Program urged in 1993 that "nutrition education be a major educational component of all child nutrition programs and offered in all schools, child care facilities, and summer sites" (Mandell, 1993). Further, the goal of the National Health Education Standards for youth is to achieve "health literacy" –"the capacity to obtain, interpret, and understand basic health information and services and the competence to use such information and services to enhance health" (Joint Committee on National Health Education Standards, 1995). Similar objectives were incorporated into the Healthy People 2000 Initiative — a national agenda to improve overall health and prevent disease. Under the priority area of nutrition, the 2000

Initiative included a specific objective for increasing nutrition education in all schools (US Department of Health and Human Services, 1991). In the recently released Healthy People 2010, however, this objective was changed to include only middle, junior, and senior high schools (US Department of Health and Human Services, 2000). This appears to reflect the shift in attitudes in the entire Healthy People 2010 Initiative rather than a statement about nutrition education's importance in grade school. ("Nutrition" is not included as a key indicator in the Healthy People 2010, but rather one of 28 focus areas under the new title "nutrition and overweight.")

School-based programs are not new, however. Because schools provide a "captive" audience, numerous nutrition education programs have targeted school-age children. According to Contento, et al. (1992), the "direct" programs can be sorted into primarily two groups and approaches: general nutrition education programs and targeted behavioral change programs. General nutrition education programs cover more broad nutrition issues, such as the role of nutrients in the body. Targeted behavioral change programs attempt to initiate specific behavior changes to ultimately reduce the risk of chronic disease, such as cardiovascular disease. Based on an extensive evaluation of school-based nutrition programs around the country, they found that the "targeted" programs showed a more positive impact on behavior than the "general" programs. In many cases, however, the "targeted" programs were more intensive, provided larger doses of interventions, and involved various components of the child's environment (food service, parental involvement) than their "general" counterparts.

Length of Intervention. The length and dosage of a nutrition education intervention is an important determinant of the program's overall impact and efficacy. According to Contento's (1992) review of school-based programs, the majority of studies involved only 10-15 hours of instruction over a 3-15 week period. According to the School Health Education Evaluation, this level of nutrition education hardly produces large-scale impacts (Connell et al., 1985). Ten to fifteen hours of health education could be expected to result only in "large" effects on knowledge, and 30 hours were needed to produce "medium" effects for general health practices above and beyond knowledge. Further, 40 hours were required for changes in attitudes and 50 to achieve consistent levels in knowledge, attitudes, and behavior. Implications from this research are that for behavior changes to be manifested, sufficient time in nutrition classes is required.

Unfortunately, these large doses of intervention are not commonplace. In a study conducted in Nevada, 17% of teachers who taught nutrition in the past school year spent less than one hour teaching nutrition, 61% spent between 1 and 5 hours, and only 22% spent more than 5 hours on nutrition. Although this is considerably lower than that reported in Colorado -- an average of 7.4 hours per year – another study in New York and New Jersey found that teachers were teaching nutrition for an average of 11.1 hours, still lower than that recommended for behavior impact, not just knowledge effects (Olson et al., 1986). The mean number of hours spent on nutrition lessons nationally was found to be 13 hours (Celebuski et al., 2000).

Current Level of Nutrition Education in Schools. Another issue is that in many cases nutrition is not even included in school curriculums, particularly in grade school where teachers are responsible for all subjects. This has tremendous impacts since the effectiveness of a school-based nutrition education program ultimately lies with teachers. Seventy-four percent of surveyed teachers in Nevada reported teaching nutrition during the prior year (Woodson et al., 1995), 68% of the surveyed teachers in New York and New Jersey (Olson et al., 1986), and 86% in Colorado (Colorado Department of

Education, 1998). The U.S. Department of Education reported that 88% of teachers reported teaching nutrition lessons to their students in the 1996-97 school year, with a higher percentage of kindergarten through second grade teachers teaching nutrition than third to fifth (Celebuski et al., 2000).

Barriers to Nutrition Education. There are many layers to the story of why nutrition education is or is not included in classrooms. Ultimately teachers are responsible for determining if it is included in their curriculums. Therefore, their concerns need to be addressed in any nutrition education intervention. The two primary barriers Colorado teachers cited to nutrition education were lack of time (according to 87% of teachers) and up-to-date materials (82%) (Colorado Department of Education, 1998). Other obstacles included lack of administrator or district support and lack of appropriate materials. Apparently student interest was not a barrier; neither was teacher interest. These results are not representative of only Colorado, however. Similar barriers and patterns have been consistently found in other states (Olson et al., 1986).

For example, although more than 90% of surveyed teachers from Iowa indicated that students needed nutrition education, approximately 40% of the teachers found that there was not adequate time to teach nutrition (Uhrich et al., 1995). The main barriers to implementation of a program in Arkansas outlined by Dollahite, et al. (1998), were competition with other subject areas, inconsistent expectations about nutrition education, and "passive support" from administrators despite the availability of resources, teacher training, and teacher initiative and interest. In Nevada over one-third of elementary teachers surveyed reported that several types of print materials and audiovisual aids were completely unavailable, particularly computer software for elementary children (Woodson et al., 1995). Nicklas and colleagues (1997) also cited administrator or district support and more specifically educational requirements, district-wide politics, staff shortages, space restrictions, and school scheduling as barriers to nutrition and health education.

Teacher Interest. Several studies have suggested that teacher interest is a prime factor in whether nutrition is taught in the classroom (Olson et al., 1993). In other words, if teachers are interested in nutrition, they will teach it. According to one study, more time was spent on nutrition among those teachers who rated themselves as "extremely interested" in the subject (Olson et al., 1993). In Colorado, 91% of teachers enjoyed learning about nutrition, which was translated into 86% of teachers teaching nutrition (Colorado Department of Education, 1998). In addition, 68% of teachers expressed an interest in teaching more nutrition.

Teacher Preparation. Teacher interest may also play a role in teacher preparation and, in turn, nutrition education. It is possible that teachers already interested in nutrition participate in in-service trainings – for self-fulfillment and educational purposes. One study found that in-service training resulted in an increased health and nutrition impact on children (Connell et al., 1985). Another study found that teachers who reported taking at least one college-level course in nutrition, studying nutrition on their own, or attending in-services on nutrition were more likely to teach at least five hours of nutrition (Gates et al., 1994). Yet another survey of 326 fourth and fifth grade teachers showed that college training was significantly associated with the presence of nutrition education in classrooms (Uhrich et al., 1995). Finally, Weiss and Kien cited teacher training as one of the most critical elements of effectively implementing school-based programs (Weiss et al., 1987). They further propose that teaching methods include how to influence behavior rather than focusing purely on nutrition concepts.

Teachers' Resource Needs. As part of a needs assessment by the Colorado Nutrition Education and Training Program (NET) (Colorado Department of Education, 1998), 600 first through fifth grade teachers were contacted in Colorado. Based on responses from 152 teachers (a response rate of 25.3%), teachers suggested more materials (for them and students), assistance with activities from food service personnel, and nutrition training. Resource needs may vary between states, districts, and schools. In Iowa 52% of teachers thought there were adequate nutrition teaching materials available at their schools (Uhrich et al., 1995).

Preferred Format and Materials. From the Colorado survey, the teachers' main sources of nutrition information were resources and materials they had collected themselves, consumer magazines, and the Dairy Council (Colorado Department of Education, 1998). A similar assessment, conducted with health educators in grades six through twelve, found comparable results. When asked what types of resources they preferred, 75% mentioned computer software, along with materials with a teacher's guide and student handouts, and videotapes. Another study conducted in Missouri found that the top five preferred formats for additional nutrition materials among elementary teachers were videotapes, games or puzzles, posters or charts, bulletin board displays, and computer programs (Gates et al., 1994).

Preferred Placement in Curriculum. In Colorado, nutrition was often taught as part of health and science. This was also found in Iowa (Uhrich et al., 1995) and Missouri (Gates et al., 1994). Apparently, this is a nationwide trend as demonstrated by results of a survey conducted by the U.S. Department of Education – 39% of teachers integrated nutrition with health/physical education and 33% with science (Celebuski et al., 2000). About one-third of teachers (35%) taught nutrition as a separate subject. State standards could partially explain how nutrition is taught and with what subjects. In Colorado, nutrition is included in the "science" standards. The standards recommend that kindergarten to fourth grade students know and are able to describe the basic food requirements for humans (Colorado Department of Education, 2001).

Children's Learning Preferences. In addition to understanding what nutrition resources teachers want, it is important to know what methods and types of information are preferred by children to elicit their interest in nutrition. Based on one study in Michigan with 83 fifth graders, students' preferred strategies for learning were games (52%), food experiments (51%), and computer games (40%) (Murphy et al., 1994). Information presented from teachers was considered the least preferred method of learning (6%).

Behavior Models. Behavior change models play an important role in guiding intervention programs. Programs that are behaviorally-based and theory-driven are more successful in achieving behavior change (Contento et al., 1992). Achterberg and colleagues suggest that nutrition education use a minimum of two or more complementary theories, when possible (Achterberg et al., 1985).

Social Learning Theory (SLT), also referred to as Social Cognitive Theory (SCT), has shown great efficacy with children's programs, most likely due to its cognitive component. SLT incorporates behavior, personal factors, and environmental factors into a triadic, reciprocal model, as illustrated in Figure 2.1 (Bandura et al., 1977; Bandura et al., 1982; Bandura, 1986).

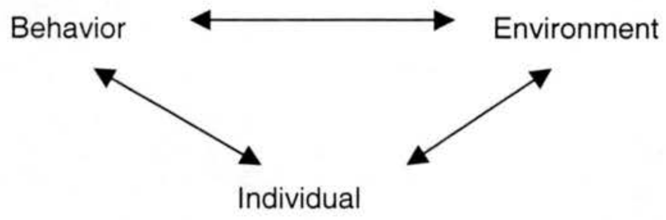


Figure 2.1: Social Learning Theory

Individual characteristics include socio-demographics, culture, learning styles, cognitive stage, knowledge, preferences, and attitudes. One's environment encompasses physical, social, and institutional structures – such as home, parents, teachers, friends, and schools. The theory also has a number of key constructs. (See Table 2.4)

Table 2.4: Social Learning Theory Constructs and Definitions (Bandura, 1986)

Construct	Definition
Individual	Characteristics related to an individual – socio-demographics, culture, learning styles, cognitive stage
Environment	Physical, social, and institutional structures which affect individual characteristics and behavior -physical -- home & school -social – role models (parents and teachers) and peers -institutional -- school
Behavior	Specific identified behavior
Reciprocal Determinism	Triad between behavior, environment, and individual
Self-efficacy	Confidence in performing behavior
Social Support	Modeling and emotional support to promote behavior
Expectation	Evaluation of behavioral outcome
Expectancy	Value placed on behavioral outcome
Reinforcement	Incentives and rewards for performing behavior

SLT-driven health behavior programs typically use techniques, which emphasize the "cognitive mediators of behavior," such as expectations, observational learning, reinforcements, and self-efficacy (Glanz and colleagues, 1990; Parcel et al., 1987; Jaycox et al., 1983; Coates et al., 1981). Programs with parental and school involvement allow for certain environmental factors (such as the availability of healthful foods) to be addressed, thus strengthening the program's theoretical framework (Coates et al., 1981; Crockett et al., 1995; Kirks et al., 1982; Perry et al., 1988).

Parental Involvement. Parents play a critical role in providing dietary choices and modeling to their children by molding their physical and social environment. Given parents' importance, Weiss and Kien go as far as saying that "school-based attempts to alter nutrition attitudes and behavior may be antagonistic to family attitudes and behavior unless schools plan for greater parental involvement" (Weiss et al., 1987). Numerous school-based programs have targeted both parents and children – some had varying levels of success in eliciting behavior change (Crockett et al., 1989; Dollahite et al., 1998; Kirks et al., 1982; Perry et al., 1988); others reaped no additional benefit than a traditional school-based program (Petchers et al., 1987).

The degree of success appears to depend on the level of parental involvement. One study used two different levels of parental involvement – the first involved a classroom-based intervention with take-home materials for parents. The second level expanded on the first level, by including a parent-oriented curriculum that mirrored that taught within the classroom. The results indicated that the parent-oriented curriculum had significantly greater impacts than the classroom-only class in the areas of diet knowledge, efficacy, intention, outcome expectation, modeling, parent-child communication and child involvement at home with food and cooking (Crockett et al., 1989). Kirks and colleagues (1982) found that parental involvement played a more significant role with younger children than older children. They attributed it to young children spending more time interacting with parents and the lack of "dominant peer pressure." Contento and colleagues' (1992) review of school-based research also upheld this finding. Despite the importance of parental involvement, the majority of teachers report that they involve parents only to a "small extent" or not at all in nutrition activities, including homework assignments.

Multi-Cultural Nutrition Education Programs. This is an area that shows great promise, but which has not been pursued is school-based nutrition education programs for multi-ethnic groups. In a comprehensive review of nutrition education programs, Lytle called for further research in the area of multi-ethnic groups (Lytle, 1994).

Computer-Assisted Nutrition Education. Interactive computer technology and multi-media have advanced in the past ten years as growing opportunities for nutrition education. They have the flashiness of mass media – with animations, video, and music – while still providing avenues for education. According to Lytle and Achterberg computer-assisted nutrition education is also as an effective way of "promoting learning and behavior change" (Lytle et al., 1995). In comparison to other subject areas such as math and reading, however, few nutrition education computer programs exist for school-aged children. In fact, a search of the National Agricultural Library's Food and Nutrition Software and Multimedia Programs Database for programs for grade school children yielded only four software programs, as shown in Table 2.5 (Food and Nutrition Information Center, 2000). No interactive multi-media nutrition programs for Hispanics were found, even though computer-assisted education is considered an effective medium for immigrant and Latino children (Bellman et al., 1990; Chavez, 1990; Chisholm, 1994). As one author stated, it provides a "risk free environment" for students to express their ideas without criticism (Padrón et al., 1996).

Table 2.5: National Agricultural Library's Listing of Multimedia Programs for Grade School Children (Food and Nutrition Information Center, 2000)

Name of Program	Producer	Main Activities	Target Age
5 A Day Adventures	Dole Food Company, Inc.	Interactive program with music and videos to promote 5-A-Day fruits and vegetables	Grades 1 - 4
The Breakfast Quest	General Mills, Inc.	The program includes a Breakfast Calculator which allows for nutrient analysis of breakfast. It also has a lesson about the Food Guide Pyramid.	Grades 3 - 9
Eat for Health	Genesee Intermediate School District	Analyzes meals and diets. Includes activities for classrooms.	Grades 5 - 8
Ship to Shore	Penn State Nutrition Center	The program is an interactive game based on a fictional Columbus' voyage	Grades 6 - 8

The Food and Nutrition Software and Multimedia Programs Database may not be all-inclusive, but it does illustrate the limited supply of multi-media programs for children and Hispanics on nutrition. One of the software programs highlighted by the database is Dole's *5 A Day Adventures* program, an excellent example of a creative strategy for promoting intake of five fruits and vegetables a day (Zlotkin, 1996). Currently used in classrooms as well as a number of other settings (including English as a Second Language classes for older Hispanic women), *5 A Day* illustrates the extent an interactive computer program can offer creativity and depth. Songs and animated fruits and vegetables are used to stimulate the child's interest in the program. The program has also been extended to include an interactive website (Produce for Better Health Foundation, 2001). Unfortunately, neither has been thoroughly evaluated: Current reports are only anecdotal.

Another program developed for late elementary students included in the NAL database was "Ship to Shore," a program delivered by floppy disk. In this program, students become "apprentices" to Christopher Columbus. They are faced with decisions and must utilize math, science, language arts, and social studies concepts (Matheson, 1994). Results from the evaluation indicated that fantasy and character identification, sounds and animation, and use of appropriate graphics affected students' interest and learning. Matheson further commented on this by stating, "To assure that the nutrition concepts embedded within these stories were accurately interpreted, attention must be given to the realism and accuracy of the graphics, and to the level of prior knowledge of the students" (Matheson, 1994). She also encourages incorporating problem-solving assignments with an evaluation component to help students learn. The other two programs found in the database have not been evaluated and reported on elsewhere.

Computer-Assisted Nutrition Education for Adults. Despite the limited number of programs for children, a plentiful supply of nutrition computer programs is available for adults. These range from diet analysis programs to nutrition education programs. Of those computer programs that have been reported on, computer-assisted nutrition education has been well-received. According to Carroll and colleagues, ninety-three percent of interviewed clients participating in the Supplemental Food Program for Women, Infants, and Children (WIC) had positive feelings about using an interactive multi-media nutrition education program. They appreciated this method of communication because of its "nonjudgmental nature and privacy in learning" and because it allowed self-paced learning (Carroll et al., 1996). In fact fifty-four percent of the clients reported that they liked multi-media over talking to a person.

One form of computer-assisted nutrition education, which has found success with adults, is computer-tailored nutrition education programs. As the name suggests, the computer generates specific messages based on an individual's stage of behavior and/or psycho-social characteristics. Campbell, et al. (1999) found that individuals that received tailored messages had significantly improved knowledge, stage of change, and certain eating behaviors compared to the control group. All women who participated in their study were low-income women who were receiving food assistance. Another program conducted in The Netherlands was successful in reducing fat and increasing fruit and vegetables using tailored messages (Brug et al., 1999).

While computer-assisted nutrition education programs appear promising for a wide range of audiences, Lytle and Achterberg (1995) caution that special effects not be used at the expense of content and overall nutrition messages. Kolasa and Miller echo this by stating that technology should not deviate from the intent and purpose of the program" (Kolasa et al., 1996). Finally, Campbell and co-workers (1999) highlight the importance of formative evaluations in developing effective multi-media programs. As they stated in their conclusions, their formative evaluation contributed to the "level of participation and acceptability that was achieved with a 'hard to reach' audience."

<u>Diffusion of Innovation.</u> One theory that adapts well to computer technology and computer-assisted education is Roger's theory, the Diffusion of Innovation (Rogers, 1983; Rogers, 1994). This theory posits that the diffusion and adoption of innovations are determined by the scientific attributes of the innovation along with perceptions of the specific adopter. Innovations are considered new ideas, practices, or services. Diffusion refers to the process by which an innovation is adopted or communicated over time. Rogers identifies several variables that determine the rate or speed of adoption of

innovations -- perceived attributes of innovations; type of innovation-decision; communication channels; nature of the social system; and extent of change agents' promotion efforts. Of the attributes related to "new" innovations, he cites relative advantage, compatibility, complexity, trialability, and observability as important factors in how individuals perceive the innovation, thereby determining the rate of adoption (Rogers, 1986). To enhance the success of a nutrition education software program, these characteristics should be addressed prior to and during development and implementation.

Nutrition Education Tools. Over the years, there have been a number of nutrition education tools that have been developed to promote healthy attitudes and behaviors towards nutrition. As a guideline for crafting nutrition education messages, the Dietary Guidelines Alliance compiled a list of suggestions for writing effective nutrition messages based on focus groups with consumers (The Dietary Guidelines Alliance, 1996). They suggest customizing messages to a particular audience by following these hints:

- Keep tips positive, short and simple.
- Be specific.
- Don't assume that the consumer understands the benefit of the action or behavior.
- Make the messages manageable and doable.
- Avoid referring to foods as "good" or "bad."
- Provide concrete, measurable results.
- Be realistic.
- Incorporate examples and foods that are culturally-appropriate to your audience.
- Use humor only when possible and appropriate.
- Cite activities that are time-saving.

Dietary Guidelines. The first edition of the *Dietary Guidelines for Americans* was published in 1980 jointly by the U.S. Department of Health and the Department of Health and Human Services to "respond to the public's need for authoritative, consistent guidance on diet and health (US Department of Agriculture et al., 1980)." The Dietary Guidelines consistently form the basis of federal policy and nutrition education and information programs. Because the underlying research for the Guidelines is constantly changing, Congress passed an act requiring that the Dietary Guidelines for Americans be revised every 5 years, after a thorough review of research studies by the Federal Dietary Guidelines Advisory Committee.

The most recent *Dietary Guidelines for Americans* were released in June 2000, the fifth edition, based on the ABCs to good health (US Department of Agriculture et al., 2000):

> **A**IM FOR FITNESS...
> Aim for a healthy weight.
> Be physically active each day.
>
> **B**UILD A HEALTHY BASE...
> Let the Pyramid guide your food choices.
> Choose a variety of grains daily, especially whole grains.
> Choose a variety of fruits and vegetables daily.
> Keep food safe to eat.
>
> **C**HOOSE SENSIBLY...
> Choose a diet that is low in saturated fat and cholesterol and moderate in total fat.
> Choose beverages and foods to moderate your intake of sugars.
> Choose and prepare foods with less salt.
> If you drink alcoholic beverages, do so in moderation.

Food Guide Pyramid. Developed in 1984 by the U.S. Department of Agriculture, the Food Guide Pyramid) goes beyond the "basic four food groups" to help put the Dietary Guidelines into action (US Department of Agriculture, 1996a). It is a great illustrator of what to eat each day. (See Figure 2.2.) Not only has it formed the base of many meals, but of many nutrition education programs. It is based on extensive research highlighting the importance of different foods (and relative quantities) in providing the nutrients and energy for optimal health and the prevention of disease. Many studies use the Food Guide Pyramid as a reference point for evaluation to assess the sufficiency of Americans diets in achieving basic dietary recommendations.

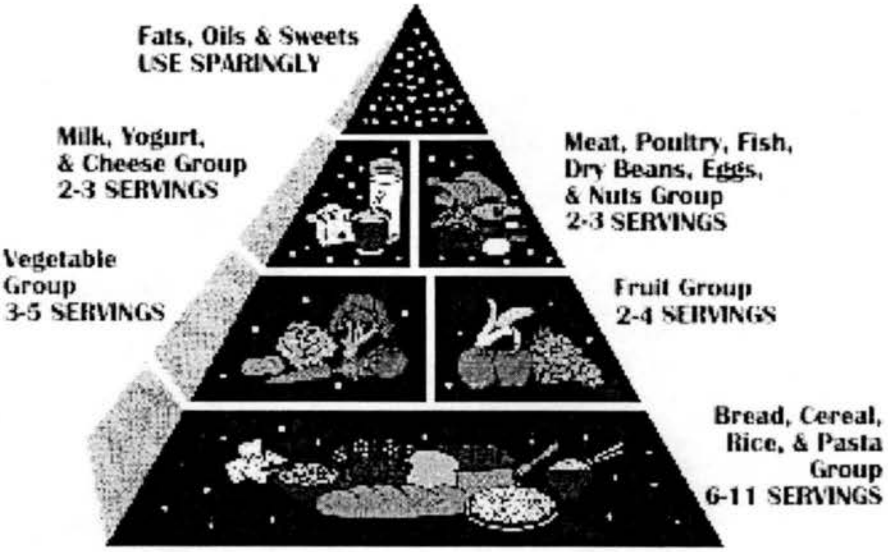


Figure 2.2: The USDA Food Guide Pyramid

Evaluation. Reliable, valid, and sensitive are all terms related to the efficacy of an evaluation tool in making conclusions about a program's impact (internal validity) and applicability to other programs (external validity). Reliability and validity are examined below. Sensitivity refers to the degree to which an instrument can successfully filter through differences between individuals' responses in the evaluation tools.

Evaluation is an important tool in justifying a program, as well as providing guidance for future programs. There are typically three types of program evaluation: formative, process, and summative (including impact) (Windsor et al., 1994). A formative evaluation involves a needs assessment (feasibility study) to identify condition- and people-specific problems facing a population to formulate goals and objectives for the program, as well as potential evaluation instruments. This can be done several ways (quantitative and qualitative) – through a review of the literature and by conducting surveys, interviews, or focus groups. Process evaluations include more of a qualitative evaluation to ensure that a program is being implemented as intended and, if not, to make appropriate changes before the program is completed. These evaluations can be in the form of feedback from program participants and personnel, review of personnel time and budget, and evaluation of attrition and retention rates. Summative evaluations involve the final review of the program, and if applicable, an impact evaluation (such as knowledge, skills, behavior, cost-benefit analysis).

Validity. Validity refers to the extent to which an instrument measures what it is supposed to measure (Windsor et al., 1994). In nutrition, food frequency questionnaires are common tools for determining dietary intake. If researchers were interested in assessing fruit and vegetable intake, they would need a questionnaire that contained popular fruits and vegetables. If the list did not include juices, such as orange juice, however, the instrument would not be valid, since juice is a major source of fruit intake. In this case, the instrument is not accurately measuring fruit and vegetable intake.

For dietary assessments, overall validity is often determined by comparing one instrument (that is being tested for "validity") to another one (that has proven validity and reliability) and then determining correlations (Hu et al., 1999; Willett WC et al., 1985). In many cases, this involves comparing an instrument that is less time-, cost-, and labor-intensive (such as food frequency questionnaires) to methods that require more input (food records and observations) (Baranowski et al., 1986; Feskanich et al., 1993). Feskanich and colleagues (1993) attained Pearson correlations of .17 to .95 (depending on the food) when they compared one food frequency questionnaire to diet records. Longnecker and co-workers yielded a .52 median correlation between a food frequency questionnaire and diet records, which they cited as being "similar to that reported previously" (Longnecker et al., 1993). Hu and associates (1999) attained correlations ranging from .45 to .74 between a food frequency questionnaire and a diet record and considered that "reasonable" validity.

There are several specific forms of validity. Face validity is the extent to which the instrument "appears" to measure what it is supposed to (Windsor et al., 1994). Content validity is the extent to which the instrument measures the full-breadth of a program's content. Construct validity is the extent to which the instrument relates to a theoretical framework. And criterion validity is the extent to which an instrument relates to another tested instrument. Face validity and content validity are most commonly used within nutrition education. These are conducted through pilot-tests with 10 – 20 individuals. Responses to the instrument are reviewed to verify that answers correlate (for the most part) to expected answers. If they do not correspond, the instrument will need to be revised and pilot-tested again. An example of this would be a survey to identify the "types" of computers used within schools. A pilot test with schools may show that schools respond with the answer, "personal computer." This may or may not be useful. If you want to know what platform of computers they have, the wording will need to be revised to probe for appropriate answers, such as "IBM 486."

Reliability. Specifically, reliability refers to the extent to which an instrument will produce similar results if administered several times (Windsor et al., 1994). If an instrument is not reliable, it is difficult to be confident about any reported findings and inferences. For example, if a thermometer is used to measure if someone has a fever and the first reading is 96.0, the second 102, and the third 99, it is difficult to be confident about any conclusions (even though the mean is relatively "healthy"). Considering that 96 reflects a "hypothermic" state and 102 a sign of infection or illness, the variances have profound implications for treatment. A reliable instrument's readings would be more like 102, 102.5, 101.5: In this case, it is clear in all cases that the individual has a fever.

Reliability can be measured through a variety of ways. The main forms include:

1) Internal consistency of the instrument measured with a Cronbach-alpha test.
2) Multiple form test – the administration of two forms of the same test to measure correlation between results from the tests using Pearson's correlation for continuous variables and Cohen's kappa for discrete variables.
3) Split-half – the randomization of questions in the instrument into two sets of data. Pearson's correlation is used for continuous variables and Cohen's kappa for discrete variables to determine correlations between results.
4) Test-re-test (this has a lower reliability than the other methods due to potentially uncontrollable biases) – the administration of the same instrument at two different times. This may result in several biases: individuals may improve just by taking the test; and the first test may have alerted them to some issues which they have investigated since the last administration of the instrument, this results in improved scores (Windsor et al., 1994).

Typically a reliability correlation of 0.70 or higher is recommended for general reliability, but 0.90 is required to support clinical measures (Nunally, 1978). Still, lower coefficients in dietary assessment are often considered "adequate." Willett and colleagues obtained intraclass correlation coefficients of .49 to .71 for different nutrient values when they conducted test and re-tests using food frequency questionnaires. They still found that it provided "useful information" (Willett WC et al., 1985). They attributed the variances – in part -- to week-to-week variations and supplement use (Salvini et al., 1989). Feskanich and Willett (1993) had similar results in a different study investigating reproducibility. They obtained Pearson correlations between .31 for pie to .92 for coffee. The mean was .59.

<u>Selecting an Evaluation Instrument.</u> Reliability and validity become important issues when selecting a measurement method technique. Baranowski and Simons-Morton (1991) outline a number of criteria in selecting a measurement instrument:

1) prior assessment -- validity and reliability
2) precision – level of detail and sensitivity

3) appropriateness – cultural and developmental
4) implementation – sound procedures, conversions, respondent burden, staff burden
5) financial -- cost-effectiveness

Given these criteria, a data-collection method should be chosen that "most clearly meets the nature and purposes of a study, within resources and constraints" (Windsor et al., 1994).

Selecting a Dietary Assessment Tool. Dietary assessment is a critical tool in nutrition education programs and interventions. There are several classes of dietary assessments: dietary records, written as meals are eaten; diet recalls, recalling what was eaten; diet history, usual eating patterns over a given period of time; and food frequency questionnaires, quantity and frequency of food eaten in a designated time. Each has strengths and weaknesses. According to the Dietary Assessment Resource Manual written by Thompson and Byers (1994), dietary records and dietary recalls are the "gold standard" since they provide quantitative information and have the potential of being extremely accurate. They also address the above-mentioned criteria of prior assessment, precision, appropriateness, and implementation. Cost may be a factor if recalls are obtained through personal interviews. Under-estimates and incomplete records are two other major concerns (Gersovitz et al., 2000).

Food frequency questionnaires ask respondents to report how often they eat a list of foods for a specific period. Characteristics of the foods are often omitted, such as portion size and preparation technique. The advantage of using food frequency questionnaires is that data entry (and coding) is easier and respondent burden lowered; implementation is therefore easier than with dietary records. The major limitation is that many details of dietary intake are not measured and therefore precision and conclusions based on food frequencies are limited.

Dietary assessments with children pose a different set of issues, since children may not be able to recall dietary patterns and habits as accurately and thoroughly as adults (Baranowski et al., 1994). Individual interviews appear to be the most effective method of dietary assessment with children who are at least in fourth grade; below that age, it is recommended that their parents are interviewed (Baranowski et al., 1991). Baranowski and colleagues have found that self-reported food frequency questionnaires and observer's food record of the child's consumption produced 82.9% agreement – pointing to this technique as a viable alternative for children's dietary assessment (Baranowski et al., 1986).

Summary

Lack of time is considered one of the biggest barriers to teaching nutrition in schools, pointing to the possibility of integrating nutrition into the curriculum with other subject areas. Large doses of intervention will yield more behavioral impacts. School-based programs should be behaviorally-based and theory-driven. Social Learning Theory appears to be a successful theoretical framework for school-based nutrition education programs. Nutrition education should use a minimum of two or more complementary theories, when possible. To have a greater impact, attempts should be made to involve family and intervene on the school environment. Teacher input and training (in some cases) is requisite for a successful nutrition education program. Teachers perceived computer software as "unavailable" suggesting that few computer software programs on nutrition exist for elementary children. Computer software appears to be a viable nutrition education tool as long as messages are not lost through fancy imaging and as long as facets of the Diffusion of Innovation framework are taken into account.

At all costs, evaluation should be incorporated into all phases of research projects. Reliable, valid, and sensitive evaluation instruments should be used to substantiate results.

LATINO HEALTH ISSUES

Food Choices. Nutrition education programs might jointly target risk factors associated with genetics and behavioral factors to improve overall health. In order to effectively do this, however, it is important to have a clear picture of all of the factors that influence food choices, although this may be difficult. As Nestle, et al., state, "A blend of many factors, ranging from biological to anthropologic, interact in complex and changing ways to influence the development and maintenance of food choices" (Nestle et al., 1998). Acculturation is one component of this. Other societal-level values include: cultural values; perceptions, beliefs, attitudes and values; social influences; the media; availability; and variety. They also include individual-level influences, such as food preferences and history.

Food Acceptance. According to Day et al., "Food acceptance is a complex reaction determined by the physiologic, psychologic, biochemical, social, educational, and sensory reactions of individuals who move in a framework of race, religion, tradition, economic status, and environmental conditions" (1978). To investigate some of the attitudes toward choosing foods, Day and colleagues interviewed 40 Mexican American women from southern New Mexico. What they found was that the top four choices for serving foods "intensively" were: preparation (it can be prepared in different ways);

sensory factors (it tastes good); economics/geography (it is easily attained and in the food budget); and health (it is nutritious).

Cultural Influences. Jerome believes that culture is the most important determinant of behavior. Therefore ethnographic research should be integrated with nutrition studies in order to determine: sources of temporal variation, inventories of food supplies and pathways, patterns of consumption, population characteristics, traditions surrounding food, and appropriate language for surveys (Jerome et al., 1981). Further, Jerome (1997) points to the importance of culture-specific dietary assessments. Kumanyika and Golden (1991) advocate this approach as well. In fact, they suggest incorporating time-trend perspectives into analyzing cultural differences.

Latino Health. Cultural perspectives are becoming increasingly important as the U.S. demography changes. As was described earlier, by the year 2002 it is expected that non-Hispanic whites will become a "minority" group in the U.S. with Latinos playing a leading role in America's profile (US Bureau of the Census, 2000). With this shift, it is important that health issues specific to these once "minority" groups are addressed.

The importance of preventive medicine and nutrition education is clear when Hispanic nutrition and health issues are investigated. According to comprehensive national surveys, certain diseases and health conditions have been identified to occur with higher incidence and prevalence among the overall Hispanic population than the non-Hispanic white population. These include Type 2 diabetes (Diehl et al., 1989; Hamman et al., 1989; Flegal et al., 1991), obesity (Diehl et al., 1989; Pawson et al., 1991; Hazuda et al., 1991), gall bladder disease (Diehl et al., 1989), and pancreatic and stomach cancer (Carter-Pokras, 1994). In fact recent findings indicate that during the 1990s Hispanics had a 38 percent increase in diagnosed diabetes compared to whites who saw an increase of 29 percent (Centers for Disease Control, 2000b).

In addition, at every age and for both men and women, non-Hispanic black and Hispanic persons reported worse health than non-Hispanic white persons (Kramarow E et al., 1999). There are also substantial differences in health status across Hispanic subgroups, with health indicators significantly worse for Puerto Ricans and Mexican Americans than Cuban Americans and "other" Hispanics (Hajat et al., 2000). Despite these findings, hypertension (Ramirez, 1996; Rewers et al., 1996) and heart disease rates (Maurer et al., 1990) are overall lower or similar to those rates found in non-Hispanic whites.

Latino Dietary Intake. Research from the Hispanic Health and Nutrition Examination Survey (HHANES) pinpointed whole milk, hamburgers and soft drinks/soda (three "non-traditional" foods) as the three most important sources of energy for Hispanic women between the ages of 17 and 34, comprising 7.0%, 6.0% and 5.5% of total energy, respectively (Block et al., 1995). Dietary analysis from migrant Puerto Rican families living in the South Bronx emphasized the contribution of milk and hamburgers as leading energy sources (Sanjur et al., 1986). Further HHANES research indicated that the top three fat sources, accounting for 25% of fat intake, were from hamburger, whole milk and eggs, corresponding to the leading caloric foods consumed by the sample. The top three protein sources were beef steaks/roasts, hamburgers, and whole milk, highlighting the contribution of protein foods as the leading fat and thus energy sources for Hispanics.

These results are also valid for Hispanic children. Similar to women, the top five energy sources for children between the ages of one and five were whole milk/whole milk beverages, breads/rolls/crackers, eggs, soups, and hamburgers/cheeseburgers and fat sources whole milk/whole milk beverages, eggs, hamburgers/cheeseburgers, soups, and hot dogs/ham/lunchmeat (in that order). The top three fat sources accounted for 38% of fat for children. Murphy and researchers also found that Hispanic children from the HHANES study exceeded the recommended meat servings (Murphy et al., 1990).

Other important findings (Block et al., 1995):

- 54% of women consumed soft drinks, 31% of children.
- Top 3 vitamin A food sources for children: carrots, cold cereals, and milk
- Top 3 vitamin C food sources for children: orange juice/grapefruit juice, fruit drinks, oranges/tangerines
- 37% of children ate cold cereal
- 32.7% of children ate pinto beans
- 31.1% children drank fruit drinks
- 82.4% children drank whole milk/whole milk beverages

Regardless of whether Hispanics maintain some "traditional" eating behaviors, non-Hispanic whites, as a whole, appear to eat more healthfully than Hispanics. Results from the San Antonio Heart Study showed that Mexican American females consumed more calories, carbohydrates, and cholesterol than non-Hispanic whites and Mexican American males consumed more carbohydrates, saturated fat, and cholesterol, regardless of socio-economic status and acculturation (Haffner et al., 1985). Keys and Hegsted scores, which are summaries of atherogenic diets based on saturated and polyunsaturated fats and cholesterol intake, indicated that Mexican American males and females ate more atherogenic diets than their non-Hispanic white counterparts.

Despite these findings, data show that Mexican Americans eat more fiber than other Hispanics, non-Hispanic whites and non-Hispanic blacks. The average fiber intake for all

Mexican Americans was 17 grams daily, closer than the other groups to the 20-30 grams recommended by the National Institutes of Health (Alaimo et al., 1994). Adult Mexican American males age 20 and over consumed nearly 24 grams of fiber on average, while teenage males consumed nearly 20 grams. The study did not indicate what contributed to the higher fiber intake.

Latino Children's Dietary Intake. According to the National Coalition of Hispanic Health and Human Services, Hispanic children consumed more than the recommended daily cholesterol level and less than the recommended number of servings from the breads, fruits, and vegetable groups (National Coalition of Hispanic Health and Human Services Organization (COSSMHO), 1995). Another study conducted with Hispanic children revealed that knowledge was limited concerning the relation between food and health, particularly in the areas of high-sugar and high-fat foods (Olvera-Ezzell et al., 1994).

Migrant Farm Workers. Hispanics comprise the largest percentage of migrant farm workers in the U.S. (US Bureau of the Census, 1998). Many migrant farm workers are also recent immigrants. Occupation reflects both socio-economic status and lifestyle and, in turn, may influence dietary requirements and dietary intake. The Colorado Migrant Health Program cites poor nutrition as a key "special health need" related to migrant farm workers in addition to occupational hazards, inadequate housing and field sanitation, and physically demanding labor (Colorado Department of Health, 1994). Specific nutritional concerns include anemia, low weights, obesity, low resistance to infectious illnesses and hunger. Due to the high rate of mobility, continuous comprehensive health care and education is also difficult.

Migrant Children. Migrant children have been found to have a higher incidence of hospitalization and chronic illnesses than children in the remainder of the population. Data from Larson, et al. (1974), reported that vitamin A deficiency was the most prevalent nutritional problem of young migrant Mexican American children from the Lower Rio Grande Valley of Texas, measured through dietary, clinical, and biochemical measurements. This was followed by vitamin D deficiency and low caloric intakes. Overall, heights and weights were below standards, symptomatic of undernutrition. Results from focus groups conducted in southern Colorado highlighted the migrant farm workers' awareness and concern about the health of their children. According to Palmeri and co-workers (1998), low income Hispanics and migrant farm worker focus group participants wanted their children and family to eat more healthfully by "consuming more fruits, vegetables and milk" and "eating a balanced diet." They also expressed a desire to discourage their children from "consuming pop, 'junk foods,' fast foods, candy, and chips."

Summary

A wide range of factors influence food preferences and choices. These include cultural values; perceptions, beliefs, attitudes and values; social influences; the media; availability; and variety. Certain diseases and conditions are more prevalent among Latinos, such as Type 2 diabetes, gall bladder disease, pancreatic and stomach cancer, and obesity. Given Hispanics' current diet, nutrition education is warranted to improve overall risk for disease, overweight and obesity. Migrant farm workers -- primarily Hispanic -- have specific nutritional concerns including anemia, low weights, obesity, low resistance to infectious illnesses and hunger. Migrant children have higher incidence of hospitalization and chronic illnesses than children in the remainder of the population.

ACCULTURATION

Definition. Acculturation has been defined as the "cultural change that results from continuous, first-hand contact between two distinct cultural groups (Berry, 1992)." Acculturation is more loosely defined as the *process* of change that results when two cultures (people, societies) come into contact with each other first hand. Different types of change can occur as a result of this contact. On the group level, these include physical, biological, political, cultural, and social relationship changes (Berry, 1992). At the individual level, numerous psychological and behavioral changes take place (Berry, 1980). According to Berry, these changes are largely dependent on "moderating factors" existing prior to acculturation and during acculturation. (See Figure 2.3.) These include migration motivation, expectations, status, societal attitudes, and social support. When total acculturation takes place, it is considered "adaptation" or "assimilation." Depending on one's perspective, the consequences can be either positive or negative: positive in that the adoption of new traits may position the person more optimally in the new society and provide more opportunities for advancement; negative in that traditional behaviors, values, and customs may be entirely abandoned or shed.

Importance of Acculturation. Acculturation has been a growing concern in the U.S. due to the developing population of minority and immigrant populations—from Asia to Latin America. In fact, social theorists now point to these emerging groups as "majority" populations illustrating the demographic changes. Given this growth, multiculturalism has also become an issue across the county. Within schools this has been driven primarily by, but not limited to, the bilingual education movement (Garcia, 1990). Sensitivities to different cultural beliefs and traditions have also been heightened on a national level not only within schools, but employment settings and political movements.

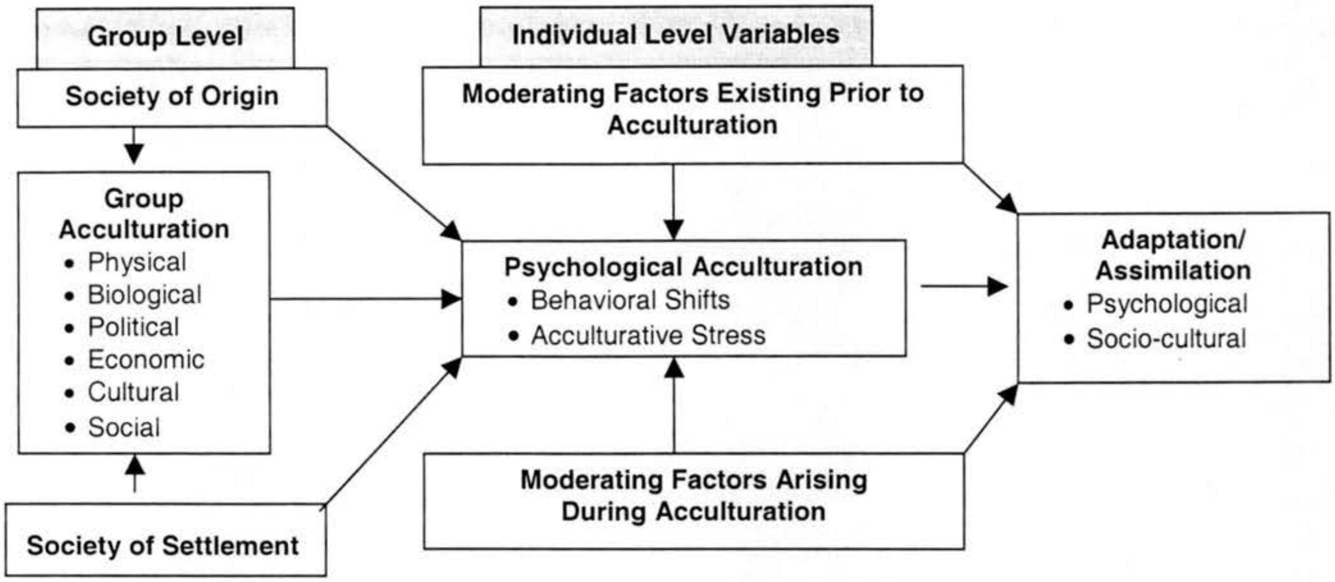


Figure 2.3: Factors Influencing Acculturation (Berry, 1980)

Adjustments Related to Acculturation. The acculturation process can be traumatic, since it involves cultural and linguistic adjustment. Such terms as "culture shock," "culture stress," and "acculturative stress" have been used to describe this phenomena. According to Brown (1994), there are four stages and reactions to the acculturation process: 1) euphoria; 2) culture shock; 3) recovery; and 4) adaptation or assimilation. The severity of the reactions depends on a number of factors, including coping strategies, initial health, age, and education (Berry, 1980). The adaptive process is also dependent on time: It is likely that given time, an individual will become either well- or mal-adapted. Magaña and colleagues (1996) found that Mexican Americans who shifted to the English-speaking culture had significantly more years of education and lived in the U.S. longer compared to individuals who identified mostly with their native culture. This shows that familiarity with the host culture is key before an individual transitions from identification from one culture to a new one.

It is unclear in what stage of acculturation individuals experience the most stress. One view holds that the level of distress may be higher among the less acculturated (Alston et al., 1992; Cuellar et al., 1997; Vega et al., 1984). Another postulates that as acculturation increases, the higher the expectations for achievement, resulting in more stress (Kaplan et al., 1990). What is known is that certain factors may foster and sustain stress. Cuéllar and Roberts (1997) found that gender and socio-economic status were significant predictors of depression, more specifically females and individuals with low-incomes. Mehta (1998) indicated that feelings of acceptance were directly related to mental health in study participants from South Asia. Further, Cobb (1976) found that loss of social support in the form of family and close interpersonal relationships was one of the most significant aspects of acculturative stress. Balcazar, et al. (1997), confirmed this. They found that family cohesiveness (prior to migrating) was a significant factor in acculturative stress, particularly when the individuals were classified as "traditional." This is not surprising, considering that Rueschenberg and Buriel (1989) found that despite increasing social systems outside of the family as a result of acculturation, the "basic internal family system"—cohesion, expressiveness, organization, control, and conflict—remained unchanged.

Smart and Smart (1995) believe that the acculturative stress experienced by Hispanics is very unique and cannot be compared with others' experiences, such as Europeans. In fact, certain characteristics inherent in the Latino culture may actually impede movement through the stages of adjustment: discrimination on the basis of skin color; illegal immigration; geographic proximity which allows for ongoing "connection" with native country and may enhance resistance to the adoption of new traits; the legacy of armed conflict (Central America in particular); Hispanic reliance on physical labor coupled with fewer jobs in this area and a higher demand for technical expertise; and unique Hispanic emphasis on social and family ties.

For children, acculturative stress may be even more devastating. They are faced with demands to perform well in school, along with demands to psycho-socially adjust to new surroundings. Prewitt-Diaz and Santiago (1998) found that recent migrant children had lower self-esteem than their non-migrant counterparts. They also perceived that their performance in school and learning were lower and that they exhibited more anxiety.

To address some of these concerns, Smart and Smart (1995) encouraged counselors and social service workers to assess stress level, address unique language needs, and provide social support and social skill building. Schools should also address adjustment issues for recent immigrant children.

Paradox of Acculturation. Acculturation as a whole is a paradox with no consensus on acculturation's "external" explications, such as its theoretical structure or even how it should be used in assessment/evaluation (Magana et al., 1996). Further, there are questions about the "internal" framework of acculturation, such as why some individuals experience a faster pace of acculturation while others retain traditional behaviors, attitudes, and values.

Linear Model. Despite this paradox, a multitude of information and theories about acculturation are available. The theories can be grouped into primarily two schools of thought. One posits that acculturation follows a linear, unidirectional, unidimensional route from low acculturation to high acculturation, as shown in Figure 2.4 (Park, 1928; Stonequist, 1937). As individuals become more acculturated, they acquire traits of the host culture.

$$\text{(Low) 1} \xrightarrow[\text{Cultural Orientation}]{\text{Mexican American}} 3 \xrightarrow[\text{Cultural Orientation}]{\text{Euro American}} \text{5 (High)}$$

Figure 2.4: Unidimensional Acculturation Model

<u>Bicultural Model.</u> The other supports a "bicultural" model, where individuals do not necessarily adopt "host" traits at the expense of "native" traits, but rather become "fluent" in both cultures. This model was developed after the limitations of the unidimensional model were identified. As Mendoza states (1989):

> Because acculturation involves the interaction of at least two cultures, theoretical and empirical formulations must measure and describe the degree of acquisition of the customs of an alternate society, as well as the degree of retention of native cultural customs. This perspective helps distinguish between individuals who are similar in their level of immersion into an alternate society but dissimilar in the degree to which they have retained their native customs.

The largest contrast with the unidimensional model is that the bicultural model incorporates ethnic identity and socialization into the model. It also assumes, as Mendoza states, that individuals can co-exist in both cultures without being at serious conflict about either, so persons can either be well-grounded in both Mexican American and Anglo cultures (in the case of Mexican Americans), or persons somewhat anomic, or marginal, without strong roots in either culture (Szapocznik et al., 1980). This was formally known as "dual culture personality." See Figure 2.5.

The implications of this model are that "bicultural" and "marginal" individuals respond and react differently to both cultures. The literature suggests that "marginal" individuals are marked by negativity and character traits that predispose them more to mental health and overall social adjustment problems, as illustrated in Table 2.6 (Aellen et al., 1969; McFee, 1968). They feel isolated from both the "native" and "host" cultures.

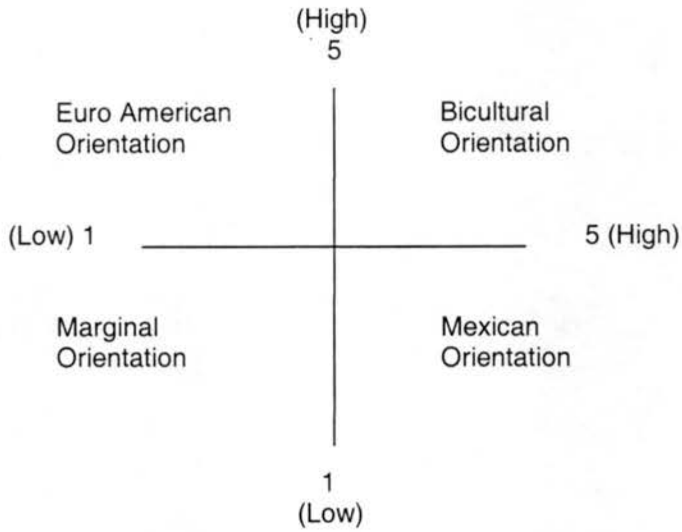


Figure 2.5: Bicultural Model (Buriel, 1993)

"Bicultural" individuals, on the other hand, appear to possess two social persona and identities and exhibit greater behavioral and cognitive flexibility to different cultural situations (Padilla, 1994). They are easily able to switch from one cultural orientation to another and generally have a positive attitude toward both cultures.

Table 2.6: Traits of Bicultural and Marginal Persons (Padilla, 1994)

The bicultural person	The marginal person
Confident	Self-hatred
Secure	Low self-esteem
Well adjusted	Anomie
Open to other people	Insecure
Socially/culturally tolerant	Closed to other people
Cultural translator/broker	Feelings of inferiority

Mutual Acculturation. Until now the focus of acculturation and biculturalism research has been on immigrant groups. But as the Hispanic population grows, there may also be a need for Euro-Americans to reciprocate. According to Buriel (1993), Euro-Americans may not develop the competencies to be "bicultural," however they may be able to build an appreciation and respect for the cultural differences.

Measuring Acculturation. Because there has not been any consensus on what variables define acculturation, measuring acculturation level has been even more difficult. To simplify this, acculturation has been limited to only a few questions about acculturation in many cases—such as length of residence in the U.S. and/or generation number in the U.S. (Hiller et al., 1991). These questions, however, do not explore the depth of psycho-social adaptation or the interaction between various behaviors and social or even linguistic factors. Their limitations are often compounded by questionnaires with only a few questions on ethnicity and/or culture, "indirect measures of cultural values" (Betancourt et al., 1993). As Padilla (1994) affirms, "Simple questionnaires that force an individual to select white, Asian, African American, Hispanic and American Indian are too simplistic and inadequate in assessing the multiplicity of ethnic, racial, and cultural backgrounds that constitute an individual's core identity and that determine how a person responds to different social contexts."

To address these concerns, several acculturation scales have been developed. Measures of acculturation typically determine where individuals are in the process of acculturation, while focusing on certain domains of acculturation—such as behavior, ethnic loyalty, cultural awareness, social relationships, language use, and food preferences. Still, as Dana and colleagues (1996) state, "Acculturation measures differ greatly in the amount and kinds of information they yield." Despite this limitation, each scale provides some insight into acculturation and cultural self-identification.

Measuring Unidimensional Acculturation. A unidimensional assessment of acculturation commonly includes questions about language, social relations, ethnic identity or the psycho-social factor of interest, with ordinal response formats that can be averaged or summed (Burnam et al., 1987; Cuellar et al., 1995; Hazuda et al., 1988). *Exclusively Latino (or Hispanic), mostly Latino, both equally, mostly Anglo (or non-Hispanic), exclusively Anglo* are common response formats. A high score suggests high acculturation, a low score low acculturation—for example "exclusively Latino" might be given a "1" while "exclusively Anglo" a "5." This type of scale is simple and straight-forward to measure, but limiting since it embeds both bicultural and marginal orientations in the middle of the range—the same limitations as its respective model. Nevertheless, these instruments are still warranted and fruitful provided their limitations are taken into account, especially since the implications of marginality and biculturality may not be relevant in some cases (disciplines). See Table 2.7 for the most widely used unidimensional scales.

Measuring Bi-Dimensional Acculturation. Measuring acculturation for the bicultural model proves to be slightly more difficult, but can be used to assess mutual acculturation as well. To effectively measure biculturality or marginality, the individual's identification with the host culture and the native culture need to be assessed separately. This can be accomplished several ways and even by using ordinal responses, as for the unidimensional scales. Separate items can be used within a questionnaire to assess identification with the different cultures (Oetting et al., 2000). The unidimensional scale can also be scored based on the number of answers reflecting identification with the native culture, with the host culture, and equally with native and host cultures. The result is a set of three bipolar scales. This latter approach is termed "bidimensional scoring." An alternative to these options is to use a scale specifically designed to measure bi-

Table 2.7: Most Widely Used Unidimensional Acculturation Scales

Acculturation Scale Title	Authors	Measured Variables	Validity/ Reliability	Primary Use
The Acculturation Rating Scale for Mexican Americans (ARSMA)	Cuéllar, I., Harris, L.C., & Jasso, R. (Cuellar et al., 1995)	20 items measured through four factors: • Language use and preference • Ethnic identity • Cultural heritage and ethnic behaviors • Ethnic interaction	$\alpha = .88$[1] Test-retest = .80	Mental health, although cited in over 85 different scientific journals and used for several purposes
Dimensions of Acculturation and Assimilation in the San Antonio Heart Study	Hazuda, HP, Stern, MP, Haffner, SM (Hazuda et al., 1988)	6 dimensions were studied: • Adult proficiency in English • Adult pattern of English versus Spanish language usage • Value placed on preserving Mexican cultural origin • Attitude toward traditional family structure • Sex-role in organization • Interaction with members of mainstream society	$\alpha \geq .6$[1]	San Antonio Heart Study (Determination of risk profile for diabetes and heart disease)
Modified Cuellar Scale for Mexican Americans	Delgado, JL, Johnson, CL, Roy, I (Delgado et al., 1990)	Modified Cuellar scale with 8 questions: • Language ability • Self-identification • Parents' ethnic identification • Generation in the U.S.	N/A	Hispanic Health and Nutrition Examination Survey (HHANES)
The Multigroup Measure of Ethnic Identity (MEIM)	Phinney, JS (Phinney, 1992)	14 items measured: • Positive ethnic attitudes • Sense of belonging • Ethnic identity achievement • Ethnic behaviors or practices • "Other group" orientation	$\alpha = .81$[1] for high school students $\alpha = .90$[1] for college students	Ethnic identity
The Short Acculturation Scale for Hispanics (SASH)	Marin, G, Sobogal, F, VanOss Marin, B, et al. (Marin et al., 1987)	12 items	$\alpha = .92$[1] $r > .70$[2]	Ethnic identity
Measurement of Acculturation in a Community Population of Mexican Americans	Burnam, A, Hough, RL, Karno, M, et al. (Burnam et al., 1987)	26 items	$r > .70$[2]	Based on ARSMA and the Behavioral Acculturation Scale

[1] internal consistency (Cronbach's alpha); [2] concurrent validity
NA = not available

dimensionality, such as that developed by Cuellar and colleagues (1995): The Acculturation Rating Scale for Mexican Americans II (ARSMA-II). See Table 2.8

Table 2.8: Most Widely Used Bi-Dimensional Acculturation Scale

Acculturation Scale Title	Authors	Measured Variables	Validity/ Reliability	Primary Use
The Acculturation Rating Scale for Mexican Americans II (ARSMA-II)	Cuéllar, I., Arnold, B., Madonado, R. (Cuellar et al., 1995)	50 items measured, including assessment for two cultures: • Language use/preference • Ethnic identity • Cultural heritage and ethnic behaviors • Ethnic interaction	$\alpha = .68$ to $.91$[1] test-retest = .72 to .96 $r = .89$[2]	Mental health

[1] internal consistency (Cronbach's alpha); [2] concurrent validity

Assessing Children's Acculturation Level. Measuring children's acculturation level proves to be even more difficult and limited than adults. Based on a literature search, only three acculturation scales for children were found, highlighting the need for research in this area. See Table 2.9. Only one scale was found that was administered directly to children (Barona et al., 1994); the other two were administered to teachers and/or parents (Franco, 1983; Martinez et al., 1984).

Table 2.9: Children's Acculturation Scales

Acculturation Scale Title	Authors	Measured Variables	Validity/ Reliability	Primary Use
Children's Hispanic Background Scale	Martinez, R, Norman, RD, & Delaney, HD (Martinez et al., 1984)	30-item Martinez scale	Test-retest: .92 r=.50	Children, schools
Children's Acculturation Scale (CAS)	Franco, J (Franco, 1983)	10-item Likert-type scale which takes about 5 minutes to complete (administered to parents or teachers)	$\alpha = .77$[1] Test-retest: .97 r (with ARSMA) = .76[2]	Children, schools
The Short Acculturation Scale for Hispanic Youth (SASH-Y)	Barona, A, Miller, JA (Barona et al., 1994)	12 items	$r = .96$[3]	Children, schools

[1] internal consistency (Cronbach's alpha); [2] concurrent validity; [3] split-half reliability

Dietary Intake and Acculturation. Numerous studies have shown a relationship between acculturation and dietary preferences and intakes. It is clear why this exists: many native traditions and foods are no longer available. Also, social and peer influences persuade changes in perspective and attitude towards "new" foods resulting in dietary habits that reflect those of the new country.

An analysis of dietary recalls with first- and second-generation Mexican Americans in the United States showed that first generation Mexican Americans consumed significantly more protein, carbohydrates, vitamins A and C, folic acid and calcium than did second-generation Mexican Americans, despite a much lower socio-economic status (Guendelman et al., 1995). In another study consumption of "new" foods (nontraditional foods) among recent immigrants from Mexico who moved to the Sacramento Valley increased 44 percent, while the use of traditional foods decreased 33 percent (Nutrition Reviews, 1987).

Based on research with Mexican American immigrants in California, Eunice Romero-Gwynn and colleagues (1993) found that there were foods that were "highly sensitive," "moderately sensitive," and "stable" to change (and acculturation) within the Chicano culture. Highly sensitive foods included Mexican sweet bread, lard, pasta soup, Mexican dairy cream, home made fruit beverages (aguas frescas), atole (milk-based hot beverage). Highly sensitive adopted foods include white sliced bread, margarine, ready-to-eat breakfast cereals, vegetable salad, salad dressing, mayonnaise, cooking oil and artificial fruit drinks such as Kool-Aid, Tang and Gatorade. Moderately sensitive foods include tostadas, meat soup with vegetables, eggs, refried beans, rice cooked with milk and sweetened with sugar, cooked vermicelli, and chilaquiles (a tortilla, egg, salsa, and cheese casserole). Ham, flour tortilla, cooked vegetables as a side dish, plain cooked rice, sour cream, and ice cream were incorporated into their diets at a moderate rate. Licuado (milk blended with fruit), corn tortilla, green and red salsas, tacos, and rice cooked with tomatoes or other vegetables were found to be "stable." Vegetable, pancake, cold milk, and cheese intake increased slightly. Many of these changes were attributed to substitutions for traditional ingredients that were no longer available or too costly. For example, Mexican sweet bread was replaced by toast with jelly/jam and margarine or butter. Ready-to-eat breakfast cereals replaced the traditional oats and milk breakfast beverage, "atole."

Length of residence was significantly and inversely correlated with intake of vitamin C-rich and vitamin A-rich fruits and vegetables based on a study with Mexican American and Puerto Rican mothers in the Supplemental Food and Nutrition Program for Women, Infants, and Children (WIC) in Chicago (Chavez N et al., 1994). A similar trend was seen in a different study, conducted twenty years prior. Duyff and colleagues (1975) found that the majority of Puerto Rican teenagers who lived in Chicago did not meet the recommended dietary allowances for vitamin A, along with calcium and iron They also found that those teens who had lived in Chicago longer had lower iron takes, but higher milk intakes. Typical patterns of the U.S. also emerged – intake of low-nutrient, high-calorie snack foods was prevalent among study participants. At that time, the five foods consumed by the highest percentage of the sample were milk, rice, cola, bread, and sofrito (a Puerto Rican sauce).

Inmink and colleagues (1983) studied the impact of different migration patterns on diet. They found that individuals who migrated to the U.S. permanently ("forward" migrants) maintained diets higher in protein and fat than groups of individuals who migrated to the U.S. then returned to Puerto Rico ("return" migrants) and individuals who never migrated from Puerto Rico ("non-migrants"). There was a trend for micronutrients as well. Forward migrants had significantly higher intakes of calcium, iron, vitamin A, riboflavin, and vitamin C than non-migrants. They also found that return migrants had higher calcium and vitamin C intakes than non-migrants.

<u>Men's Diet and Acculturation.</u> Among recent immigrants, men's dietary changes are similar to women's. Another study looked at the dietary intake patterns and acculturation levels of 106 Hispanic immigrant men—mostly Mexican Americans--through a cross-sectional study (Gardner et al., 1995). Based on a semi-quantitative food frequency questionnaire (FFQ) and a 17-item acculturation scale, Gardner, et al., found that corn tortillas, carne asada, refried beans, salsa, rice, chicken, apples, jalapeños, bistek, black beans, bananas, and pan dulce were consumed by more than 50% of participants. Other dietary findings suggested that protein intake was almost twice that of the RDA—123 g. versus 63 grams/day. Total fat and saturated fat intakes were 33 and 12.2%, respectively.

Related to a qualitative question about dietary changes as a result of migration, they found that the current diet of participants was considerably different than that pre-migration. Participants had higher current intakes of poultry, wheat, prepared foods high in fat, prepared foods high in refined sugars and sugared drinks and lower intakes of pork, poultry skin, fish, cheese, nonfat milk, lard and margarine. Another interesting finding was that 90% of participants reported consuming high fat cheeses or whole milk, supporting findings from Block et al. (1995), who found that milk was one of the largest sources of calories and fat in Hispanic women and children's diets. In fact, half of the participants had never tried lowfat or nonfat dairy products. The overall diet appeared adequate in all essential nutrients.

Further, they found that the number of traditional foods in the diet was not related to acculturation level, but that dietary variety (the number of foods) was higher for men with higher acculturation scores. Contrary to other findings, total vitamin C intake correlated positively and significantly with acculturation. When looking at "atherogenic" nutrients, they found no association between them and acculturation level.

Children's Diet and Acculturation. Children's dietary intakes are also affected by acculturation and "new influences." In 1984 Dewey, Stode, and Fitch (Dewey KG et al., 1984) found that, based on food frequencies, immigrant preschool children increased their consumption of lunch meats, hot dogs, chips, and canned juice after moving to the U.S. (California). They also decreased consumption of several "traditional" foods, such as nopales (cactus), chayote, sweet potato, jicama, chicharrones (fried pork skins), and tamales. They also found that on average there was an increase in basic foods by 46%, a decrease in traditional foods of 33% and an increase in new foods by 44%. Basic foods included different types of meat, eggs, milk, cheese, fruit, juice, vegetables, bread, rice, and pasta. Traditional foods included tortillas, beans, chili peppers, mole, chorizo, and posole. New foods were lunch meats, hot dogs, canned foods, frozen vegetables, ice cream, and soft drinks. The study was a prospective study, but still shows interesting trends.

Based on Jerome's food patterning model of core, secondary, peripheral, and never foods (see next page), Koehler, Harris, and Davis (1989) investigated dietary intakes of 160 Hispanic, Navajo Indian, and Jemez Indian children in New Mexico. They found that soda, tortillas, cereal, whole milk, chips/salty snacks, bread/rolls, eggs, citrus fruit, other fresh fruit, fruit juice, fruitade, and lemonade were core foods of Hispanic children diets.

children diets. Major regional core foods included tortillas, salsa, green chile stew, enchiladas, tacos, burritos, and green chile.

Other Cultures. These trends illustrate that as acculturation rises, consumption of American foods increases, while consumption of native foods decreases. This trend among Hispanics is also evident in other cultures. Based on a bicultural model, Lee and associates (Lee et al., 1999; Lee and colleagues, 1999) found that as acculturation rose, Korean Americans adopted more American foods, particularly for breakfast and lunch. They also found that those individuals considered bicultural tended to incorporate more different types of foods into their diet.

Dietary Patterning. Jerome (1982) provides a framework for many of the dietary patterns and shifts that occur as a result of acculturation. This framework is based on "consumption frequencies and patterns of recurrence in the overall diet." Based on analysis of diets for a period of ten years, Jerome found that individual foods in a person's diet fall into distinct categories. Essentially, each person's (and culture's) diet is composed of a "core" diet, which includes foods that are eaten almost everyday and which are relatively stable during a repatterning process. At the next level is the "secondary core" diet with foods that are still common, but not as common and stable as the "core" foods. Located in the outer circles, peripheral, ceremonial, and marginal diets consist of foods that are eaten infrequently and which "tend to enter and leave the established pattern more frequently" (Jerome, 1982). This is depicted in Figure 2.6.

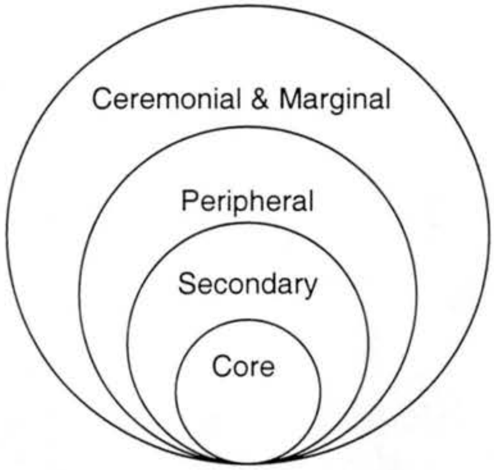


Figure 2.6: Dietary Patterning (Jerome, 1982)

The following table, 2.10, illustrates the specific dietary components of the framework.

Table 2.10: Dietary Patterning Organizational Framework (Jerome, 1982)

Factor	Core	Secondary	Peripheral	Ceremonial	Marginal
Recurrence	Constant	Constant	Constant	Constant	Inconstant
Frequency-of-Use	Very high	Moderately high	Moderately low	Very low	Very low
Calendrical Use	Nx day/ or week	Nx/week	Nx/month	Nx/year	Nx/year

<u>Health and Acculturation.</u> Coupled with nutrition, many disease risk factors of immigrants converge with those of the host population. Espino and Maldonado (1990) found that acculturation was a strong predictor of hypertension among elderly Mexican Americans. Cobas and colleagues (1996) found that low birthweight was indirectly associated with acculturation (using the modified Cuellar scale). Dietary intake – total calories, calcium, iron -- was an intervening variable between acculturation and low birthweight. Research has also shown that acculturation plays a role in several additional risk behaviors and factors – smoking (Epstein et al., 1998), obesity (Hazuda, 1988; Popkin et al., 1998), cervical screening (Harmon et al., 1996), eating disorders (Pumariega, 1986), drug use

(Brindis et al., 1995), and access to medical care (Chesney et al., 1982; Wells et al., 1989).

Socio-Economic Status and Acculturation. Many argue that socio-economic status is actually the contributing factor– not acculturation (Marks et al., 1987). The premise is that as acculturation rises, income potential increases resulting in increased purchasing power for such things as "luxury" foods and medical care. For example, one study with HHANES participants found that increased education, increased income, and older age were associated with greater access to health care (Solis et al., 1990). Acculturation did not play a significant role: only language was a predictor of health care utilization among Mexican Americans and Cuban American men. A study conducted at Colorado State University with elderly Mexican Americans found that socio-economic level was associated with consumption of high-fat meats, mixed dishes, and fats, but that acculturation was only associated with high-sugar foods (Butler, 1989).

Overall, it appears that the roles of socio-economic levels and acculturation may vary depending on the measured variable, since many studies illustrate an acculturation effect independent of socio-economic status. Espino and Maldonado (1990) found that acculturation was a stronger predictor of hypertension than socio-economic status among elderly Mexican Americans. And Hazuda and colleagues (1988) found that the effect of acculturation on overweight and obesity was stronger than socio-economically mediated factors. Nonetheless, these contradictory findings highlight the importance of measuring both socio-economic and acculturation levels, along with health variables.

Acculturation Issues for Education. Educational achievement is an obvious concern among children who are adapting to a new culture. While the children are acclimating and adjusting to a new culture, they are faced with high demands to learn English (if not already known) in order to actively participate in classroom discussions and lessons. To date Hispanic students achieve below national norms in literacy (Goldenber et al., 1991). Garcia-Vazquez and colleagues (1995) found that the factor that impacted student perfomance the most was English proficiency.

Results of surveys with 5,266 children of immigrants found that length of U.S. residence was related to students' overall academic performance in school along with standardized mathematics and reading scores (Portes et al., 1996). Length of residence is sometimes used as a measure of acculturation. The study, completed with Cuban, Vietnamese, Haitian, and Mexican immigrants, also highlighted parental socio-economic status and hours spent on homework as contributors to performance.

According to Reyes-Blanes and Daunic (1996), utilizing "context embedded teaching" can enhance learning among recent immigrants, while improving sensitivity to their culture among the rest of the class. They suggest the following characteristics to be incorporated into school curriculums to promote cohesiveness among students:

1. information from the student's home language and culture;
2. a holistic teaching approach in which meaning is emphasized over grammar;
3. lessons, content and materials that are meaningful to the learner and based on cultural commonalities; and
4. lessons that promote peer collaboration (enhances "content and language mastery")

Bilingual Education. Benefits of bilingual education are more effective learning, improved self-respect and sense of self-worth, and gradual exposure to the majority culture. While there are limiting factors, Larson and Davis (1981) suggest that administrators and educators should exhibit caution and forethought since initiating such programs can provide long-range benefits with minimal disturbance to the minority group. When compared to the alternatives, bilingual education and acculturation has produced more positive results than negative results. According to a study conducted with 80 children, Buriel (1993) also found that respect for cultural differences was high for all groups of children.

Educational materials should not be directly translated for the target population. According to Saini and Rowling (1997):

> "Translated information is decontextualised from the sets of knowledge and meanings of the population group to whom the information is directed. Thus, the cultural context underpinning the original version is transferred to different cultural contexts which are treated as homogenous groups."

<u>Translation.</u> Typically in translation, equivalence is the desired outcome—that is the materials are "equivalent" in more than one language (Del Greco et al., 1987). There are several levels of equivalence, including conceptual, construct operationalization, linguistic and scalar (Edwards, 1994). Conceptual equivalence refers to equivalence in understanding among the targeted cultures, construct to the transition from theory or ideas to measurement, linguistic to vocabulary, idioms, grammar, and syntax, and scalar to the compatibility of meaning across measures. To enhance equivalence, one should:

1. Assess the need for translation
2. Determine overall appropriateness of the content and actual messages: Is the content considered "etic" (relevant to all cultures) or "emic" (culture-specific)? Are there colloquial expressions, which may not be understood cross-culturally?
3. Analyze the reading level of the original, un-translated materials
4. Provide adequate context for the items to be translated
5. Utilize key informants to help prepare materials for translation through discussions and/or focus groups
6. Translate by "decentering"--translating and making necessary adjustments to the original document—back-translating, or using a committee approach where a group of individuals jointly translate the document.

Summary

Considering that acculturation is not measured uniformly, the implications of acculturation on health and even education are nebulous. With a growing immigrant population, acculturation issues will become increasingly important. Acculturative stress can affect many dimensions of a person's life, including self-esteem. For children, it is important to ease this transition and minimize stress related to it. Many changes occur as a result of acculturation – including dietary changes. Our knowledge of acculturation and nutrition is still limited, however. Acculturation was not measured consistently or uniformly for dietary studies. In some cases, acculturation was measured only by length of residence. Socio-economic variables should be measured alongside acculturation.

COGNITIVE DEVELOPMENT

Information Processing Theory. A strategy for understanding the intricacies of cognitive development is information processing theory. As the name suggestions and as Robert Siegler confirms, "The basic assumption underlying this theory is that thinking *is* information processing (Siegler, 1986). Like Piagetian theory, it attempts to answer "what" develops and "how" development occurs in relation to cognitive development. It goes beyond that, however, to understand "structural" characteristics of acquiring, storing, and retrieving information, along with processes of thought.

There are several assumptions related to information processing theory. The first is that thinking is limited by the amount of information that can be stored and the speed by which information can be processed (Bjorklund, 1995). Secondly, thought is flexible and adapts to circumstances (Siegler, 1986). Finally, information is believed to move through a system (Atkinson et al., 1971).

Information Flow. As a simplification of the memory system, Figure 2.7 depicts the flow of information in the mind according to information processing theory (Atkinson et al., 1971). As illustrated in the diagram, there are essentially three "structures" to information flow -- sensory registers; short-term or working memory; and long-term or permanent memory. (These are also referred to as stores.) Information from the environment enters the mind through our senses briefly. It then moves into short-term memory. Interchanges between short- and long-term memory help formulate responses to the current condition or problem. Short-term memory is where problems are solved and ultimately where outcomes, reactions, and behaviors are initiated.

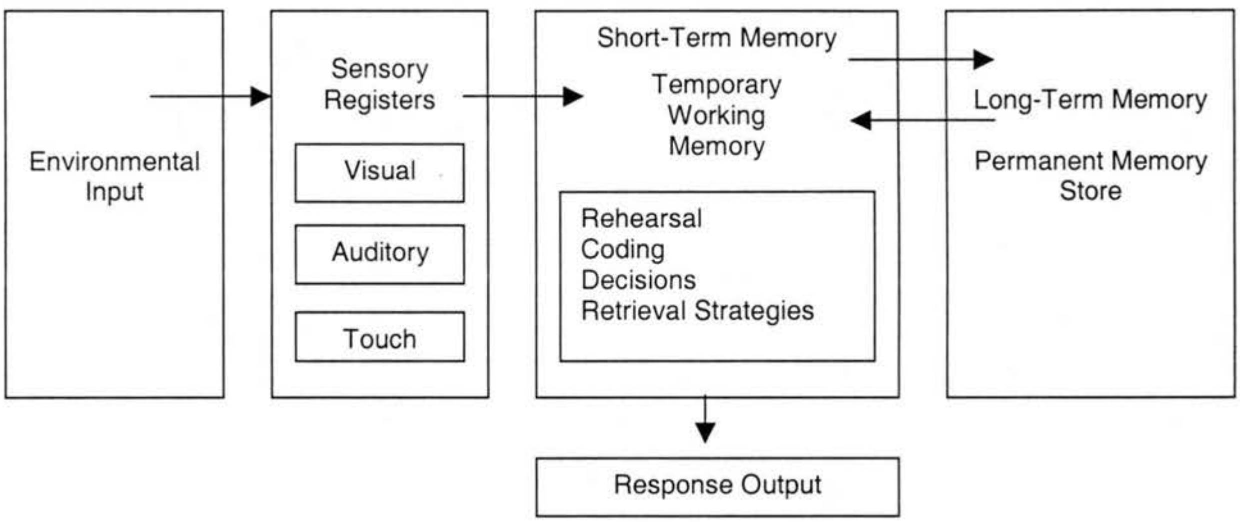


Figure 2.7: Flow of Information through the Memory System (Atkinson et al., 1971)

In many ways, this system is analogous to a computer or a word processing program, which is in part the basis of this theory (Miller, 1993). Buttons are pushed on the keyboard (environmental input). Each button generates a signal to the computer (sensory registers). The computer's central processor responds by showing letters and/or words on the screen (short-term memory). And the operations and experiences can be documented and saved for future use (long-term memory). Items can also be printed out or other manipulations can take place (response output).

Sensory Memory. The capacity to retain large amounts of information briefly that have just been experienced or encountered is considered sensory memory (Atkinson et al., 1971). This takes place in a matter of milliseconds. Morrison and colleagues (1974) found that the sensory memory of 5-year olds was equal to that of adults for recall of simple geometric figures.

Short-term Memory. Short-term memory, according to Bjorklund (1995), is "where we live, mentally." It involves combining information from sensory memory and long-term memory, then transforming that information into new forms. The example that is used by Siegler (1986) is that when we read a book, our sensory memory identifies shapes, lines, and figures on the page. Our long-term memory allows us to give meaning to those symbols in the form of letters and words. Meanwhile, our short-term memory compiles these information sources and, in turn, finds meaning in the text as a whole.

According to Atkinson and Shiffrin (1968), information passes out of short-term memory in 15 to 30 seconds. The longer information is in the short-term store, the more likely it will be transferred to long-term store. One method of doing this is through rehearsal, such as repeating a number over and over again. Rehearsal allows people to overcome structural limitations and the "fading" of short-term store.

It is not surprising that younger children have lower memory capacities than older children, since they have had fewer experiences and have a more limited long-term memory. Younger children also require more time to process information (Dempster, 1981; Keating et al., 1980; Whitney, 1986). This was demonstrated through activities measuring recall rate of words and speech rate in words per second. Based on these activities, the researchers found that speech rate was a good indicator of memory span and was also directly proportional to age (Hulme et al., 1984). Based on these findings, it is suggested that more time be given to younger children to enhance memory retention and allow for rehearsal strategies to take place (Douglas et al., 1977; Naus et al., 1977).

Long-term Memory. Long-term memory is a reservoir of memories that are kept indefinitely and which are limitless (Atkinson et al., 1968). If a cognitive operation is applied, short-term memory information is stored in long-term memory. It is thought that people store information in separable units, which are not always accessible in concert. For example, someone might remember the physical description of someone they met, their occupation, and other characteristics, but not remember the person's name. Siegler (1986) refers to this as the "on [the] tip of the tongue" scenario.

Processes. Processes are the methods used to actively access and manipulate information in sensory, short-term, and long-term memory. Atkinson and Shiffrin (1968) refer to these processes as "control" processes, since they control what happens to information in a memory store. Unlike structural features like sensory memory, these processes are learned and vary from person to person and situation to situation. One process already described is rehearsal. Two other processes that are important in cognitive development and information processing are automatization and encoding.

Automatization. Automatizaton refers to the amount of attention that is required to process information. There are two ends of the spectrum – controlled (also called effortful) and automatic. Processes that need a great deal of attention are considered "controlled" and those that only need a little, if any, are "automatic" (Hasher et al., 1979). Controlled processes require the use of mental effort, while automatic processes require none of the short-term memory capacities. Further, automatic processes occur without intention, do not interfere with other processes, do not improve with practice, and are not determined by intelligence, motivation, and education. The contrast is true of "controlled" processes. In any case, both types are influenced by the type of information and a child's previous experience with that type of information. The shift from controlled to automatic, to a certain degree, is an indication of cognitive development in children (LeFevre et al., 1988). For example, fourth and fifth grade children are able to automatically process single-digit addition problems with small, medium, and large addends, whereas second graders can only automatically process problems with addends of five or less (Siegler, 1986). Above addends of five, second graders are using controlled processes.

Encoding. When we observe something or receive a piece of information, our mind processes and identifies the "most critical information in a situation" (Siegler, 1986). According to Siegler, processing provides a degree of order to the complex world around us. It also allows a person to retrieve or compare other relevant information from short-term and long-term memory stores that may aid in resolving a situation. Younger children have more difficulty encoding situations than adults. They do not have as many experiences to provide them with tools for sifting through their environment's stimuli and determining the most critical elements. This is referred to as the ability to "selectively" encode – or filtering out relevant from irrelevant information. As a result, the goals for educational programs need to be pre-defined, simple, and laid out in a manner which is clear and does not provide distractions, which would make it difficult to selectively encode.

Summary

Given the focus of this project is development of a CD-ROM it seems appropriate and relevant that we use a cognitive model that is based on or uses the computer as an analogy. Information processing theory provides structure to children's thinking so we can improve on our understanding of how children process information. It also allows us to understand limitations of children's information processing, including encoding and parallel thinking.

Information processing theory can help guide us in developing a program that enhances sensory reactions that will, in turn, help children build long-term stores. This can be done primarily through incorporating rehearsal techniques and mnemonic strategies to enhance long-term retention and allow sufficient processing time for educational messages. This theory nicely complements social learning theory as well. Social learning theory focuses on incorporating behavior with personal and environmental factors. Social Learning Theory –driven programs typically use techniques, which emphasize the "cognitive mediators of behavior," such as expectations, observational learning, reinforcements, and self-efficacy, which would in turn strengthen many of the strategies embraced by information processing theory.

CHAPTER 3

Considerations for Developing a CD-ROM Nutrition Education Program for Hispanic Children

Introduction

Schools have long existed as "direct" and "indirect" avenues for nutrition education through formal health and nutrition curriculums and through school lunch programs and other provisions of foods (vending machines, etc.), respectively (Contento et al., 1992). Because schools provide a "captive" audience, there have been numerous nutrition education programs targeting school-age children (Dollahite et al., 1998; Auld et al., 1998; Gates et al., 1994). Interactive multi-media offers great educational opportunities within schools, because students can learn at their own pace, receive immediate feedback, and have fun (Lytle et al., 1995). Within highly ethnic areas, computer technology may allow students within the same classroom to learn the same information/content, but in their preferred languages.

Despite the abounding current multimedia and CD-ROM market in the U.S., to date there are very few nutrition and health education computer programs for elementary children, particularly minority populations. Further, little research exists that explores formative issues leading to the actual development of such programs: The majority of software programs currently in use have been created by private firms and have un-documented needs assessments.

The objective of this paper is to present data from a formative evaluation, conducted with Hispanic 4th and 5th grade children, classroom teachers, and media teachers (or coordinators), which investigated format and content factors for developing a CD-ROM program for Hispanic children. The Diffusion of Innovation Theory acted as the theoretical framework for the study. This theory posits that the diffusion and adoption of innovations are determined by the scientific attributes of the innovation along with perceptions of the specific adopter (Rogers, 1995). Innovations are considered new ideas, practices, or services, while diffusion refers to the process by which an innovation is adopted or communicated over time. This theory appeared appropriate given the fact that the ultimate goal of the research described herein was to develop a CD-ROM nutrition education program for classrooms. In educational settings, computers still represent an emerging technology or innovation. Therefore it is important to understand what features — including content and format -- of a CD-ROM program would enhance its adoption. In the context of the Diffusion of Innovation theory, many of these characteristics can be classified as perceived attributes of innovations and include relative advantage, compatibility, complexity, trialability, and observability (Rogers, 1995).

The concept of a children's CD-ROM nutrition program for bi-ethnic populations emerged from the community-based program— *La Cocina Saludable* (The Healthy Kitchen) (Serrano et al., 2000; Taylor et al., 2000). *La Cocina Saludable* targeted low income Hispanics (parents) in southern Colorado, an agricultural-dependent and economically depressed region with a high Hispanic population. Following the program's implementation, participants in the program expressed an interest (through focus group discussions) in a nutrition education program for their children. As a result, the formative evaluation described here — focus groups and teacher surveys — was conducted in the same locations as *La Cocina Saludable*. It is hoped that the two programs—child and parent--will eventually be integrated, as well as expanded to other regions around the country.

Methodology

Questions for the focus groups, classroom teacher surveys, and media teacher surveys were carefully laid out to complement and supplement each other. This is depicted in Figure 3.1 showing many of the content and format issues measured through these three avenues. Responsibilities differ between classroom and media teachers (coordinators). Preferences also vary between teachers and children.

Focus Groups. The main goal of the focus groups was to identify children's preferences related to computer software programs—features that would increase the likelihood of its adoption. This research was led by Gretchen Buege and was the thrust of her thesis (Buege, 1999). Focus groups with children and adolescents have been an effective means of qualitative data collection in many areas such as marketing research (Koble et al., 1981; Spethman, 1992; Winski, 1992), health and risk behavior research (Stanton, et l., 1993; Houghton, et al., 1995), and bike helmet use (Stevenson et al., 1992). Based on Krueger's research with children and focus groups, the following suggestions were implemented: 1) children met in informal settings, 2) focus groups were limited to 60 minutes or less, 3) dichotomous questions that can be answered with yes or no were avoided, and 4) the age group was kept to within two grade levels (Krueger, 1994).

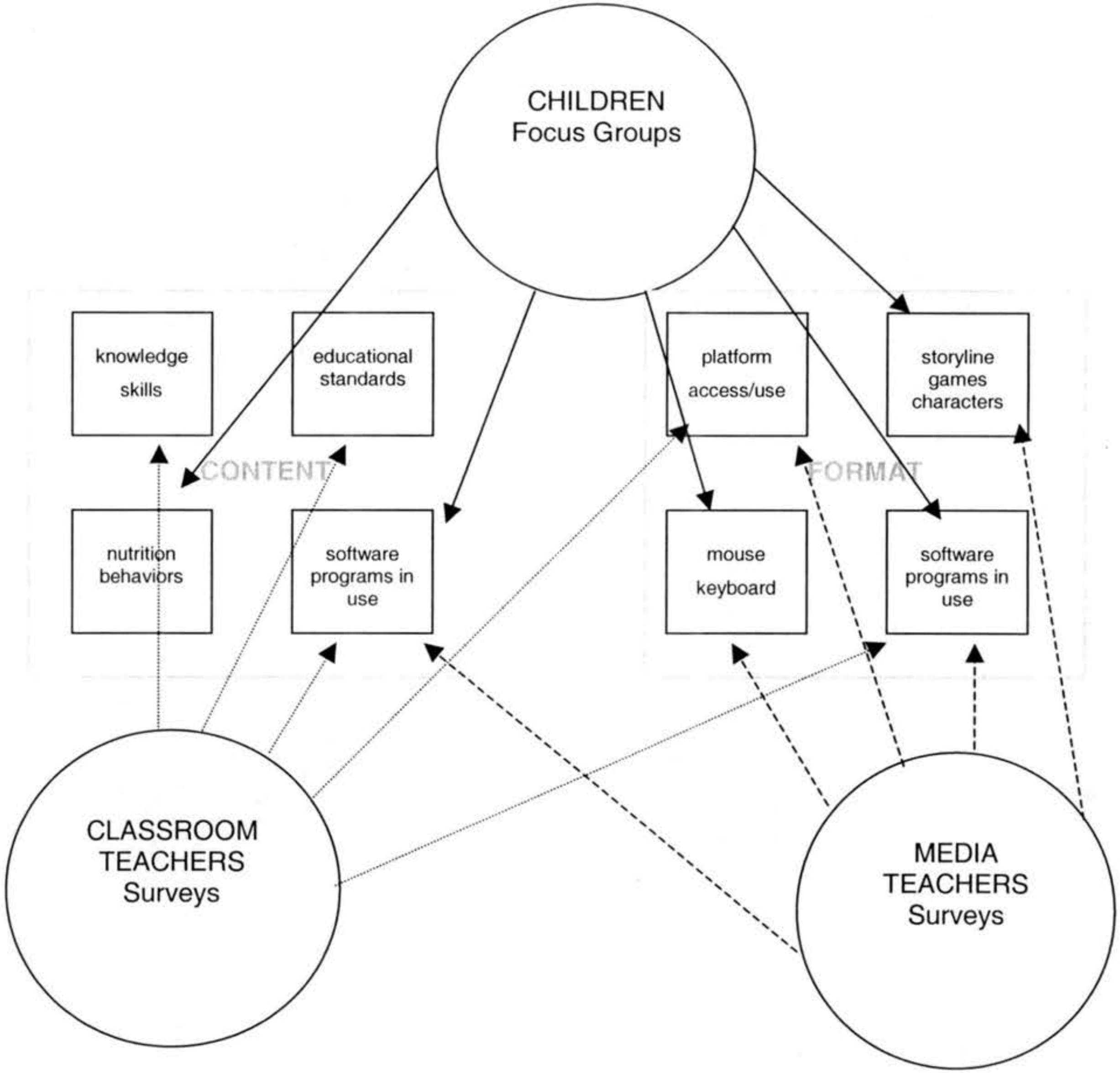


Figure 3.1: Interaction Between Different Components of the Formative Evaluation in Determining Format and Content of a CD-ROM Program

Primary topics of the focus group questions involved 1) likes and dislikes about using a computer, 2) likes and dislikes about learning from a computer in school, 3) children's favorite computer programs and characters, and 4) children's previous exposure to and use of nutrition education computer programs. Focus group questions were asked in an order that was structured as general to specific, with probing questions added where necessary. (See Appendices A-16, A-17.) Focus group questions were first reviewed by a professor specializing in qualitative research, including focus group discussions. After modifications were made, the questions were reviewed by faculty members and specialists in nutrition education and technical journalism (computer technology) and revised as necessary. After the initial focus group, it was determined that changes in the questions and question order did not need to be made. Additionally surveys were developed for focus group participants (children) to determine their access to computers and video games, along with computer use on a weekly basis.

Four of the focus groups were conducted with fourth grade students from Platte Valley Elementary School in Kersey, Colorado. (Refer to map on page A-1.). Students were recruited with the help of fourth grade elementary teachers at the school. Four more focus groups were held at the Boys and Girls Club in Pueblo, Colorado. Students at this location were recruited by the Boys and Girls Club program directors. These cities were chosen due to their high Hispanic population and because Pueblo represented an urban population, while Platte Valley represented a rural population. Written consent was obtained from all children and their parents. (See Appendices pages A-10 to A-15 for copies of consent forms.) Consent was obtained from the Human Subjects Committee. (See letter from the Human Research Committee in Appendix page A-7.)

All focus groups were led by a trained focus group moderator, with a co-moderator present at all times to take notes and record all discussions. After completing surveys, the children were invited to view/experiment with two different computer programs on mathematics for approximately 15 minutes prior to the actual discussion. As recommended by Krueger (1994), this was done to ensure that children had something "concrete" on which to base the discussion, making it easier for children to understand the concepts presented in the focus groups. Since not all children are exposed to nutrition education, we chose to use mathematical computer programs. We hoped to minimize the effect lack of exposure or lack of knowledge on attitudes toward the computer programs. The two programs' content was held constant – both covered elementary fractions, a topic routinely covered beginning in fourth grade. The format of the two programs varied: one provided a "game" element where decision making was necessary; the other was formatted as a story in which children had to read a small section, complete a task, and "turn the page" to continue.

Upon completion of each focus group, children were given two-dollar gift certificates for Dairy Queen, as well as a snack provided by the moderator and assistant moderator. Each child was asked to sign his or her name to a list upon receiving the gift certificate, so that the project investigators could get reimbursed for the purchase of the certificates.

Following each focus group, the moderator and assistant moderator reviewed notes and major points mentioned by the participants. All focus groups were transcribed professionally. Transcripts were then analyzed by two reviewers, with all comments being grouped into "strong," consistent findings or "lesser," more inconsistent findings. Strong findings were indicated when comments were mentioned or agreed upon by half or more of the participants within each focus group. The lesser findings were indicated when comments were mentioned or agreed upon by less than half but more than one-third of the participants in each group. Findings were then ranked according to strength and consistency across groups. Overall summaries of the reviewers were compared to collate agreement between the findings—enhancing reliability of results. Any discrepancies were presented to a neutral third party for a final decision.

Classroom Teacher Surveys. Prior to the development of the classroom teacher and media teacher surveys, a literature review was conducted to find existing evaluation instruments, which measured computer use, nutrition education, and available computer technology. No appropriate instruments were found. As a result, written surveys were developed based on the objectives outlined earlier. The classroom teacher survey contained a range of open-ended and closed-ended questions. (Refer to Appendices pages A-18 to A-21 for survey instrument.) Questions included: "What are *the three most important* skills a child needs to learn before starting 5^{th} grade?;" "What type of information do you present with computers?;" and "What are some reasons you don't teach nutrition?" to "Would you use a computer program to teach nutrition?;" Do you use computers in your classroom to present information?;" and "Do you decide what software programs are used?"

The single most important goal of the classroom teacher surveys was to determine if computers would be a viable method or innovation of delivering nutrition education to 4^{th} grade children based on the teachers' or adopters' perspectives. Specific objectives included: 1) ascertaining what subject areas (relative advantage and compatibility) and skills (complexity) needed to be integrated into the program; 2) identifying barriers in teaching nutrition education (relative advantage of computers); 3) evaluating the receptiveness and effectiveness of children learning with computers (compatibility); and

4) assessing logistical issues related to program development, including length of a "typical" science class and perceived demand for Spanish materials (flexibility and compatibility).

After initial development, the surveys and the survey objectives were administered to three nutrition faculty members, two Associate Extension Specialists in nutrition, ten nutrition education graduate students, and one professor each in technical journalism (computer technology) and human development. They reviewed the surveys for content validity -- the extent to which the instrument measured what it was supposed to measure – along with format and wording of the survey. Based on their feedback and comments, the surveys were edited. The revised surveys were then administered to two 4th grade teachers and the media teacher from Platte Valley, Colorado—the location of the focus groups—as a pilot-test. Their feedback was requested. No changes were suggested.

Names of all classroom teachers in 13 counties of southern Colorado (La Cocina Saludable counties) were obtained by calling all of the schools in that area and talking to the receptionist or school secretary. The surveys were sent to a total of 100 4th and 5th grade classroom teachers, whose schools provided letters of commitment. Dillman's (1978) method of implementing mail surveys was generally followed. A motivating cover letter was used to make a "basic appeal" and which relied on personalization. (See Appendix page A-18.) Each cover letter was addressed directly to the teacher and was personally signed by the principal investigator. The cover letter described the objective of the surveys and also instructed teachers that the survey was completely voluntary and that all answers were confidential. A Hispanic Food Guide Pyramid magnet was also enclosed as an incentive to fill out the survey.

All letters were mailed first-class rather than using bulk mail. A self-addressed stamped envelope was provided with each survey, to make it easy for teachers to return the survey back to us. Teachers were also notified that they would receive another free gift once we received their survey. If a survey was not received in four weeks, a postcard was sent to the teacher reminding the teacher to fill out the survey. After another two weeks, another survey was mailed to non-respondents with a self-addressed stamped envelope. Teachers who returned surveys were sent a free Food Guide Pyramid brochure.

After separate analysis of 4^{th} and 5^{th} grade classroom teacher surveys, the data from the two grades were collapsed into one group. The data were consistent across all questions. The majority of questions for classroom teachers were open-ended, so several responses were often provided to the question. Also, depending on how a teacher answered a question, he or she was either probed with other questions or asked to skip the remainder of the question and proceed to a different question. For example, if a teacher answered "yes" to teaching nutrition, the teacher was then asked if nutrition was taught alone or with a different subject. If a teacher answered "no," the teacher was asked to give reasons for not teaching nutrition. Given the nature of the questionnaire, results are reported as the total number of teachers who gave a certain response. For those questions where figures are provided, percentages are calculated by dividing the number of teachers who provided that answer by the total number of responses.

<u>Media Teacher Surveys.</u> Surveys with media teachers were used to determine the most appropriate platform for a CD-ROM nutrition program (flexibility). Survey questions drew on questions that were asked to children in the focus groups as well as teacher surveys. (See Figure 3.1.) After a draft survey was developed, the surveys and the survey

objectives were administered to three nutrition faculty members, two Associate Extension Specialists in nutrition, ten nutrition education graduate students, and one professor each in technical journalism (computer technology) and human development. As in the classroom teacher surveys, they reviewed the surveys for content validity -- the extent to which the instrument measured what it was supposed to measure – along with overall design of the survey. Based on their feedback and comments, the surveys were edited.

The technology survey consisted of fifteen questions divided into two categories: computers and accessories, including platforms, speakers, CD-ROM drives; and software programs, such as computer programs in use, criteria for software programs, and nutrition computer programs. (Refer to pages A-22 to A-25 to see the survey.) The majority of questions required media teachers to fill in the blank and then expand on their answer. For example, one question, "Would you be interested in using a nutrition computer program in your class?" was followed by the question, "What would increase your chance of using a nutrition computer program?" Another question requested information on the number of available computers in the computer classroom, followed by a question requesting the teacher's recommendation for a computer platform, based on the types of computers available at that school and the teacher's own preference.

Names of media teachers were obtained at the same time as the classroom teachers. Refer to the protocol described under classroom teacher surveys for specific details on the implementation of the surveys. Media teachers received personalized cover letters (see page A-22), self-addressed stamped envelopes, and magnets. In the event they did not return a survey, we sent a reminder postcard then another survey. A total of 21 surveys were mailed out to media teachers, representing the same schools as the classroom teacher surveys.

Frequencies and percentages of teachers responding to each question were calculated. In many cases, answers to certain questions were used to group responses and investigate trends.

Results

Focus Group Participants. Fifty-two fourth grade children participated in eight focus group discussions. The number of participants varied from five to eight in each group. The mean age of the participants was nine years, nine months. These discussions were "mixed," combining both sexes and both ethnicities as students. Ethnicity of the 52 participants was 54 percent (n=28) Hispanic and 46 percent (n=24) non-Hispanic: thirty-six percent of the Kersey focus group participants were Hispanic versus seventy-five percent of Pueblo participants.

Children's Likes and Dislikes of Computers. Many focus group members consistently indicated that learning from a computer was a "fun" way to learn: "I like it 'cause you don't have to sit at a desk...you can look at the computer and it sort-of teaches by itself instead of a teacher; "It's better than class ... it teaches you like the teacher except you don't get yelled at so many times if you don't understand." The largest proportion of the participants who had an aversion, consistently agreed that their biggest dislike about computers was when they had mechanical problems, while others stated they had no dislikes. Comments showed that they became frustrated when the computer was slow, "froze-up," or lost information. As one student said, "I get mad 'cause sometimes it will freeze up or jam and it won't do what you want it to do." Another student stated, "Sometimes it's just really slow." When asked to choose whether they preferred using a mouse versus a keyboard to run a program, participants consistently indicated that a mouse was "easier" to use.

Children's Favorite Characters. Funny voices, interesting appearances and actions of characters seemed to play a large role in the acceptance of the programs. Noting that characters play a large role in deciding whether a program was liked, participants were asked to name and describe some of their favorites. A very strong finding was indicated within the Platte Valley groups concerning the characters from the *5 A Day Adventures* program. Group members liked their funny voices and actions, stating: "I like Bobby Banana 'cuz he sounds like this surfer guy and says 'hey dude'," "I like Bobby Banana cuz' he's funny and can ride a skateboard;" and "I like the Broccoli guy cuz' he sings and dances." Weaker, less consistent findings indicated group members' preferences for animals and space aliens. Many students had not used any programs, which incorporated human characters. Findings within and across groups indicated a preference for made-up, creative characters.

Children's Use of Nutrition Software Programs. To assess prior exposure to nutrition education computer programs, participants were asked to describe any they had used at school, home, etc. All participants from Platte Valley had used Dole's *5 A Day Adventures* and described the program in great detail. Pueblo participants did not mention any nutrition computer programs. All participants with knowledge of *5 A Day Adventures* chose those characters as their favorites. Participants from Pueblo had lesser agreement on their favorite characters.

Classroom Teacher Survey Respondents. Forty-two surveys, a 42.0% response rate, were received from classroom teachers -- 37 (88.1%) were from female teachers and five (11.9%) from male teachers. Respondents were from a total of 21 different schools and eight different counties – including the towns and cities of Aguilar, Alamosa, Guadalupe, Granada, Las Animas, Rocky Ford, Lamar, Crowley, and Pueblo. The majority of teachers who responded taught fifth grade. Twenty-seven fifth grade teachers (64.3%) and fifteen fourth grade teachers (35.7%) returned surveys. After preliminary analysis, data from the two grade levels were collapsed. Results presented here include fourth and fifth grade responses.

<u>Nutrition Education in Classrooms.</u> "Integration" was a concept, which was continually brought up in relation to teaching and lessons. As one teacher stressed, "I like to integrate as many subject areas together as I can because students make better connections and applications to what they have learned." Given this, it is not surprising that of the 28 teachers who taught nutrition, 93% of them taught nutrition with other subjects, most commonly health and/or science. Fourteen teachers taught nutrition with health and twelve with science. Teachers additionally named the human body (9), language arts (3), reading (3), social studies (2), and math (2) as subject areas taught with nutrition. For distribution of answers by percent of total responses, see Figure 3.2.

Of the 28 teachers who taught nutrition, the majority of teachers (16) covered the Food Guide Pyramid/food groups within their nutrition lessons. Lecture and discussion were the most frequent resources for nutrition education (19) followed by videotapes and textbooks (13).

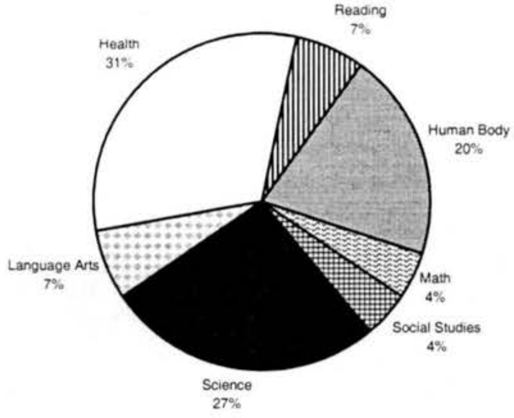


Figure 3.2: Subject Areas Taught with Nutrition (n=28)
(Percent of Total Responses -- Multiple Answers Possible)

Barriers to Teaching Nutrition. Of the 14 teachers who did not report teaching nutrition, six cited "time" as the reason. The next biggest reasons were that it was not part of the curriculum (4), they did not have resources or training (2), and that students had "already learned about nutrition" (2). Some of the teachers provided multiple reasons, such as "[Nutrition] not part of 5th grade curriculum and no time," and "District and state educational demands are great in time. Basically no time." When asked what they would need to teach nutrition, five teachers mentioned both "time" and "materials or handouts." Other identified resources included training (2) and combining nutrition with overall curriculum (1). Four teachers did not provide answers. When asked what subject areas should be included with nutrition, they stated health and science, along with reading, math, and social studies.

Computer Use in Classrooms. Thirteen of 42 teachers responding to the survey used computers in their classroom. Computers were used mostly in the areas of math, reading, and typing. Support for computer use was encouraging. Twelve of 13 teachers who used computers believed that they were "effective" in teaching children: "I think computers are effective in teaching children because they seem to be highly motivated by this way of learning, and they are kept interested and 'entertained." Another teacher pointed to the flexibility and independence as an effective characteristic of computers: "They meet the needs of the different types of learners."

Questions, which assessed logistical and linguistic issues, revealed that most teachers (30) reported that students had at least one computer class a week, with an average time for a computer class being 49 minutes. Twenty teachers decided what software programs were used in those classes — in all of the other cases, media teachers and/or principals were the decision-makers.

Using Computers to Teach Nutrition. In terms of computers and nutrition, 33 of 42 teachers reported that they would use computer programs to teach nutrition, represented by the quote, "I feel it [a computer] reinforces learning and the students love to work on the computers." Most teachers cited multiple reasons: students' positive reception to computers (8); the effectiveness of computers (3); because computers "save time" (3); the "innovativeness" of using computers (2), and "simplicity" (2). See Figure 3.3. Teachers who said they would not use computers to teach nutrition mentioned time or computers in general as barriers: "No time. We barely get computers in at their regular time or science," and "[Computers] use up too much time which I don't have."

Several interesting findings were uncovered through these surveys. Only three of the teachers who used computers to present information said they would not present *nutrition* information on computers. Five of the teachers who currently taught nutrition would not use computers to teach nutrition. On the other hand, ten of the teachers who said they did not currently teach nutrition indicated they would use computers to teach nutrition.

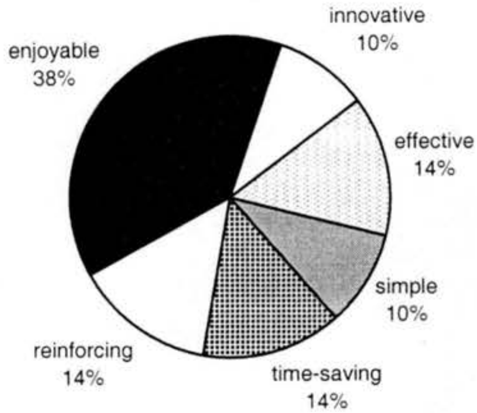


Figure 3.3: Reasons Teachers Would Use A Nutrition Computer Program (n=33)
(Percent of Total Responses -- Multiple Answers Possible)

Spanish Materials. Nearly half (20 of 42) of teachers saw a need for Spanish materials. Responses depended on the percentage of Hispanics at each school and the specific teacher. The average percentage of Hispanics at schools for teachers who answered "yes" to Spanish materials was 59.2% (40 – 95%) versus 50.3% (40 – 87%) for teachers who answered "no."

Media Teacher Survey Respondents. A total of 12 media teachers (of twenty-one surveys mailed out) returned surveys, a return rate of 57.1%. Respondents represented 13 of the 22 total possible schools and seven different counties -- a cross-section of schools and regions in southern Colorado including Alamosa, La Junta, Lamar, and Pueblo. Outside of these factors, no other demographic variables were obtained. (See map on page A-3.) One media teacher taught at two schools. Of these, four (33.3%) were female and eight (66.7%) were male. Each grade school had only one media teacher. Two schools shared one teacher.

Length of Computer Class. The main purpose of the media survey was to determine the most appropriate platform for a CD-ROM nutrition program. To begin with, we assessed class characteristics to help determine the length of the computer program, as well as the number of users per computer. Considering a child's attention span and the length of class, media teachers recommended between 20 to 45 minutes for a computer module. Thirty-four minutes was the average. Given class size and computer availability, eight of thirteen teachers thought that the optimal computer program should target one child per computer.

Computer Platforms and Preferences. In terms of the accessibility to computers and accessories, the majority of media teachers reported using Apple or MacIntosh computers -- ten of 12. Most computers were equipped with speakers, about one quarter (44/199) had headphones and 193/199 computers had CD-ROMs. Seven of 13 teachers indicated they preferred using a CD-ROM over the web and six preferred the web.

Computer Software Programs. Software programs in use focused on the main subject areas—reading, writing, and math. The remainder drew on a wide range of topics, including geography, typing, and word-processing. Six media teachers used software programs with storylines and eight used programs with games. Similar to the findings with the classroom teachers, media teachers attributed the following characteristics to why children liked the computer programs within their classes: games, adventure/challenge, interactivity, and creativity.

The majority of media teachers (11/13) were responsible for choosing computer programs. Criteria for choosing computer programs included: integration with the curriculum (5), educational content (4), recommendations from other teachers (4), cost (3), and consistency with state standards (2). As stated by two teachers, "Reviews and recommendations from other teachers. How well they support curriculum," and "Affordability, content, award winner." Age appropriateness and Spanish materials were also mentioned: "Whether [the software program] is bilingual or not."

<u>Computer Nutrition Programs.</u> Only three of these media teachers surveyed had used nutrition computer programs: two of these mentioned *5 A Day Adventures*. On the other hand, 11 of 13 teachers (84.6%) were interested in using a nutrition computer program. They stated that for a teacher to use a nutrition education software program, it would need to be easy to use ("user friendly"), interactive, interesting, and bilingual: "Good content, varied activities, interactive, no crashing during use" and "[It] would need to be integrated into the curriculum with other subjects." See Figure 3.4.

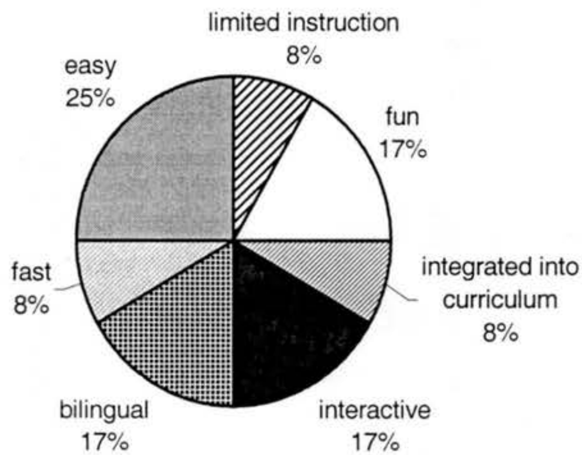


Figure 3.4: Characteristics Needed in a Computer Nutrition Program (n=11)
(Percent of Total Responses -- Multiple Responses Possible)

Discussion and Conclusions

Barriers to Nutrition Education. "Time" was cited as the biggest barrier to teaching nutrition followed by "not included in the curriculum." These findings support other research in health and nutrition education (Colorado Department of Education, 1998; Dollahite et al., 1998; Uhrich et al., 1995) where time and school/district support were identified as major factors influencing whether certain topics were taught. Commensurate with "time" are nutrition knowledge and resources. If a teacher does not feel "comfortable" teaching nutrition or does not have resources available to teach, then extra time is needed to prepare lesson plans. According to Uhrich (1995), this is certainly the case. Based on a survey with 326 Iowa teachers, 82.3% indicated that they were "self-taught" in nutrition and less than half had any formal nutrition classes in college. To address these concerns, several nutrition education programs — namely Nutrition Education Training Programs -- have conducted teacher training workshops (Dollahite et al., 1998; Olson et al., 1993) or even hired "resource teachers" to teach specific courses (Auld et al., 1998). Computer software programs act as an excellent potential for nutrition education, since they reduce time spent on planning lessons and training and may reduce money spent on subject teachers. Children also enjoy computers and considered them "fun" and "easy" for learning.

Teacher Preferences. Analysis of teacher surveys indicated that teachers are receptive to the idea of using computers to teach nutrition, particularly teachers who were not including nutrition within their curriculum. They cited time, effectiveness, innovativeness, simplicity, and enjoyment as main reasons for choosing nutrition computer programs. As part of the Nutrition Education Training assessment in Colorado, 75% of teachers preferred computer software as resources (Colorado Department of Education, 1998). Very few teachers in this study mentioned using nutrition software programs, even though students from Platte Valley responded favorably to the *5-A-Day Adventures* nutrition program and characters. Teachers did not indicate a clear preference for CDs over the internet or web -- 53.8% versus 46.2%, respectively. Since the web does not currently support extensive animation and video, a CD-Rom program has greater potential to be the interactive medium.

Integration. "Integration" will be key in the program's receptiveness to teachers, since this was an important theme for teachers. The idea of multidisciplinary programs is not new, though, for nutrition (Lytle et al., 1995; Passmore, 1996). Very few teachers teach nutrition as a separate unit. According to Lytle, et al (1995), this focus is in response to new efforts for comprehensive school health, "displacement of nutrition from its traditional role in home economics education," and general interest in integrated curricula in schools. Typically, states establish certain educational standards for "core" subject areas, such as reading, writing, and math. It is not surprising from this that surveyed fourth and fifth grade teachers pointed to reading, writing, and math as the top three skills needed before 5th grade. What is surprising is that only two to three teachers included nutrition with these subjects. Consistent with other findings (Soliah et al., 1983; Zemel et al., 1993), the majority of teachers taught nutrition with health and science. This points to the need for nutrition to be integrated with reading, writing, and math, so that it will be more readily included in the curriculum.

Children's Preferences for Computer Programs. A strong and consistent finding related to program format was that children enjoyed programs with characters that were "fun." Discussions consistently revolved around character voices, animation, appearances, and quotations. Malone (Malone, 1981) and Rieber (Rieber, 1990; Soliah et al., 1983) found that games containing graphics were popular among elementary students and even promoted learning in some cases. Another strong finding was indicated by focus group participants' desire for a computer program to contain a game element or challenge. Children spoke about "gaining levels" and "beating the computer." This finding follows other research with 5th grade children that showed that "games" were the most preferred method for learning about nutrition (Murphy et al., 1994). Further, media teachers indicated that most of their computer programs had storylines and games. This pointed to the need to use games and/or storylines within our program. These findings agree with research by Matheson and Achterberg (Matheson et al., 1994), who found that sounds, animation, and special effects, along with challenge and problem-solving, played a role in increasing students' interest in the program. Research by Malone (Malone, 1981) also indicated that the most important component determining game popularity for elementary students was whether or not the game incorporated a goal or challenge.

Finally, some of the questions were the same for both classroom and media teachers. As a result of an informal assessment of computer program use, it was found that differences in responsibilities existed from school to school and district to district. So, it was important to ask both groups similar questions about using nutrition software programs to reflect perceptions and feedback from all teachers responsible for choosing the software programs. The majority of classroom teachers and media teachers claimed responsibility for choosing software programs. Responses pointed to the importance of incorporating their input into software development, as well as efforts to market the software for use within schools. The software program must also be implemented in the framework of the schools' and districts' standards and goals.

Limitations. Although the use of focus groups can be advantageous to researchers, limitations do exist (Krueger, 1994; Patton, 1990). Assembly of focus groups takes a considerable amount of time and it may be difficult to entice people to take part. In the case of children, participation can be limited by parental lack of consent. Data are also difficult to analyze. All comments must be kept in the context of the discussion. Finally, many uncontrollable limitations are bound to occur in any focus group discussion held with children. At times, it was difficult to determine whether children were responding honestly. For instance, in this study, when asked what they didn't like about using a computer, many children responded that they had no dislikes. Here, it is not possible to conclude that this is true, as many may just not have known what to say. This also becomes true with survey questions, as it is hard to determine if kids filled them out accurately.

Other limitations specific to this research also existed. First, in all groups, the children knew each other. Although it is recommended that focus groups are composed of people unfamiliar with one another, this was almost impossible to control due to the school settings for the discussions. Also, the groups were not homogeneous in regard to ethnicity or gender. This too was hard to control and it was decided that the children might be more comfortable and willing to discuss in an environment that was much like their class in school.

Even though the children had access to computers at the "Boys and Girls Club," most of the programs were games -- not educational programs. Additionally they lacked mice, CD-ROM drives, and speakers. It is unclear what technology existed at their respective schools. Therefore, computer use cannot be accurately compared between the two groups. This too, undoubtedly, affected answers involving preference over the mouse and various favorite games (*5 A Day Adventures*) as well.

Several limitations existed with the teacher surveys as well. First, surveys were conducted with a convenience sample, not a randomized sample, since we wanted to obtain responses from as many teachers from the target area as possible. Second, these schools represented low-income districts. In the case of media teachers, the computer technology (actual computers, speakers, headphones, CD-ROM drives, etc.) may not be as advanced as in higher income districts (as noted in the focus group limitations too). Third, the majority of collected data was qualitative in order to supplement focus group results. Therefore, there were no concrete data or statistics. The biggest challenge with qualitative surveys is that they can elicit a wide range of responses, making it difficult to group data and responses. Luckily, this was not a problem in this study. The pilot-test helped alleviate this. Another barrier with qualitative data is that no formal correlations can be analyzed between answers — only frequencies and/or trends. Finally, classroom teachers and media teachers are not necessarily trained in nutrition. Nevertheless they can still provide insight into what important skills and concepts should be included with nutrition computer programs (based on current use). General survey limitations—length of survey and misinterpretation--also existed.

<u>Diffusion of Innovation.</u> Through focus groups and surveys, children and teachers were able to reflect on different characteristics of computer technology and CD-ROM programs. In the context of one component of the Diffusion of Innovation theory -- perceived attributes of the innovation -- several factors proved to be important (Rogers, 1983; Rogers, 1994). *Compatibility* refers to whether innovations are harmonious with socio-economic and philosophical values of the target population. Overall, CD-ROM

programs appeared to be compatible with children's and teachers' attitudes and beliefs, as long as certain guidelines were followed (see below). A CD-ROM program also provides a *relative advantage* to teachers who may not feel comfortable teaching nutrition and health and/or who may not have the time to prepare lessons in those areas, especially if it integrated them with reading, writing, and math. Based on feedback from teachers and certain inherent characteristics of computers, many other factors could also be addressed. Children can learn at their own pace and in their language of preference. Computer programs also highlight the concept of cost- and time-efficiency – reduced training time, no need for nutrition subject teacher, and possibly long-term benefits of improved nutrition and health (given a long-term intervention). As long as the software program is "easy" to use and designed for children, computer programs are fairly easy to install.

<u>Conclusions</u>. Based on findings from this study, it is recommended that a nutrition or health education computer program for elementary students include the following: 1) characters that have funny voices, interesting appearances, and animation; 2) a game or challenge element in which a goal is attained; 3) a storyline; 4) integration with other subject areas, namely reading, writing, and math; 5) easy, fun, and fast features which promote interactivity and limited instruction time; 6) the Spanish language (if Hispanic audiences are included); and 7) compatibility with existing computer platforms in schools.

Chapter 4

Short Acculturation Scale for Hispanic Youth (SASH-Y) in Colorado: Demonstration of a Changing Demography

Introduction

The main objective of this study was to determine acculturation level of 4^{th} and 5^{th} grade children in Colorado using the Short Acculturation Scale for Hispanic Youth (SASH-Y). This study was part of a larger study investigating dietary changes among children as a result of acculturation.

Acculturation is the *process* of change that results when two cultures (people, societies) come into contact with each other first hand (Berry, 1992). Different types of change can occur as a result of this contact. On the group level, these include physical, biological, political, cultural, and social relationship changes (Berry, 1992). At the individual level, numerous psychological and behavioral changes take place (Berry, 1980).

Acculturation has been a growing issue in the U.S. due to the developing population of minorities and immigrants—particularly Hispanics (U.S. Bureau of the Census, 1998). Defining acculturation poses several challenges. Measures of acculturation typically determine where individuals are in the process of acculturation, while focusing on certain domains of acculturation—such as behavior, ethnic loyalty, cultural awareness, social relationships, language use, and food preferences. For children, assessing acculturation is particularly difficult (Szapocznik et al., 1980). Certain psychological components of acculturation may not be appropriate or measurable, given children's cognitive abilities.

Several acculturation scales exist which can be administered to teachers and/or parents (Franco, 1983; Martinez et al., 1984), however in some cases this may not be convenient or altogether accurate. Very few valid and reliable instruments exist, which can be administered directly to children and which incorporate cultural behaviors within them. In 1994, a preliminary report was published using the SASH-Y, a uni-dimensional acculturation survey administered directly to Hispanic youth in an urban school district in Texas (Barona et al., 1994).

The Short Acculturation Scale for Hispanic Youth (SASH-Y) differed from other scales in that it: 1) considered the "embeddedness of the individual within the context of the family within the context of the culture" by including questions about ethnic social relationships; 2) could be administered directly to children; and 3) obtained socio-economic data from children without assessing parents' length of stay in the U.S. or generation by assessing if their school lunches were subsidized. This is a follow-up to that study, investigating similarities and differences in findings six years later in Colorado.

Methodology

Acculturation Scale. Acculturation level was assessed using the Short Acculturation Scale for Hispanic Youth (SASH-Y), developed by Barona and Miller (1994). This scale is a modification of the Short Acculturation Scale for Hispanics (SASH) (Marin et al., 1987) – reflecting changes in content, so that it was more appropriate for children. (See pages A-32 to A-35.) Based on a sample of 141 Hispanic and 230 non-Hispanic white children from an urban school district in the southwest, Barona and Miller obtained an excellent internal consistency ($\alpha = .94$), both for Hispanics and non-Hispanics (.92 and .85 respectively) and split-half reliabilities (Hispanic, .95, and non-Hispanic whites, .87).

An additional advantage of this instrument is that it can be administered *directly* to children rather than to parents and/or teachers.

The SASH-Y contains 12 questions. The abbreviated description of the question, which are referred to in the tables, are in brackets:

1. [Reading] What languages do you read and speak?
2. [Parents] What languages do your parents speak to you in?
3. [Home] What languages do you usually speak at home?
4. [Think] In which languages do you usually think?
5. [Friends] What languages do you usually speak with your friends?
6. [T.V.] In what languages are the t.v. programs you usually watch?
7. [Radio] In what languages are the radio programs you usually listen to?
8. [Movies] In what languages are the movies, t.v. and radio programs you prefer to watch or listen to?
9. [Grandparents] In what languages do your parents speak with their parents?
10. [Close Friends] Your close friends are:
11. [Parties] You prefer going to parties at which the people are:
12. [Visit] The persons you visit or who visit you are:

Responses related to language were: only Spanish; more Spanish than English; both equally; more English than Spanish; and only English. The initial SASH-Y responses related to ethnicity were: all Hispanics; more Hispanic than non-Hispanic; both equally; more non-Hispanic than Hispanic; and only non-Hispanics. We modified the wording of the survey so that "Latino" was used in place of "Hispanic" based on experience from other projects working with Hispanics in Colorado.

Because this was part of a nutrition study, a question was included which addressed food preferences: "What type of food do you prefer?" (See page A-34, question number 10, in the Appendix.) Possible answers included: all Mexican-American; more Mexican-American than Euro-American; both equally; more Euro-American than Mexican American; and only Euro-American. Examples were also provided for both types of food: enchiladas, rice, and beans for Mexican-American and hamburgers, pasta, potatoes, for Euro-American.

Each answer is given a score of 1 to 5. One represents the "low" acculturation response, such as "only Spanish," and five the high acculturation, such as "only English." Individual scores from all of the questions are added up to determine the total acculturation score. The total acculturation score can be compared to a normative data grid: 12 to 30 points is considered "low;" 30 to 45 "moderate;" and 45 to 60 "high." Unless specified, analyses using the food preference question were not conducted.

Procedures. The SASH-Y was administered to students in 4^{th} and 5^{th} grade classrooms who voluntarily provided informed consent. Informed consent was obtained from all children and their parents per protocol set out by the Office of Regulatory Compliance at Colorado State University. (Refer to Appendices pages A-26 to A-31 for consent forms.) Subjects were told that that the questionnaire was voluntary and that they were to answer with the best of their ability, it was not a test. The researcher read the instructions, whereby children then filled out the survey independently. Children were also instructed not to look at other children's answers. Schools that participated were compensated with a complimentary copy of a computer nutrition education program (see Chapter 8 for details about the program). Children who participated in the study were compensated for their time with a $5 gift certificate either at Wal-Mart or at a movie theater, depending on the location.

Test/Re-Test Reliability. In order to establish reliability of the scale with our population, we administered the questionnaire to students at one school twice. The questionnaires were first administered to children after lunch by the researcher. Then two weeks later, the principal administered the survey to children who filled out the first survey during class time. The surveys were then mailed to the researcher. Percent agreement was then calculated. All children in the test-retest study were compensated with a $5 gift certificate at Wal-Mart. The school was also given the opportunity to have a pizza or ice cream party for the subjects (because they completed tests and re-tests, above and beyond the tasks of children from the remainder of the dietary acculturation study), but the school declined.

Criterion Validity. To determine criterion validity -- the extent to which an instrument relates to another tested instrument – children between 8 and 12 and one of their parents were administered the SASH-Y. Children between the ages of 8 and 12 and their parents were recruited through the Larimer county 4-H club in Colorado. The director of the county program included a short paragraph about our study in their Christmas 2000 newsletter, which was distributed to 4-H families in the area. Interested individuals were asked to call or email the researcher for more details and to obtain a packet of information.

A total of 12 parents called for more information and were sent packets, along with their children. Parents and children were instructed on the phone and in the written instructions to fill out the surveys separately and return them in separate enclosed envelopes. Parents were also asked to answer the survey questions for the child who was also filling out a survey. The child's packet contained a list of instructions, along with a child's consent form, parental consent form, survey and a self-addressed stamped envelope. The parent's packet contained a list of instructions, consent form, survey, and self-addressed stamped envelope. Identification numbers were put on each survey prior to sending them out to the children and parents to ensure confidentiality in reporting. Ten of twelve pairs of parent and children surveys were returned, a return rate of 83.3%. Children received $5 and parents received $10 for filling out the survey. Checks were sent to them after receipt of the survey.

Data Analysis. Means and standard deviations were calculated for total acculturation scores for all children participating in the study. The range of possible scores was 12 to 60.

Reliability between test and re-test and criterion validity were established using percent agreement. For the test/retest analysis, responses from both tests were compared question by question. A total number of responses in agreement were tabulated. Then a percent agreement was calculated. The same procedure was done for the criterion validity assessment. Each response was compared between parents' and children's tests. Total percent agreements were then calculated.

Internal consistency was evaluated using Cronbach alpha. Split-half reliability was also determined for the survey, as per Barona's protocol. Split-half reliability randomly assigns questions to two groups (two halves) and compares the internal consistency of those responses.

Spearman's correlations were computed between questions. Univariate analysis of variance (ANOVA) was used to determine the significance of grade, gender, age, school, and self-identified Hispanic identity to overall acculturation scale. Total acculturation scores (AS) were transformed, so that this analysis could be done with AS as the independent variable. Based on the distribution of scores, the following transformation was done to normalize the data: $\sqrt{[100 - [(AS - 12)/AS)]} \times 100$. All of these findings were then compared to those of Barona and Miller (1994).

Factor analysis was used to determine which questions in the acculturation scale contributed most to the overall acculturation score. In addition to this, a Varimax factor rotation was undertaken to enhance the interpretability of the scale's factor structure. In contrast to Barona and Miller's initial Promax factor rotation, a non-orthogonal rotation, a Varimax standard factor rotation was undertaken to enhance interpretability of the scale's factor structure. (We were unable to obtain the "kappa" used in their study, which determines the rotation and analysis. The kappa value was not reported on in the journal article and they did not respond to communication attempts.) As a result, we were not able to calculate the interfactor correlations of the phi matrix for the different factors, as they did; based on the inherent assumptions of Varimax, all of the interfactor correlations yield zero. Eigenvalues and explained variance were used to determine the number of factors to extract.

Results

Subjects. A total of 137 4th and 5th grade children from five schools and eleven classrooms in southern Colorado, a largely rural area, participated in the study. Thirty-one percent were from fourth grade and 68% were in fifth grade. The mean age was 10.5 years (SD = .75). The majority of participant children were male, Hispanic, and in fifth grade. The sample consisted of 77 males with a mean age of 10.5 years (SD = .72) and 59 females with a mean age of 10.5 (SD=.79).

Test/Retest. A total of twelve children completed tests and re-tests. The test-retest yielded a 70.8% agreement in all possible scores collected (n=12). The lowest percent agreements were obtained for ethnicity of close friends (41.7%, n=5), ethnicity of individuals at parties they want to attend (50.0%, n=6) and language use of their parents with their grandparents (50.0%, n=6). Children reported language use with friends identically from test to re-test; the perfect agreement was 100.0%.

Criterion Validity. There was a 90.3% agreement between parents and children's responses. Each response was compared. Data from the parent-child questionnaires were not included in the other analysis, since they were administered to non-Hispanic children and parents outside of our target area.

Internal Consistency. Analysis of our sample yielded an excellent internal consistency, $\alpha = .89$ (n=137). Split-half reliability of the entire sample was .84. Both were comparable to results from Barona and Miller's overall cronbach-alpha and split-half reliability, $\alpha = .94$ and .96, respectively.

Acculturation Level. The mean for the total sample was 47.0 (SD= 9.4), almost three points lower than that of Barona and Miller, 49.5 (SD= 9.9). A total of 11(8.0%) children were considered low acculturated, 33 (24.1%) moderate, and 93 (67.9%) high. A low level of acculturation is considered a total acculturation score of 12 to 30, moderate 30 to 45, and high 45 to 60. The analysis of variance (ANOVA) resulted in significant main effects for gender and school ($p<.05$). Females had lower levels of acculturation. A significant interaction also existed between school and Hispanic self-identification ($p<.05$). The main effects for age and grade were not significant, however. Further, Hispanic self-identification did not correlate with acculturation score (only 3 of 13 low acculturated considered themselves Hispanic). In fact, some children who were considered "low" acculturation did not identify themselves as "Hispanic."

Factor Analysis. When using the three-factor model proposed by Barona and Miller, we obtained strong internal consistency scores for each of their factors -- .86 for extrafamilial language use, .86 for familial language use, and .74 for ethnic social relations. Extrafamilial language use included language use or language preference outside of the family, such as language the child thought in, language preference of media, and language preference with friends. Familial language use refers to questions about language use at home and with family members. Ethnic social relations signified questions about the ethnicity of close friends and of people at parties they attended.

When we conducted factor analysis without using Barona and Miller's parameters and model, again language use appeared to be the biggest determinant of acculturation level. The language that the child read and spoke, the language that they spoke with their parents, and the language they spoke at home accounted for most of the explained variance in total acculturation score. Examination of rotated extracted factors (with loading value cut-offs of 0.5) suggested a three-factor solution. See Table 4.1.

The first factor explained 82.6% of all variance, the second 13.5%, and the third 5.9%. Based on how these questions were grouped, these three factors were labeled as "personal language use" (the language that the child spoke at home, with parents, friends), "external language use and preference" (the language that the child chose to view t.v., listen to the radio, and watch movies) and "ethnic social relations" (ethnicity of individuals who were close friends, visited, or at parties they attended), respectively.

Although we arrived at three factors, including "ethnic social relations," there were several differences in our findings versus those of Barona and Miller. Rather than grouping data according to "personal" and "external" language use, their data suggested that "extrafamilial language use" and "familial language use" were more appropriate factors. In their study, extrafamilial language use accounted for 80.5% of the explained variance, familial language use 11.6%, and ethnic social relations 7.9%. See Table 4.2 for comparisons in factor analysis. Although our findings suggested that different "factors" were optimal using our data, Barona and Miller's factors were still found to be appropriate.

Table 4.1: Loading Values for Acculturation Questions When Using Three-Factor Analysis

Questions	Factor 1 "personal language use"	Factor 2 "external language use"	Factor 3 "ethnic social relations"
Reading	**.823**	.248	.117
Parents	**.669**	.462	.253
Home	**.726**	.433	.228
Think	**.861**	.112	.049
Friends	**.595**	.387	.210
Television	.421	**.741**	.201
Radio	.197	**.842**	.010
Movies	.224	**.803**	.129
Grandparents	.481	**.560**	.112
Close Friends	.171	.005	**.786**
People at Parties	.025	.289	**.795**
People who Visit	.250	.055	**.790**

Based on the factor analysis shown below, regardless of factors, it is clear that language use plays an important role in determining acculturation level (using this scale). Questions pertaining to language were also highly correlated to each other, $r \geq .5$. Not surprising (since there is considerable overlap), the highest correlation among questions was seen between the language(s) that parents spoke and language(s) spoken at home, $r = .754$.

Table 4.2: Comparisons in Factor Analysis Between Studies

Questions	Factor 1 "personal language use" or "extrafamilial language use"	Factor 2 "external language use" or "familial language use"	Factor 3 "ethnic social relations"
Reading	X O		
Parents	X	O	
Home	X	O	
Think	X O		
Friends	X O		
Television	O	X	
Radio	O	X	
Movies	O	X	
Grandparents		X O	
Close Friends			X O
People at Parties			X O
People who Visit			X O

X=Colorado State University Dietary Acculturation Study O=Barona and Miller

Language Use. The majority of children spoke more English than Spanish, as shown in Table 4.3 – in descending order of percentage of "English only" children. The high mean scores illustrate this too. Still, about40% spoke some Spanish at home and with their parents – when adding results from the range of "more Spanish than English" to "mostly Spanish." Additionally about one-third (36.5%) of children's parents spoke "more Spanish than English" or "mostly Spanish" with the children's grandparents.

Table 4.3: Children's Self-Identified Language Use

	Mostly Spanish 1	More Spanish than English 2	Both Equally 3	More English than Spanish 4	English only 5	Mean Score
Friends	6 (4.4 %)	1 (0.7 %)	13 (9.5 %)	8 (5.8 %)	109 (79.6 %)	4.55
Think	4 (2.9 %)	5 (3.6 %)	11 (8.0 %)	16 (11.7 %)	101 (73.7 %)	4.50
Home	7 (5.1 %)	9 (6.6 %)	16 (11.7 %)	10 (7.3 %)	95 (69.3 %)	4.29
Television	4 (2.9 %)	5 (3.6 %)	18 (13.1 %)	16 (11.7 %)	94 (68.6 %)	4.39
Movies	2 (1.5 %)	3 (2.2 %)	20 (14.6 %)	20 (14.6 %)	92 (67.2 %)	4.44
Parents	15 (10.9 %)	8 (5.8 %)	14 (10.2 %)	12 (8.8 %)	88 (64.2 %)	4.09
Radio	8 (5.8 %)	8 (5.8 %)	17 (12.4 %)	17 (12.4 %)	87 (63.5 %)	4.22
Reading	2 (1.5 %)	7 (1.5 %)	18 (13.1 %)	26 (19.0 %)	84 (61.3 %)	4.34
Grandparents	28 (20.4 %)	22 (16.1 %)	19 (13.9 %)	9 (6.6 %)	59 (43.1 %)	3.36

Social Interactions. Ethnic social variables reflected the socio-demographic profile of the region. Unlike language, which appeared to segment children into different acculturation levels, a large portion of students had equally close friends, people at parties, and people who visited who were Hispanic (Latino) and non-Hispanic (Latino), 48.9%, 54.7%, and 46.7% respectively. The mean scores show this disparity. See Table 4.4. While the language use mean scores hovered near 4.0 ("mostly English"), the ethnic social variables mean scores were close to 3.0 ("both equally"). In fact, one of the lowest Spearman's correlations was seen between the language that the child thought in and the ethnicity of people at parties the child attended, $r = .094$. The ethnicity of close friends and language of radio was the lowest with $r = .050$. See Figure 4.1 for graphical comparisons between language use and ethnic social variables.

Table 4.4: Children's Responses Toward Ethnic Social Variables

	Latinos 1	More Latinos than non-Latinos 2	Both Equally 3	More non-Latinos than Latinos 4	Non-Latinos only 5	*Mean Score*
Close Friends	22 (16.1 %)	10 (7.3 %)	67 (48.9 %)	12 (8.8 %)	22 (16.1 %)	*3.02*
People at Parties	12 (8.8 %)	13 (9.5 %)	75 (54.7 %)	12 (8.8 %)	21 (15.3 %)	*3.13*
People who visit	17 (12.4 %)	23 (16.8 %)	64 (46.7 %)	11 (8.0 %)	18 (13.1 %)	*2.92*

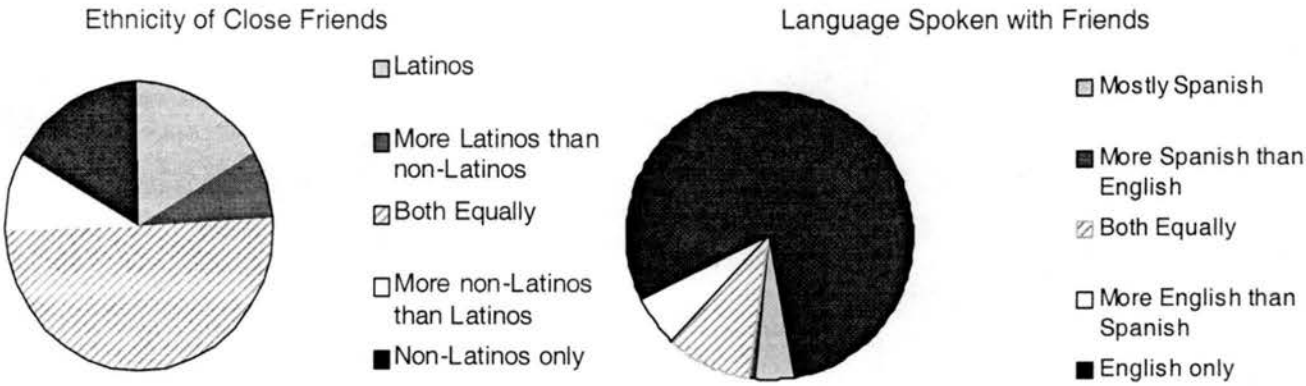


Figure 4.1: Comparisons in Responses to Acculturation Questions

Food Preference. In our study, we found that food preference was positively correlated with acculturation level – as acculturation level rose, preference for non-Hispanic foods increased. (See question 10 on page A-34.) Food preference was most highly correlated to ethnicity of close friends, but still low with a value of .409. The internal consistency of the acculturation scale including the food preference question was .89 – no change from the scale's value without the question – indicating that it neither improved the overall internal consistency nor hindered it. The mean score for food was 2.76, the lowest among all questions. Results from the tests/re-tests also showed a low percent agreement for this question, 38.5%, demonstrating that the question was not highly reliable or indicative of acculturation level.

Discussion/Conclusions

The Short Acculturation Scale for Hispanic Youth (SASH-Y) included familial and cultural contexts by addressing questions about ethnic preference and ethnic social relations. These questions were included based on substantive research pointing to the importance of these in acculturation research (Franco, 1983; Padilla, 1994). Nevertheless, our findings suggested that peer associations and ethnic social relations did not contribute significantly to overall acculturation among children. Children's friends and social relationships were equally Hispanic and non-Hispanic, irrespective of level of acculturation, indicating that mutual acculturation and integration were taking place in these communities, a concept described by Buriel (1993).

The language that the participants' grandparents spoke had a slightly higher loading value for the factor, "external language use," than for the factor titled, "personal language use." In both cases, it had the lowest loading value. Since it had a loading value above .50, however it was included in the "external language use" factor. The question is worded, "What language do your parents speak with their parents?" Depending on which parent the child considered, the answer could vary. For example, the mother's parents may speak Spanish, while the father's may speak only English. It is likely this reason that this question was not as sensitive as the other language questions.

Our findings also point to the difficulty in applying the bicultural model of acculturation to children. This model posits that individuals do not necessarily adopt "host" traits at the expense of "native" traits, but rather become "fluent" in both cultures. The largest contrast with the unidimensional model is that the bicultural model incorporates ethnic identity and socialization into the model. It also assumes, as Mendoza states, that individuals can co-exist in both cultures without being at serious conflict about either, so persons can either be well-grounded in both Mexican American and Anglo cultures (in the case of Mexican Americans), or persons somewhat anomic, or marginal, without strong roots in either culture (Szapocznik et al., 1980). Despite compelling evidence supporting this argument and psycho-social perspective (Cuellar et al., 1995; Padilla, 1994), we decided to use the uni-dimensional model (SASH-Y) because we thought that the stage of children's cognitive development would make it difficult to assess "biculturality" and "marginality."

Our findings -- both formal and informal -- confirmed our hypothesis. Overall, children found it challenging to assign an "ethnicity" to themselves and their friends. Self-identified ethnicity was not a significant main effect for acculturation. And while conducting surveys with the children, many children asked for assistance on the ethnicity questions (more than other questions). It is not surprising -- given these factors -- that these questions had such low percent agreements in the test/re-tests. (They were told to respond "to the best of their ability.")

One contributing factor to this could be the age of our subjects. The mean age was 10.5 for both boys and girls (slightly younger than 13.2 and 13.0, respectively, for Barona and Miller). Bernal, et al. (1990) found that ethnic identification, ethnic knowledge, and to a lesser extent, ethnic preferences were associated with age. Quintana and Vera substantiated this finding by illustrating that older children had a better understanding of ethnic identity and prejudice than younger children (Quintana et al., 1999). Knowledge was also related to parent's acculturation and ethnic socialization.

Our study participants' reactions and responses may also reflect attitudes of bi-ethnic communities and/or national trends exhibiting a growth in the Hispanic population. In part, this hypothesis could be supported by the ethnic social variables – over half of the children had close friends that were equally Hispanic (Latino) and non-Hispanic. And according to the recently released U.S. Census Bureau's 2000 Statistical Briefs, Hispanics now comprise 35.3 million people, or 12.5% of the population (U.S. Census Bureau, 2000). In Colorado, 17.1% are considered Hispanic or Latino. Still, further research is warranted to follow-up on these hypotheses.

Another issue that Barona and Miller (1994) investigated was socio-economic data. Their research drew on socio-economic data obtained about subsidized school lunches. We assessed if children ate school lunch, but not if it was subsidized. We did, however, find that there were no main effects of acculturation level if children ate school breakfast (which is subsidized), indicating that in our population socio-economic status was uniform among acculturation levels. Socioeconomic status was not measured through any other method. We initially had included information on place of birth, length of residence in U.S., and socio-economic status, in the parent's surveys, but found when recruiting individuals for the parent-child reliability test that Hispanic parents, particularly recent immigrants, were reluctant to answer any personal questions about their background (place of birth), income, and education. This could have been due to possible fears of association with government and immigration services. It is unclear.

Our findings suggested that food preference (question number 10 on page A-34) was not a reliable or strong predictor of acculturation level, at least using the question included in our survey. It is possible that a different, a more reliable, question would yield different results. Findings from the remainder of the dietary survey (reported in Chapter 7) did exhibit changes in diet as a result of acculturation – many foods were sensitive to adoption and elimination with acculturation.

One of the biggest findings in our study was that language preference and usage were dominant and sensitive factors in measuring acculturation level in children. Language use was found to be the most predictive determinant of acculturation in our study, accounting for 82.6% of all variance. This finding supports results from Barona and Miller's preliminary report, along with other studies (Franco, 1983; Marin et al., 1987; Padilla, 1994). What is still in question, however, is which questions would merit inclusion in a shortened scale given the differences in factor analysis outcomes. For a young audience -- like ours -- it certainly appears that ethnic social relations are neither necessary nor reliable. Their internal consistency values are lower. They had the lowest percent agreements in the tests/re-tests. And those three questions only accounted for 7.9% of the total variance.

The major concern with measuring language use is the validity of self-assessment. Bahrick et al. (1994), found that the validity of language self-assessment varied depending on the task. Other researchers have warned that self-assessment may result in inflation bias (Anderson et al., 1984). Delgado and colleagues (1990) found that Hispanics rated their skills in Spanish better than in English. Even in the case when children over-estimated their Spanish language ability, their responses about language may be a reflection of their ethnic identity and still an accurate assessment of acculturation and culture. It is likely that it is a better assessment than self-identified ethnicity.

In our study, children had difficult assigning an ethnic identity to themselves and their friends. Self-identified ethnicity was not correlated with acculturation scale. Future studies should explore other avenues to assess children's ethnicity, along with overall cultural perspectives. Niemann and colleagues (1999) conducted focus groups with 49

Mexican Americans. Participants believed that their ethnic identity was largely formed by their attitudes and values towards familialism, work ethic, food, and celebrations. Using these findings as a framework for future studies would provide further insight into ethnic identity and its relationship to acculturation (and dietary acculturation). Children may be able to grasp these tangible concepts better too.

Future Studies. It is clear that parental cultural attitudes affect children to some degree. Okagaki and Moore (2000) found a strong relationship between parents' and young adults' ethnic identity beliefs -- mediated by the children's perceptions of their parents' beliefs. The next level of research should mutually study children and parents looking at acculturation level, length of stay in the U.S., generation number, and ethnic identity and socialization -- as they relate to dietary patterns. (See Chapter 7.) Szapocznik and Kurtines (1980) hypothesize that children and youth acculturate much faster than adults, although the mediating factors are not well understood. Such a study would allow for a broader understanding of the relationship between cultural attitudes and dietary behaviors between generations and possible reasons for these differences.

Another interesting study would look at acculturation among Hispanics in a predominantly non-Hispanic community rather than a bi-ethnic community, as in our study. It is possible that children may more accurately assess ethnic social variables, since they may more easily notice cultural differences and may feel "different."

Conclusions. Overall, our findings suggest a few differences between different states and regions, different ages, and changes in demographics (a more Hispanicized culture) – measured through mean acculturation level and responses to ethnic self-identification. Our findings continue to support SASH-Y as an appropriate tool for assessing children's acculturation level, while providing guidance in possible solutions to shorten the scale. Further, the tool has been shown to be valid and reliable for children in fourth grade and higher.

CHAPTER 5

Development and Evaluation of a Dietary Acculturation Food Frequency Questionnaire for Mexican American Children

Introduction

Food frequency questionnaires (FFQ) are common tools for determining dietary intake, particularly in epidemiologic research (Willett, 1990). They are useful in that they measure "usual" consumption over extended time periods. As a result, they help minimize variability in intake. Compared to other forms of dietary assessment – such as observational studies and personal interviews – FFQ are less time-, cost-, and labor-intensive. For FFQ to be accurate, however, they must include culturally relevant foods. Tucker and colleagues found that estimated mean nutrient intakes were lower in "standard" food frequency questionnaires than those developed with a specific cultural population in mind (Tucker et al., 1998). FFQs pose several challenges when working with children. Some researchers have questioned children's ability to think abstractly and to understand "average intake" (Field et al., 1999) – even at the fourth and fifth grade level. Others have found over-estimation and within-sample variability to be issues (Baranowski et al., 1986).

Validity and reliability are two important factors in selecting an evaluation instrument. They help determine if the interpretation of the results are meaningful and free from errors (Gronlund, 1998). Validity refers to the extent to which an instrument measures what it is supposed to measure (Windsor et al., 1994). Criterion validity is the main form of validity in dietary assessments. This refers to the extent to which an instrument relates to another tested instrument. Reliability, on the other hand, refers to the extent to which an instrument will produce similar results if administered several times (Windsor et al., 1994). In essence it measures "consistency" and can be measured through a variety of ways. The main forms include: internal consistency of the instrument; multiple form test; split-half; and test-re-test.

Baranowski and Simons-Morton strongly articulate that a data-collection method should be chosen that "most clearly meets the nature and purposes of a study, within resources and constraints" (Windsor et al., 1994). In our case, we were interested in investigating the impact of acculturation on children's diets, however no relevant instruments existed. As a result, we developed a questionnaire taking into consideration validity/reliability, precision, appropriateness, implementation, and financial criteria (ref: Baranowski & Simons-Morton). Our main goals for this questionnaire were to: 1) develop a reliable and valid instrument for Mexican American children; 2) determine foods that represented different acculturation levels (not necessarily diet quality); 3) develop a culturally and age-appropriate survey that could be used with children as young as 4th graders; 4) implement the survey with minimal staff and respondent burden; and 5) administer and evaluate the survey cost-effectively. Highlights of the development and evaluation (validity and reliability) of the FFQ are presented here. Findings from the dietary acculturation component are reported elsewhere (see Chapter 6).

Methods

Development of a Food Frequency Questionnaire. This study was part of a larger study focusing on the development of a CD-ROM program, covering topics on the Food Guide Pyramid. As a result, the prime concern of this study was to identify foods that reflected acculturation level from each food group – so that they could be included within the computer program. The study's objectives were different from traditional dietary intake studies in that information was not needed about nutrients, food constituents or average intake, so portion size was not necessary. Therefore, 24-hour diet recalls and/or personal interviews – considered the most accurate yet time- and labor-intensive methods -- were not justified. Because there were no self-administered questionnaires for children that investigated acculturation, a food frequency questionnaire was developed and tested specifically for this project.

The different foods that were included in the questionnaire were determined by: research on the most frequently consumed foods by children, Hispanic and non-Hispanic (Block G et al., 1986; Block et al., 1995; US Department of Agriculture, 1996; US Department of Agriculture, 1998); foods that were identified as "sensitive" to adoption and/or change (Romero-Gwynn et al., 1993); "core" foods from Koehler and colleagues' research with Hispanic children (Koehler et al., 1989); and feedback from Food and Nutrition Specialists from around the country (see below under reviewing). The questionnaire was designed in a format that followed the Food Guide Pyramid. This format was chosen since the focus was on specific foods rather than on meal patterns. Based on feedback from a Cognitive Specialist, we also believed that fourth and fifth grade children would be able to follow such a format.

Wording was determined from Jerome's Food Patterning Model (Jerome, 1982) and definition of core diets and reads as follows: "Do you eat this food or drink this beverage ALMOST EVERYDAY (2 - 7 days per week)?" Based on email communication with Walter Willett transmitted by Emily Smith, who has designed multiple FFQs and is an authority in the area, it was decided that "no" would appear in the first column and "yes" in the second. According to Willett, "yes" was initially put first, but "people found it harder because most foods are consumed at low frequency (Smith, 2000)."

Since younger children are less able to recall, estimate, and cooperate in usual dietary assessment procedures, the food frequency questionnaire was designed to be easy-to-understand, short, and consistent. The FFQ also was designed using large font (14 pt and higher), serif font, and abundant white spaces. (See Appendices, pages A-32 to A-43.)

Reviews. After the food frequency questionnaire (FFQ) was developed, three rounds of review took place. The first round took place with three faculty members and ten graduate students in the Department of Food Science and Human Nutrition and one professor from the Department of Human Development and Family Studies. Once revisions were made, the FFQ was distributed nationally through a listserv for Food and Nutrition Specialists. Twelve Specialists reviewed the questionnaire and responded with comments based on the following criteria: ease of administration; age-appropriateness; listed foods; and cultural-appropriateness. Based on these comments, the questionnaire was further edited and revised. Finally, the FFQ was reviewed by four pairs of 4^{th} and 5^{th} grade children and parents. This also allowed us to determine the length of time it would take to fill out the survey, along with overall usability. Children were asked to fill out their own questionnaire. Parents were asked to fill out a questionnaire on behalf of their 4^{th} or 5^{th} grade child and make comments about the survey. Percent agreement in answers was then determined and changes made again.

Translations. Once the FFQ was finalized, it was translated by a native speaker and then reviewed by three additional native Spanish speakers. For some foods, such as eggs, all possible translations, such as huevos and blanquillos, were included in the FFQ to minimize errors and misunderstandings through translation.

Administration of FFQ. The food frequency questionnaires were administered to 137 4th and 5th grade students in a total of 11 classrooms. Subjects were told that that the questionnaire was voluntary and that they were to answer with the best of their ability, it was not a test. The researcher read the instructions, whereby children then filled out the survey independently. Questionnaires were administered to the students at one school twice – two weeks apart -- test-retest. Children who participated in the study were compensated for their time with a $5 gift certificate to Wal-Mart or to a local movie theater, depending on the location. Informed consent was obtained from all children and their parents per protocol set out by the Office of Regulatory Compliance at Colorado State University. Refer to Appendices pages A-26 to A31.

Criterion Validity. Criterion validity was established by administering the FFQ to children between 8 and 12 and one of their parents. Refer to Chapter 4 (page 4-4) for detailed information on recruitment and administration of the instrument.

Data Analysis. Reliability between test and retest, as well as criterion validity, were established using percent agreement. For the test/retest analysis, responses from both tests were compared question by question. A total number of responses in agreement were tabulated. Then a percent agreement was calculated. The same procedure was done for the criterion validity assessment. Each response was compared between parents' and children's tests. Total percent agreements were then calculated.

Internal consistency was evaluated using Cronbach alpha. Split-half reliability was also determined for the survey, as done in Chapter 4. Split-half reliability randomly assigns questions to two groups (two halves) and compares the internal consistency of those responses.

Results

Participants. A total of 137 fourth and fifth grade children from 11 classrooms and five schools were administered food frequency questionnaires (FFQ). See Table 5.1 for demographic information for these participants.

Table 5.1: Participant Demographic Information

	Number	Percentage
Gender		
Male	77	56.6 %
Female	59	43.4 %
Total	*136*	*100*
Ethnicity		
Non-Hispanic	46	34.1 %
Hispanic	89	65.9 %
Total	*135*	*100*
Age		
9	13	9.6 %
10	46	33.8 %
11	69	50.7 %
12	8	5.9 %
Total	*136*	*100*
School		
Bradford	43	31.4 %
Guadalupe	15	11.0 %
Haskins	34	24.8 %
Lincoln	21	15.3 %
Manzanola	24	17.5 %
Total	*137*	*100*

Test-Retest Participants. Of these, twelve children from Guadalupe Elementary School in Antonito, Colorado, participated in the test-retest. The majority of children were female and either 10 or 11 years old. Refer to Table 5.2 for demographic information. Half of the children identified themselves as Hispanic.

Table 5.2: Demographic Information of Test-Retest Participants

	Number	Percentage
Gender		
Male	4	33.3 %
Female	8	66.7%
Total	*12*	*100*
Ethnicity		
Non-Hispanic	6	50.0 %
Hispanic	6	50.0 %
Total	*12*	*100*
Age		
10	5	41.7%
11	7	58.3%
Total	*12*	*100*

Criterion Validity Participants. Ten pairs of children and parents were administered the FFQ as part of the criterion validity assessment. The children were predominantly non-Hispanic and between 8 and 12 years old. See Table 5.3. Demographic information, such as age and socio-economic status was not obtained from parents.

Table 5.3: Demographic Information of Children Participating in Criterion Validity Study

	Number	Percentage
Gender		
Male	2	20.0%
Female	8	80.0%
Total	*10*	*100.0%*
Ethnicity		
Non-Hispanic	9	90.0%
Hispanic	1	10.0%
Total	*10*	*100.0%*
Age		
8	2	20.0%
9	0	0.0%
10	1	10.0%
11	4	40.0%
12	3	30.0%
Total	*10*	*100.0%*

Internal Consistency. Analysis of our sample yielded an excellent internal consistency, $\alpha = .89$ (n=137). Split-half reliability of the entire sample was .84. Following these statistics and as displayed in Table 5.4, each food group had high values of internal consistency and split-half reliabilities.

Atole Agreement. As an internal check, atole was listed twice in the food frequency questionnaire – once in the breads group and once in the milk group. In part, this was done because some individuals prepare atole (milk and cornmeal) similarly to the consistency of oatmeal, while others prepare it as a beverage. It was also used to make sure that answers were being reported accurately. There was an 80.6% agreement in answers (n=137).

Reliability (Test-Retest). The test-retest yielded an overall 71.5% agreement in scores (n=12). Eight participants were girls and four boys. Half of the students classified themselves as "Hispanic." When looking at percent agreement for test-retest for the different food groups, we found that breads, tortillas, and cereals had the lowest score with 62.8% and soda and snacks with the highest, 76.9%. See Table 5.4.

When looking at the test/retest scores by food (see Appendices pages A-112 to A-114), traditional Mexican American foods were found to have higher test/retest agreements – such as custard (flan), flautas, and tripe, all with 92.3% reliability. On the other hand, many "Euro-American" foods, such as hamburgers, hot dogs, and spaghetti had low agreements, 61.5%, 61.5%, and 30.8% respectively.

Table 5.4: Reliability and Validity Results for Food Frequency Questionnaire

Food Group	Internal Consistency (n=137)	Split-Half Reliability (n=137)	Test-Re-test Percent Agreement (n=12)	Criterion Validity Percent Agreement (n=10)
Combination Foods	.77	.77	69.2	82.3
Breads, Tortillas, & Cereals	.76	.73	62.8	85.0
Vegetables	.85	.82	74.0	83.8
Fruit and Fruit Drinks	.86	.86	69.2	79.5
Milk, Cheese, & Calcium Foods	.88	.83	68.8	83.1
Meat, Beans, & Eggs	.83	.79	71.2	85.0
Soda & Snacks	.65	.67	76.9	82.9
Total	*.89*	*.84*	*71.5*	*83.4*

Validity of Different Food Groups and Foods. There was an 83.4 total percent agreement between parents and children's responses. High and low agreements between parents and children differed from the test/re-tests -- the lowest score was seen with fruit and fruit drinks, 79.5%, and the highest with breads, tortillas, and cereals and meat, beans, and eggs, both 85.0%. Still, all scores were comparable and considered satisfactory. When looking at specific foods in terms of validity, there were a number of foods that had 100% agreement between parents and children. See Appendix, page A-115. Again, many of these foods appear to be primarily Mexican American foods – such as chile rellenos, jicama, posole, prickly pear, tripe (menudo), and yucca.

Discussions and Conclusions

Discussion. Test-retest reliability measures the "stability of test scores over a given period of time (Gronlund, 1998)." We obtained a total reliability percent agreement of 71.5% by comparing responses from tests and re-tests, indicating that the FFQ was reasonably reliable. Foods with a low percent agreement from the test-retest may suffer from several biases, inherent in test-retests: individuals may improve just by taking the test; and the first test may have alerted them to some issues, which they have investigated since the last administration of the instrument (Windsor et al., 1994). The low scores may, however, illustrate that these foods are not consistent over time and may phase in and out of children's diets more frequently than those foods with high percent agreement. Overall, the questionnaire allows for a large range of foods to be included, but like 24-hour recalls, do not allow for a large variability in eating patterns for the instrument to be found reliable. They also do not take into account changes in food supply and seasonality of food (Joachim, 1998).

Validity is the degree to which the instrument measures what it is supposed to. When examining validity, children's diet assessments have generally resulted in lower correlation coefficients than adults – and often considered too low to validate findings. For example, among children, Domel and colleagues (in the same study reported on earlier) obtained correlation coefficients of between .00 to .25 when comparing food records and food frequencies for one week periods (Domel et al., 1994). These were considered "unacceptable." Another study reported correlations of r=0.0 to 0.42 between FFQ and 24-hour recalls for 4th and 5th graders, after adjusting for day-to-day variation in dietary intake (Field et al., 1999). The researchers of that study hinted at children's inability to think abstractly as the pitfall to the studies' validation. They did obtain valid findings within their adolescent cohort. Although we did not assess validity in the same manner as these studies, we still feel confident that our FFQ was age-appropriate for 4th and 5th grade children and did not require "abstract" thinking to accurately fill it out. This is reflected in a total percent agreement of 83.4% between parents and children. The FFQ only required children to identify foods that were "almost everyday" foods. Neither frequency of consumption nor portion sizes was required. Given the limitations we faced with funding and time, we chose to use parent-child FFQ assessments for the basis of our validity, rather than FFQ and food recall.

One significant finding from this assessment was that children generally marked *more* foods than their parents. This finding was also observed by Domel and colleagues through significantly higher means from FFQ than food records and paired t-tests comparing each food item from the FFQ and food record. Taylor and Goulding substantiated this finding when assessing calcium intake (Taylor et al., 1998). They found that their FFQ tended to overestimate actual calcium intakes in young children (three to six years old), even though they did find that it showed trends and "demonstrated good ability to classify subjects into extremes of calcium intake." Willett has suggested that over-reporting may be due to a "positive response bias." Differences in interpretation of foods listed together (such as "oranges and grapefruit") could have also led to discrepancies between parents' and children's responses (Willett, 1990).

We obtained fairly high percent agreements – 79.5 to 85.0% -- indicating consistency between parents and children regarding *which* foods were reportedly eaten (or not eaten). The foods with a high percent agreement between parents and children proved to be foods that were more expensive (guava), less available at stores (prickly pear, pork rinds), and typically not offered through school breakfast or lunch programs (pork). They also appeared to be "traditional" foods from the Mexican American diet, such as corn tortillas, beans, spicy sausage (chorizo), goat, flautas, atole, red and green salsas, tomatillos, guava, and atole. (See pages A-110 and A-111 in Appendices for description of foods.)

Not surprising, those foods that had lower agreement – below 70% -- were those foods that were seen in the school menus, such as barbecued beef (sloppy joe's), hamburgers, hot dogs, and chocolate milk. This finding suggested that this discrepancy might have been attributed to the lack of parent's knowledge about what their children ate at school or after-school (before dinner). Finally, children are becoming increasingly responsible for preparing after-school snacks and sometimes meals. Part of the discrepancy in reporting could have been due to this. Also, some foods and beverages, like soda had a fairly high percent agreement, 80%, implying that although parents were aware of soda consumption, a disparity still existed.

Limitations. The biggest limitation in this report is the sample size – the reliability involved a total of 12 students and the criterion validity ten pairs of parents and children. It is possible that we would have found significance in test-retest scores (for combination foods, breads, cereals, and tortillas, and soda and snacks), along with higher percent agreements between parents and children, if there were more participants in the both samples. Additionally, the same children were not surveyed for the test-retest and parent-child FFQ validity. As a result, it is difficult to accurately compare reliability and validity results between the two samples – even though overall trends can be observed. Another limitation was that the validity assessment included primarily non-Hispanics; it is uncertain what differences in percent agreement would have been obtained using Latino parents and children instead.

Other limitations involved the design of the survey instrument. We structured many of the questions similarly to other surveys, such as the Block Food Frequency Questionnaire. In some cases, a few foods were grouped together, such as oranges or grapefruits. It is possible that this was confusing for children to process – and depending on the interpretation could result in over- or under-estimation. It has been suggested that Block's food frequency questionnaire under-estimates nutrients (Wirfalt et al., 1998). We did not find this to be the case when the number of reported foods for children was compared to parents' reports of children's diets (see discussion below).

In many households, although English may be the spoken language, many traditional meals, foods, and beverages are still referred to in Spanish. To appeal to children of these households, some Spanish words were added to the English description, such as custard (flan), smoothie (liquado), and tripe (menudo). In some cases, it is possible that when non-Spanish speaking children saw the Spanish word and did not recognize it, they could have automatically assumed that they had not eaten that food or drunk that beverage. The other side of this is that even if the word is recognized when spoken, the child may not be able to read Spanish. Since we obtained a high percentage of agreement between parents and children, though, these concerns were not apparent.

Another consideration was that children could have marked foods that they recognized rather than foods that they actually ate. Again because the parent-child tests resulted in high percent agreements, this was not shown to be true.

The terminology, "almost everyday," can be considered ambiguous and abstract, especially when combined with the definition of two to seven days per week. The wording also allows for a wider range of foods to be included in their diets – possibly an over-estimate. Nevertheless, the simplicity of the survey and this definition appeared to work well with children as early as fourth grade and nine or ten years old without personal interviews. Still, the results allow us to look at patterns of change, even with this definition.

Atole had two different test-retest scores – 84.6% when considered in the bread, tortillas, and cereal group and 69.2% when in the milk and calcium foods group. It is difficult to assess -- without probing or personal interviews – whether these differences appeared because they viewed atole more as a "bread" than a "milk."

Finally, as stated earlier, this survey did not include a comprehensive list of foods therefore we could not assess overall diet quality. We were primarily concerned with Hispanic foods that could be "indicator" foods for acculturation. Therefore, the majority of foods were considered "Mexican American." Further studies investigating diet quality through acculturation should consider conducting personal interviews with children and parents to investigate dietary patterns and specific quantities of foods and beverages ingested.

Conclusions. Ultimately, despite the limitations, the overall reliability and validity of the entire survey and the sub-sections of the survey (the food groups) give us confidence in making certain conclusions about this survey. Further, the FFQ can provide some insight into dietary patterns, although dietary quality cannot be estimated. Finally, our findings suggest reasons for why certain foods were found to be more reliable and valid, while others were not. These findings warrant further research with this instrument – in particular obtaining food records through personal interviews with children and parents in conjunction with administering these FFQs. Results from such a study would allow us to investigate dietary quality, the disparity between parents and children's reports, along with substantiating and/or negative our current findings.

CHAPTER 6

Comparison of a Paper-and-Pencil and Computer-Based Food Frequency Questionnaire

Introduction

There has been increasing interest in computer-based assessments and tests in place of paper-and-pencil tests. Although the initial cost of development may exceed that of paper formats, computerized testing offers several advantages. Computerized – or online – testing can reduce testing time in some cases, provide flexibility in scheduling, allow for immediate data collection and retrieval, and reduce respondent burden (Zandvliet et al., 1997; Bugbee et al., 1990). Additionally, many test takers have been found to prefer taking computerized tests to paper-and-pencil tests (Bugbee et al., 1990).

Based on research with sixth graders, Olsen and colleagues showed no significant differences in responses or results between paper-administered tests and computer-administered tests (Olsen et al., 1986). Farrell notes that it is important for users of computerized tests to know some basic principles of computer applications in order for this to be accomplished (Farrell, 1989). In the area of nutrition, comparisons between these two methods of assessment have not been fully explored. For this study, our main research objective was to determine if children reported similar intakes using online and paper food frequency questionnaires (FFQ).

Methodology

Procedures. Children from 12 fifth grade classrooms in nine schools in southern Colorado participated in the study. All grade schools in southern Colorado with a Hispanic population of greater than 50% (n = 36) were contacted to participate in this study. Since our main objective was to look at dietary acculturation, we chose this cut-off to ensure a cross-sample of low to high acculturation Hispanics. They were from a region with a high percentage of Hispanics and migrant farm workers. Informed consent was obtained from all children and their parents, per protocol set out by the Office of Regulatory Compliance at Colorado State University. (See Appendices pages A-26 to A-31 for consent forms for paper version. Consent forms found on pages A-44 to A-49 were used for the online versions.) Schools that participated were compensated with a complimentary copy of a nutrition education software program. Children who participated in the paper version of the study were compensated for their time with a $5 gift certificate at Wal-Mart or a movie theater. Children who completed the online version, along with the entire computer evaluation, received a $10 gift certificate at Wal-Mart.

Food Frequency Questionnaire. A food frequency questionnaire was developed and tested specifically for this project. The paper version of the assessment can be found in the Appendices, specifically from pages A-36 to A-43. See Chapter 5 for more in-depth description of the design and development of the FFQ. Our main goal in developing the questionnaire was to be able to identify foods that were sensitive to adoption and change, based on acculturation (Romero-Gwynn et al., 1993).

The FFQ (paper version) was tested for validity and reliability. Analysis of our sample yielded an excellent internal consistency, $\alpha = .89$ (n=137). Split-half reliability of the entire sample was .84. The test-retest yielded an overall 71.5% agreement in scores (n=12). There was an 83.4 total percent agreement between parents and children's responses. Refer to Chapter 5 for methodology, results, and discussion of these findings.

The paper version was converted directly to a computer form, which could be administered online. (See Appendices, specifically pages A-68 to A-73, for online assessment.) The test questions and the order of presentation were identical to the pencil-and-paper format. Children were asked to click on the foods that they ate almost everyday. They were required to press a "next" button to proceed to the next page.

<u>Acculturation Level.</u> Acculturation level was assessed using the 12-point Short Acculturation Scale for Hispanic Youth (SASH-Y), developed by Barona and Miller (Barona et al., 1994). See Appendices pages A-33 to A-35 for specific SASH-Y questions. They obtained an excellent internal consistency (α = .94), both for Hispanics and non-Hispanics (.92 and .85 respectively) and split-half reliabilities (Hispanic, .95, and non-Hispanic whites, .87). The scale asks questions about language use, language preference, and ethnic social relations. Each answer is given a score of 1 to 5. Individual scores from all of the questions are added up to determine the total acculturation score. The total acculturation score can be compared to a normative data grid, which classifies the individual as low, moderate, or high acculturation.

The SASH-Y paper version was tested with Coloradoan children and parents to determine its validity and reliability with our target population. There was a 90.3% agreement between parents and children's responses. (See Chapter 4.) The SASH-Y was adapted for online computer use. Refer to pages A-50 to A-57 in Appendices.

Administration. Paper versions of the food frequency questionnaires (FFQ) were administered to children within fourth and fifth grade classrooms. The online assessments were conducted with only fifth grade students in computer labs and computers placed in their classrooms. Refer to Chapter 8 for detailed methodology of recruitment. For the computer assessments, each child was assigned a different user number. Responses were automatically saved to the computer or network into a designated database file. The children who participated in the written assessment were different than those who used the online assessment. The two assessments were completed one year apart from each other.

Data Analysis. Spearman correlations were run comparing trends in reported intakes between methods of administration and total acculturation score. Chi-Square tests were conducted to determine differences between demographic variables for the two methods of administration. Logistic regression analysis was conducted to investigate differences in reported intakes of foods controlling for method of administration and level of acculturation. Logistic regression allows for blocking of categorical data to control for factors.

Results

Participant Information. A total of 268 children from southern Colorado participated in the study – 96 were administered the paper version of the FFQ and 131 the online version. The paper version was administered in a total of five schools and the online version a total of four schools. Outside of age, no significant differences existed between children in terms of demographic variables in the two groups. See Table 6.1 on next page. Significant main effects were found for acculturation score based on ANOVA ($p<.05$).

Table 6.1: Participant Demographic Information

	Paper	Online
Gender		
Male	55 (57.3)	67 (51.1)
Female	41 (42.7)	64 (48.9)
Total	*96*	*131*
Ethnicity		
Non-Hispanic	31 (32.3)	54 (41.2)
Hispanic	65 (67.7)	61 (58.8)
Total	*96*	*131*
Age		
9	1 (1.0)	0 (0)
10	23 (23.7)	32 (24.4)
11	65 (67.0)	88 (67.2)
12	8 (8.2)	10 (7.6)
13	0	1 (.8)
Total	*97*	*131*
Acculturation Level		
Low	11 (11.3)	7 (5.3)
Moderate	25 (25.8)	25 (19.1)
High	61 (62.9)	99 (75.6)
Total	*97*	*131*

Differences in Methods of Administration. Logistic regression analysis indicated that different proportions in intakes existed between groups for 31 foods, while controlling for acculturation. This accounted for a difference of 26% of all foods listed in the food frequency questionnaire (FFQ) and an agreement in 74% of foods. There are 119 foods in the FFQ. See Table 6.2. Combination foods showed the highest number of differences -- eight. The soda and snacks group and milk and calcium foods group had the lowest numbers -- only one. For all of the foods shown in Table 6.2, reported intakes were higher for the paper version than the online method.

Table 6.2: Differences in Acculturation Sensitive Foods between Methods of Administration*

Combination Foods	Breads, Tortillas, & Cereals	Vegetables	Fruits	Milk & Calcium Foods	Meats, Beans, & Eggs	Soda & Snacks
Posole	Flour tortilla	Red salsa	Orange juice	Ice cream	Beans	Candy
Tamales	Corn tortilla	Green salsa	Apple juice		Steak	
Burritos	Mexican rice	Jicama	Fruit drinks			
Enchiladas	Atole	Potato chips	Mangoes			
Tacos	Sweet bread (pan dulce)	Vegetable soup	Pineapple			
Pizza	Crackers		Grapes			
Tostadas	Donuts					
Flautas						
8	7	5	6	1	2	1

*based on logistic regression analysis, p<.05

Total Number of Foods. Overall, children who participated in the online assessment reported eating significantly fewer foods than children who were administered the paper version. Differences shown in Tables 6.2 and 6.3 reflect this shift. Children reported eating almost half of all listed foods when using the paper version, but only about one third using the online evaluation. The mean number of foods varied from school to school, highlighting possible differences in dietary practices based on location and region.

Table 6.3: Total Number of Foods Reported by Method of Administration

Method	Total Number of Foods Mean ± SE	Percent of Total Foods Listed
Paper Version (n=96)	55.62 ± 1.98^{a}	46.7 %
Online Version (n=131)	46.42 ± 1.80^{a}	39.0 %

Same letters represent significant differences, p<.05

Reporting Based on Acculturation Level. Acculturation was correlated with total number of foods. A dramatic change took place among less and highly acculturated children when using the online version. Children classified as "low" reported eating almost forty percent fewer foods – a highly significant difference (p<.01). The difference between paper and online versions was more modest among highly acculturated children, although still statistically significant. The number of total foods reported by moderately acculturated children did not significantly decline. See Table 6.4 and Figure 6.1. Low acculturation is considered a score of 12 to 30, moderate 30 to 45, and high 45 to 60.

Table 6.4: Total Number of Foods Reported by Acculturation and Group

Acculturation Level	Paper Version	Online Version
Low	68.73 ± 6.72^{a}	42.43 ± 9.30^{a}
Moderate	59.08 ± 4.13	54.04 ± 4.58
High	51.84 ± 2.23^{b}	44.78 ± 1.96^{b}

Same letters in rows represent significant differences, p<.05

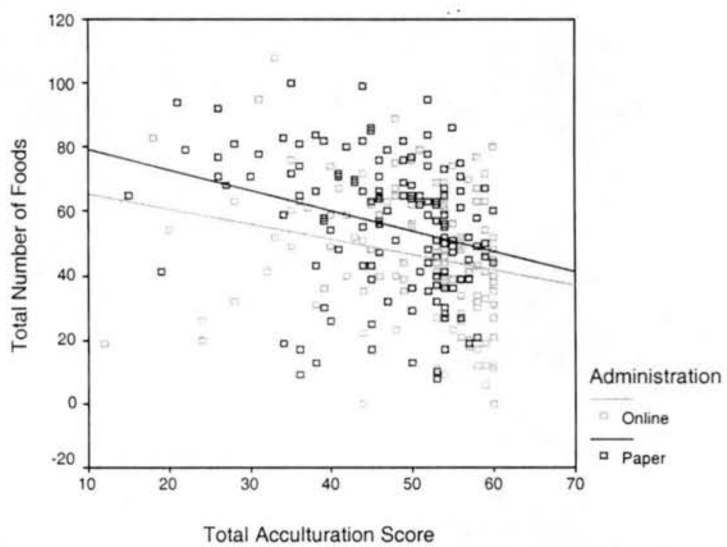


Figure 6.1: Scatter Plot of Total Number of Foods Reported by Acculturation Score

Acculturation Sensitive Foods. One of our main objectives was to determine which foods were sensitive to change and adoption as a result of acculturation. We also wanted to determine whether similar changes were documented using paper and online methods. Using Spearman correlations separately for paper and online methods, a number of foods were found to significantly change with the process of acculturation. Comparing the two methods of administration, findings indicated that a large portion of "sensitive" foods were mutual across methods. These foods are shown in Table 6.5

Table 6.5: Foods Found Sensitive to Elimination
Using Both Paper and Online Versions*

Food Group	Foods			
Combination Foods	Posole	Tamales	Tortilla casserole (chilaquiles)	Quesadillas
	Flautas	Chile rellenos	Rice pudding	
Breads, Tortillas, & Cereals	Corn tortillas	Atole	Mexican rolls (bolillos)	Mexican sweet bread (pan dulce)
Vegetables	Green salsa	Tomatillos	Jicama	Chile peppers
Fruits	Mexican drink	Prickly Pear	Papaya	
Milk and Calcium Foods	Mexican cream	Mexican cheese	Custard	
Meats, Beans, and Eggs	Thin steak	Grilled beef (barbacoa)	Mole	Tripe
Soda and Snacks	Crullers (fritters)			

*Based on Spearman correlations, $p<.05$

Many differences also existed between methods of administration as displayed in Table 6.6. Differences appeared to be widespread – across food groups and method of administration. The large majority of foods were considered sensitive to elimination – or decreased with acculturation. The main differences between methods are noted for combination foods, vegetables, fruits, and meats, beans, and eggs. A few foods increased with acculturation: canned corn and cheddar cheese were found to be sensitive to adoption with the paper version; green peppers and candy with the online version.

Table 6.6: Differences in Foods Found Sensitive to Elimination Between Methods of Administration*

Food Group		Foods				
Combination Foods	Paper	--				
	Online	Burritos	Enchiladas	Tacos	Tostadas	
Breads, Tortillas, & Cereals	Paper	--				
	Online	Flour tortillas	Mexican rice	Donuts		
Vegetables	Paper	Fresh corn	Sweet potatoes			
	Online	Red Salsa	Tomatoes	Guacamole		
Fruits	Paper	Pineapple	Peaches	Guava		
	Online	--				
Milk and Calcium Foods	Paper	Canned Milk				
	Online	--				
Meats, Beans, and Eggs	Paper	Eggs	Eggs with chicken livers	Spicy sausage	Sliced beef strips	Fish
	Online	Beans				
Soda and Snacks	Paper	Water with Hibiscus	Cake			
	Online	Cookies				

*Based on Spearman correlations, p<.05. Foods shown here decrease with increasing acculturation.

Discussion and Conclusions

Our findings highlight distinctive differences between paper-and-pencil and online assessments of diet, as well as effects of acculturation. We attempted to reduce disparities between the modes of administration by making the questionnaires parallel. Overall, comparisons between the two assessments show that children were either more conservative in their assessments of what they ate or they skipped more foods when they used the online assessment. According to Kerlinger, it is important to understand if the variations are based on "systematic" errors or due to "chance" (Kerlinger, 1973).

The former indicates that the two modes of administration are not equivalent; the latter case may suggest that they are equivalent. There are several reasons -- both systematic and random -- which potentially explain these variations. First of all, children could have viewed the computerized FFQ as a "game." In many cases, children use computers to play games – not necessarily for studying or taking tests. In an informal assessment of the FFQ, children said that they found it was "fun" to take the test. Although we took this as a positive comment about the ease of the online assessment, they may have, in fact, thought of it as a game and therefore did not take it seriously.

Another contributing factor is that our online assessment did not allow for children to review their answers. There was not a "back" button, so once they proceeded to the next page they could not change any previously answered questions – as they could for the written assessment. Green considers this an important distinction between computerized tests and paper-and-pencil tests along with omitting items, computer screen capacity, and graphics (Green et al., 1984).

Another important distinction existed between methods of administration. When taking the online assessment, children were placed at computers in isolated cubicles where other children could not see their responses. The paper assessment was administered at their desks in a classroom setting. Having a more private setting to answer questions may have affected the way children responded to questions. They may have answered more truthfully, since they were not influenced by their peers' reactions.

Variations could also be attributed to differences in geographic locations and "communities." For example, eleven children in a small town -- with a relatively large population of migrant farm workers (given the town size) -- were administered the paper-and-pencil FFQ. The community makes an effort to provide a supportive environment to the migrant workers through health and housing services. In this capacity, it is possible that this translated into a smaller variance in food selections among less acculturated children. It can also be conjectured that this localized group may have influenced the surrounding area with mutual acculturation taking place. Although this is just one example, this could also be true of other towns and communities where this study took place.

Another option was that children could have suffered from test fatigue. Test fatigue has been shown to confound performance, especially with children (Olsen et al., 1986). We asked a number of questions before asking about their diet (see Chapter 8.) By the time they reached the diet questions, they could have been tired and anxious to finish the test. Research has shown that computer tests may reduce testing time (Bunderson et al., 1989). We did not measure testing time for either online or paper-and-pencil tests to determine if we could discount fatigue or not.

Finally, there could have been a potential time effect. The two methods were administered one year apart. Because we found that similar foods were sensitive to change with acculturation, we believe that conclusions related to dietary acculturation are appropriate and within the scope of our study. Individual variability in diets has been shown to be a significant factor in other studies looking at different methods of assessment (Baranowski et al., 1986; Willett WC et al., 1985).

Further, combination foods -- such as posole, tamales, and pizza -- were found to have the highest number of different foods between methods of administration. These differences could be attributed to variations between families or, in the case of pizza, what the schools provide for school lunches. (See Chapter 7 for analysis of school lunches related to acculturation sensitive foods.) Other differences were found between groups. For example, the online version yielded more acculturation-sensitive combination foods and vegetables than the paper-and-pencil assessment. Likewise, the paper version had more acculturation-sensitive foods from the meats, beans, and eggs group. In part, these discrepancies could be related to availability of foods within those areas. With the exception of one town, all evaluations were conducted in different towns and cities.

It is difficult to assess if the discrepancies were linked to systematic or random differences without comparing results from the same children. Regardless of the differences, a large number of mutual foods were found to be acculturation- sensitive foods. These included foods from all of the food groups. Many are not necessarily considered "common" or "typical" – such as posole, tamales, tortilla casserole (chilaquiles), atole, jicama, tripe, and mole.

It is also interesting to note that highly acculturated children reported significantly fewer foods than less and moderate acculturated children in both forms of the assessment. This is discussed further in Chapter 7.

Limitations. Children in our study were fifth graders. Some studies have suggested that children at this age may be too young to accurately assess their own diet (Domel, et al., 1994). We attempted to develop a dietary assessment tool, which was easy-to-use and appropriate for this age group. It did not assess serving size; instead it merely identified foods that were eaten almost every day. Children may have reported foods as those they identified rather than those foods they actually eat. Results from reliability and validity tests appear convincing that this was not the case.

Future Studies. To distinguish between differences in intakes between children, different geographic regions, time effects, and methods of administration, a follow-up study is warranted. The ideal study would have fifth grade children from southern Colorado – representing the population described herein – be randomly assigned to a method of administration. Two weeks later they would then be administered the other form of assessment. This would tease out other factors affecting differences in reporting between the two time periods – such as individual variability in the diet and possible seasonal effects. Interviews with children about attitudes about computer versus paper questionnaires would provide insight into possible differences in reporting.

Conclusions. Although many differences in foods were exhibited between paper and online versions of the FFQ, many similarities also existed. Overall, given the agreement in responses about acculturation-sensitive foods, we feel confident about concluding that the foods found sensitive by both methods are accurate. We also feel assured in assuming that many of the differences can be attributed to variations among participants. A follow-up study is certainly necessary to substantiate our findings and conclusions. Given that few studies in the field of nutrition have explored paper-and-pencil versus computerized assessments, this is certainly the beginning.

CHAPTER 7

Dietary Acculturation among Mexican American Children

Introduction

In the past thirty years, the demography of the U.S. has changed dramatically. By the year 2005 it is expected that non-Hispanic whites will become a "minority" group in the U.S. with Hispanics playing a "major" role in America's profile (US Bureau of the Census, 1998). Given this shift, acculturation is becoming an increasingly important issue. Acculturation is the *process* of change that results when two cultures (people, societies) come into contact with each other first hand (Berry, 1992). Different types of change can occur as a result of this contact. On the group level, these include physical, biological, political, cultural, and social relationship changes. At the individual level, numerous psychological and behavioral changes take place, including dietary changes.

There is no consensus on acculturation's "external" explications, such as its theoretical structure or even how it should be used in assessment/evaluation (Magana et al., 1996). Further, there are questions about the "internal" framework of acculturation, such as why some individuals experience a faster pace of acculturation while others retain traditional behaviors, attitudes, and values. As a result, in many studies acculturation is simplified and defined as length of residence in the U.S. and/or generation number in the U.S. (Hiller et al., 1991). Padilla and Betancourt argue that these are insensitive indicators that do not explore the depth of psycho-social adaptation or the interaction between various behaviors and social or even linguistic factors (Padilla, 1994; Betancourt et al., 1993). Despite these "insensitive" indicators, several studies have exhibited a linear relationship between generation and cultural orientation with the "new" culture (Perez et al., 2000).

Further, certain trends and dietary changes have been documented using these indicators. For example, Bermudez and colleagues (2000) found that more acculturated Hispanics residing in the United States had macronutrient profiles more similar to those of the non-Hispanic whites. They also ate fewer ethnic foods than less acculturated Hispanics. A recent study by Garcia-Maas (1999) found that daughters ate more fat, and were more acculturated than their mothers. In terms of specific nutrient intake, another study found that first generation Mexican Americans consumed significantly more protein, carbohydrates, vitamins A and C, folic acid and calcium than did second-generation Mexican Americans (Guendelman et al., 1995). Finally, based on research with Mexican American immigrants in California, Eunice Romero-Gwynn and colleagues (1993, 1994) found that there were foods that were "highly sensitive," "moderately sensitive," and "stable" to change (and acculturation) within the Chicano culture.

It is clear why a relationship exists between acculturation and nutrition: many native traditions and foods are no longer available. Also, social and peer influences persuade changes in perspective and attitude towards "new" foods resulting in dietary habits that mimic those of the new country.

Objectives. The objective of this research study was to assess dietary habits (and changes) among children living in southern Colorado based on acculturation level. Dietary acculturation studies have primarily focused on adults – not children. The southern part of Colorado is a highly agricultural region and therefore has a high percentage of migrant farm workers – many of whom are recent immigrants and Hispanic. This study is part of a larger study focusing on the development of a culturally appropriate CD-ROM nutrition education program for children.

Methodology

Participants. All grade schools in southern Colorado with a Hispanic population of greater than 50% (n = 36) were contacted to participate in this study. Since our main objective was to look at dietary acculturation, we chose this cut-off to ensure a cross-sample of low to high acculturation Hispanics. These schools are located in a highly agricultural region with a high percentage of Hispanics and migrant farm workers. Letters of interest were obtained from all participating schools.

Procedures. Surveys – including a food frequency questionnaire, acculturation scale, and brief demographic questionnaire -- were administered to 5^{th} grade students from schools located in southern Colorado. Paper versions of the food frequency questionnaires (FFQ) were administered to children in fifth grade classrooms. The online assessments were conducted with students in computer labs and computers placed in their classrooms. For the computer assessments, each child was assigned a different user number. Responses were automatically saved to the computer or network into a designated database file. The children who participated in the written assessment were different than those who used the online assessment. The two assessments were completed one year apart from each other.

Subjects were told that that the questionnaire was voluntary and that they were to answer with the best of their ability, it was not a test. The researcher read the instructions, whereby children then filled out the survey independently. Informed consent was obtained from all children and their parents, per protocol set out by the Office of Regulatory Compliance at Colorado State University. Schools that participated were compensated with a complimentary copy of a nutrition education software program (see Chapter 8). Children who participated in the paper version of the study were compensated for their time with a $5 gift certificate to Wal-Mart or a movie theater. Children who took the online assessment received a $10 gift certificate for Wal-Mart. (This was part of a larger evaluation. See Chapter 8.)

Food Frequency Questionnaire. A food frequency questionnaire was developed and tested specifically for this project. Refer to Chapters 5 and 6 for more details on the design and development of the questionnaire. The different foods that were included in the questionnaire were determined by the following steps: research on the most frequently consumed foods by children, Hispanic and non-Hispanic (Block et al., 1995; US Department of Agriculture, 1996; US Department of Agriculture, 1998); foods that were identified as "sensitive" to adoption and/or change (Romero-Gwynn et al., 1993); "core" foods from Koehler and colleagues' research with Hispanic children (Koehler et al., 1989); and feedback from Food and Nutrition Specialists from around the country (see below under reviewing). (See Appendices, pages A-32 to A-43 and A-68 to A-73 to see the FFQ and pages A-110, A-111 for a description of foods.) Children were asked to identify which food s they ate "almost everyday (2-7days per week). These foods were classified as "core" foods.

The FFQ was tested for validity and reliability. Analysis of our sample yielded an excellent internal consistency, $\alpha = .89$ (n=137). Split-half reliability of the entire sample was .84. The test-retest yielded an overall 71.5% agreement in scores (n=12). There was an 83.4 total percent agreement between parents and children's responses. (See Chapter 5.)

The paper version was converted directly to a computerized form, which could be administered online. The test questions and the order of presentation were identical to the pencil-and-paper format. Children were asked to click on the foods that they ate almost everyday. (See Appendices for online evaluation screens.) They were required to press the "next" button to proceed to the next page.

Acculturation Level. Acculturation level was assessed using the 12-point Short Acculturation Scale for Hispanic Youth (SASH-Y), developed by Barona and Miller (Barona et al., 1994). The scale asks questions about language use, language preference, and ethnic social relations. Each answer is given a score of 1 to 5. Individual scores from all of the questions are added up to determine the total acculturation score. The total acculturation score can be compared to a normative data grid, which classifies the individual as low, moderate, or highly acculturated. Low represents the score of 12 to 30; moderate 30 to 45; and high 45 to 60. They obtained an excellent internal consistency (α = .94), both for Hispanics and non-Hispanics (.92 and .85 respectively) and split-half reliabilities (Hispanic, .95, and non-Hispanic whites, .87).

The SASH-Y paper version was tested with Coloradoan children and parents to determine its validity and reliability in Colorado -- with our target population. There was a 90.3% agreement between parents and children's responses. (See Chapter 4.) The SASH-Y was adapted for online computer use.

Ethnicity. When determining ethnicity, we chose to use the term "Mexican American" opposed to "Hispanic" in our study. Our target Hispanic population is primarily comprised of Mexican Americans. We thought that fifth grade children would relate to this term better than Hispanic, since "Hispanic" is not commonly used at home and outside of government and research arenas. For the Short-Acculturation Scale for Hispanic Youth (SASH-Y), the term "Latino" was used in reference to ethnicities of friends and relatives in place of "Hispanic." We also noted in the instructions for this section of the survey that Mexican American was considered "Latino." Again, we felt that this term was more appropriate for children and participants in our target area.

Data Analysis. The main research objective was to determine if children at different acculturation levels eat differently. As a result, spearman correlations were run for total acculturation scores (AS) and foods. Spearman correlations allow for analysis of correlations with non-parametric data, such as AS, and yields the same results as t-tests with normalized data. It provides an added benefit over Chi-Square tests in that trends in food consumption can be viewed over the whole range of acculturation scores rather than by level of acculturation. To eliminate any differences between methods of administration, logistic regression analyses were conducted to investigate differences in reported intakes of foods between acculturation levels, controlling for method of administration. Logistic regression allows for blocking of categorical data to control for factors. To compare the total number of reported foods between groups, independent t-tests were run. Regression analyses were conducted with the transformed acculturation score as the independent variable and age, gender, grade, ethnicity, and school as covariates. Based on the distribution of scores, the following transformation was done to normalize the data: $\sqrt{[[100 - [(AS - 12)/AS)] \times 100]}$.

Results

Participant Information. A total of 228 fifth grade children from southern Colorado participated in the study – 97 were administered the paper-and-pencil version of the FFQ and 131 the online version. The paper version was administered in a total of five schools and the online version a total of four schools. With the exception of one school, all schools were different. No significant differences existed between children, when looking at demographic variables. See Table 7.1. The majority of children were Mexican American males, who were 11 years old, and considered highly acculturated. Significant main effects existed for ethnicity on acculturation, based on analysis of variance ($p<.05$).

Table 7.1: Participant Demographic Information

	Paper n (%)	Online n (%)
Gender		
Male	55 (57.3)	67 (51.1)
Female	41 (42.7)	64 (48.9)
Total	*96*	*131*
Ethnicity		
Mexican American	65 (67.7)	61 (58.8)
Other than Mexican American	31 (32.3)	54 (41.2)
Total	*96*	*131*
Age		
9	1 (1.0)	0 (0)
10	23 (23.7)	32 (24.4)
11	65 (67.0)	88 (67.2)
12	8 (8.2)	10 (7.6)
13	0	1 (.8)
Total	*97*	*131*
Acculturation Level		
Low	11 (11.3)	7 (5.3)
Moderate	25 (25.8)	25 (19.1)
High	61 (62.9)	99 (75.6)
Total	*97*	*131*

Acculturation Sensitive Foods. One of our main objectives was to determine which core foods were sensitive to change and adoption as a result of acculturation. When controlling for method of administration using logistic regression, a large number of foods were found to be sensitive to change. See Table 7.2. (See Appendices pages A-

116 to A-118 for complete list of foods and p-values.) Combining the data from the two methods of administration allows for statistical comparisons between low, moderate, and high acculturation levels (since the "low" level of acculturation would otherwise be too small to make meaningful interpretations). This level of analysis also provides insight into where differences in dietary intake exist between levels of acculturation. The most differences were documented between children considered moderately or highly acculturated. In total 39 differences existed, compared to 28 between low and high levels and only 12 between low and moderate.

Table 7.2: Core Foods Found to be Sensitive to Acculturation Controlling for Method of Administration

Food Group	Foods				*Total*
Combination Foods	Posole[b]	Tortilla casserole (chilaquiles)[a,b,c]	Quesadillas[a,b]	Tostadas[b]	8
	Taquitos[a,b]	Flautas[a,b]	Chile Rellenos[a,b]	Rice Pudding[a,b,c]	
Breads, Tortillas, and Cereals	Corn tortilla[a]	Mexican rice[b]	Atole[a,b]	Oatmeal[c]	6
	Mexican bread rolls (bolillos)[b]	Sweet bread (pan dulce)[a,b,c]			
Vegetables	Fresh corn[a]	Jicama[a,c]	Guacamole[a,b]	Peas[b]	9
	Lettuce[2]	Vegetable Soup[a,c]	Vegetable Salad[c]	Tomatillos[c]	
Fruits	Mexican fruit drinks[a,b,c]	Mangoes[a,b]	Pineapple[a,b]	Peaches[2]	8
	Guava[a,b]	Prickly Pear[b]	Papaya[b]		
Milk and Calcium Foods	Mexican cream[a,b]	Mexican cheese[a,b]	Sliced American cheese[b]		6
	String cheese[a,c]	Custard (flan)[a,b]			
Meats, Beans, and Eggs	Beans[b]	Eggs with chicken livers[b]	Spicy sausage (chorizo)[b]	Thin-sliced steak[b]	10
	Sliced beef strips[b]	Barbecued beef[a,b]	Goat[b]	Mole[a,c]	
	Tripe[a,b]				
Soda and Snacks	Crullers[a,b]	Cookies[b]	Cake[b]		3

[a] significant differences between low and high acculturation (p<.05), [b] moderate and high acculturation (p<.05), [c] low and moderate acculturation (p<.05)

Only a few foods were sensitive to adoption (at a statistically significant level) with acculturation -- fruit drinks, canned corn, eggs, and Cheddar cheese. The remainder decreased as children moved from low to high acculturation. The meats, beans, and eggs group had the highest number of sensitive foods – ten.

Number of Core Foods. Overall less acculturated children reported eating more foods in their core diet than moderately and highly acculturated children. The average total number of foods reported by children classified as "low" were 58.5, compared to 56.6 for moderate and 47.5 for high. This is shown in Table 7.3. The total number of foods listed in the questionnaire was 119. Significant differences were demonstrated between low and high levels of acculturation and moderate and high. Less acculturated children reported eating more foods in all food groups, except meats, beans, and eggs. For this food group, moderately acculturated children reported eating a higher number of foods. For all food groups, except vegetables, moderately acculturated children had significantly higher numbers of foods than highly acculturated children.

Table 7:3: Mean Number of Core Foods Reported

Food Group	Low Acculturation (n=18)	Moderate Acculturation (n=50)	High Acculturation (n=160)
Combination Foods	7.2[a]	6.9[b]	4.5[a,b]
Tortillas, Breads, & Cereals	9.1[a]	8.2[b]	6.9[a,b]
Vegetables	9.8	8.3	8.0
Fruits	11.4	11.2[b]	9.8[b]
Milk and Calcium Foods	7.7	7.8[b]	6.6[b]
Meats, Beans, & Eggs	8.9	10.0[b]	8.1[b]
Sodas & Snacks	4.3[a]	4.2[b]	3.5[a,b]
Total	*58.5*[a]	*56.6*[b]	*47.5*[a,b]

Same letters indicate significant differences in reported number of foods, $p<.05$

Most Popular Core Foods. When looking at foods that were consumed by at least 75% of children, there were several foods that were consistent among all groups, as shown in bold – cereal, orange juice, oranges, apples, grapes, milk, and soda. See Table 7.4. From the chart it is evident that a greater number of moderately acculturated children reported eating the same foods, followed by children at the "low" and "high" acculturation levels.

Table 7.4: Core Foods Consumed by At Least 75% of Children (n=228)

Food Groups	Low Acculturation (n=18)	Moderate Acculturation (n=50)	High Acculturation (n=60)
Combination Foods	Pizza		Pizza
Breads, Tortillas, and Cereals	**Cereal** Pancakes	**Cereal** Pancakes	**Cereal**
Fruits	**Orange juice** Mexican drink **Oranges** **Apples** **Grapes** Bananas Pineapple	**Orange juice** Apple juice Fruit drink **Oranges** **Apples** **Grapes**	**Orange juice** Apple juice Fruit drink **Oranges** **Apples** **Grapes**
Milk and Calcium Foods	**Milk**	**Milk** Ice cream	**Milk** Ice cream
Meats, Beans, and Eggs		Beans Eggs Hamburger Chicken	Hamburger Hot dog
Soda & Snacks	**Soda** Cookies Candy	**Soda** Cookies Candy	**Soda**
Total	*14*	*17*	*13*

Bold denotes no difference across all acculturation levels.

When we look at foods consumed by the majority of children at each acculturation level, we find that the range of foods increases substantially for less acculturated children compared to those reported by at least 75% of children. See Table 7.5. In fact, less acculturated children reported more foods that were the same than moderately or highly acculturated children. This spanned almost all food groups – combination foods; tortillas, cereals, and breads; vegetables; meats, beans, and eggs; and soda and snacks.

Table 7.5: Core Foods Consumed by At Least 50% of Children (n=228)

Food Groups	Low Acculturation (n=18)		Moderate Acculturation (n=50)		High Acculturation (n=60)	
Combination Foods	**Burritos** **Tacos** Quesadillas Rice Pudding	Enchiladas Taquitos **Pizza**	**Burritos** Enchiladas Tostadas	**Pizza** **Tacos**	**Burritos** **Pizza**	**Tacos**
Breads, Tortillas, and Cereals	Flour tortilla Pasta **Cereal** Sliced white bread **Crackers** **Pancakes**	Corn tortilla Mexican rice Oatmeal Sweet bread **Donuts**	Flour tortilla Mexican rice Sliced white bread **Donuts**	Pasta **Cereal** **Crackers** **Pancakes**	Rice Sliced white bread **Donuts**	**Cereal** **Crackers** **Pancakes**
Vegetables	Fresh corn Guacamole **Potatoes** Lettuce salad Vegetable soup	Red salsa **Potato chips** **Carrots** Vegetable salad	Red salsa **Potatoes**	**Potato chips** **Carrots**	**Potato chips** **Carrots**	**Potatoes** Lettuce salad
Fruit and Fruit Drinks	**Orange juice** Mexican fruit drink **Bananas** Mangoes Cantaloupe **Grapes** **Peaches**	**Apple juice** **Oranges** **Apples** Pineapple **Watermelon** **Strawberries**	**Orange juice** Mexican fruit drink **Oranges** **Apples** Pineapple **Grapes** **Peaches**	**Apple juice** Fruit drinks **Bananas** Mangoes **Watermelon** **Strawberries**	**Orange juice** Fruit drinks **Bananas** **Watermelon** **Strawberries**	**Apple juice** **Oranges** **Apples** **Grapes** **Peaches**
Milk and Calcium Foods	**Milk** American-sliced cheese **Ice cream**	**Chocolate milk** **Yogurt**	**Milk** Mexican cheese **Yogurt**	**Chocolate milk** String cheese **Ice cream**	**Milk** Cheddar cheese String cheese **Ice cream**	**Chocolate milk** American-sliced cheese **Yogurt**
Meats, Beans, and Eggs	Beans **Ham** Barbecue Hot dogs Chicken **Peanut butter**	**Eggs** **Pork** Hamburger Fish Mole	Beans Spicy sausage **Pork** Hamburger Chicken	**Eggs** **Ham** Steak Hot dog **Peanut butter**	**Eggs** **Pork** Hamburgers Chicken	**Ham** Steak Hot dogs **Peanut butter**
Soda & Snacks	**Soda** **Cake**	**Cookies** **Candy**	**Soda** **Cake**	**Cookies** **Candy**	**Soda** **Cake**	**Cookies** **Candy**
Total	*61*		*46*		*42*	

Bold denotes no difference across all acculturation levels.

Least Popular Core Foods. The highest number of foods appeared for highly acculturated children in the "least popular" list – those foods consumed by fewer than 25% of children. See Table 7.6. There were a total of 30 foods listed for high versus 13 for low and 12 for moderate. There were only four foods consistent across groups in this category – yucca, apricots, sweet potatoes, and canned milk.

Table 7.6: Core Foods Consumed by Fewer than 25% of Children (n=228)

	Low Acculturation	Moderate Acculturation	High Acculturation	
Combination Foods		Pork green chile	Chilaquiles Taquitos Quesadillas	Flautas Chile Rellenos Rice pudding
Breads, Tortillas, & Cereals	Sweet bread (pan dulce) White bread rolls (bolillos) Fry bread (fritters)		Atole White bread rolls (bolillos)	Sweet bread
Vegetables	Canned corn Green pepper **Sweet potatoes** **Yucca**	Tomatillos Jicama Peas **Yucca** Cabbage **Sweet potatoes** Spinach	Fresh corn Tomatillos Jicama Cabbage	**Sweet potatoes** Spinach **Yucca**
Fruits	**Apricots**	**Apricots** Guava	Mexican drink Guava **Apricots**	Prickly pear Papaya
Milk & Calcium Foods	**Canned milk** Sour cream **Monterey Jack cheese** Cottage cheese	**Canned milk** **Monterey Jack cheese**	**Canned milk** Mexican cream **Monterey Jack cheese**	Mexican cheese
Meats, Beans, & Eggs	Eggs with chicken livers (higaditos)		Eggs with chicken livers (higaditos) Barbecued beef Thin-sliced steak	Goat Mole Tripe
Soda & Snacks				Crullers (fritters)
Total	*13*	*12*	*30*	

Bold denotes no difference across acculturation levels.

School Breakfast and Lunch. One hundred twenty-three (54.7% of reported answers) of children ate school breakfast and 200 (88.9%) ate school lunch. Based on chi-square analysis, there were no significant main effects of level of acculturation with school breakfast and school lunch. Many of the school breakfast and lunch foods are considered highly consumed foods but not "acculturation-sensitive" foods.

Discussion and Conclusions

Overall our results highlight many of the findings reported elsewhere, while raising issues related to Mexican American children in Colorado. Most importantly, we demonstrated through a cross-sectional study that several differences exist between children's diets at different acculturation levels.

Based on research with Mexican American immigrants in California, Romero-Gwynn and colleagues (1993) found that there were foods that were "highly sensitive," "moderately sensitive," and "stable" to change (and acculturation) within the Chicano culture. Results from our study supported many of Romero-Gwynn's findings. In contrast, however, we found that the majority of the foods included in our FFQ were sensitive to elimination or replacement in the core diet – as opposed to sensitive to adoption. It was not clear what constituted moderate and high in their study, so we were unable to replicate that level of analysis. Nevertheless, a number of foods were also found to be consistent – and "stable" – across acculturation levels, such as cereal, milk, orange juice, oranges, apples, grapes, and soda, all consumed by at least 75% of children in each acculturation level.

Children, who were classified as low and moderate acculturation reported eating a wider variety of foods – measured by number of foods – than children considered highly acculturated. The differences were found to be significant and in the case of moderately and highly acculturated children these differences were demonstrated in nearly all food groups. These findings certainly suggest that acculturation affects the number of foods eaten almost everyday and variety in general. Variety has been used as an assessment of diet quality and overall nutritional adequacy (Kennedy et al., 1995; Hatloy et al., 2000; Romero-Gwynn et al., 1993). Our findings, in part, support research by Lee and colleagues. They found that bicultural Korean-Americans consumed more foods than less acculturated individuals (Lee SK et al., 1999). In our case we found that less acculturated children had the highest variety. Our results contradict findings by Gardner and co-workers (1995). In their study higher acculturation scores were associated with higher dietary variety. These discrepancies could be attributed to differences in assessing acculturation and dietary variety.

There are several components to dietary variety. One contributing factor to higher dietary variety could be higher receptivity and openness to new environmental factors, such as new foods – inherent in adapting to a new culture. Lee and co-workers found that "willingness to try new foods" was an important factor in whether Koreans tried American foods (Lee et al., 1999). This may also be true with Mexican American children in our study. Children who are considered low or moderate acculturated may be more open to trying new foods, while highly acculturated children become accustomed to their standard foods and diets. Falciglia and co-workers (2000) found that children who had a fear of trying new foods had a higher intake of saturated fat and less food variety than children without that fear. We measured attitudes towards trying new foods by asking children to respond to the following statement with a 5-point likert scale, "I like to try new foods." Responses did not indicate any differences between acculturation levels (see Chapter 8), but the question measured children's desire to try new foods -- not exactly the same as "willingness."

Another factor to variety could be the idea of "bicultural" dietary patterns. The bicultural model posits that individuals do not necessarily adopt "host" traits at the expense of "native" traits, but rather become "fluent" in both cultures -- either by being bicultural or marginal (Cuellar et al., 1995). In terms of dietary intake, the bicultural model suggests that as an individual acculturates, a person consumes "new" foods and "traditional" foods equally -- suggesting an "additive" effect. The unidimensional model follows a linear path and does not take into consideration "fluency." It also suggests that new foods immediately replace "old" foods – a "replacement" effect. Diets of low and moderate acculturation children in our study exhibited an "additive" effect. They ate the highest number of foods. Their diets were also composed of a combination of traditional Mexican American and Anglo American foods. Children considered "high" acculturation reported eating fewer traditional and native Mexican American foods. Although this is a cross-sectional study, the findings demonstrate significant differences based on acculturation.

Although our study exhibited bicultural dietary patterns, we used the Short Acculturation Scale for Hispanic Youth (SASH-Y) – a unidimensional scale -- to determine acculturation level. There are several challenges related to using the bicultural model. In the bicultural model, "fluent" persons can either be well-grounded in both Mexican American and Anglo cultures, or persons somewhat anomic, or marginal, without strong roots in either culture (Szapocznik et al., 1980). As a result, an individual's identification with their "host" culture and "native" culture need to be assessed separately. It is likely that children – especially 5th graders – would have difficulty distinguishing between these psycho-social characteristics. Their parents and/or teachers would need to be interviewed or surveyed to attain this information. Further, differences between marginal and bicultural attitudes may not necessarily equate with any dietary differences. For our purposes, the SASH-Y proved to be a sensitive tool to track dietary changes without taking bicultural attributes into consideration. In fact, our study identified specific dietary differences between acculturation groups using uni-dimensional parameters outlined in the SASH-Y.

The most significant differences were seen between low and moderate acculturation levels for the food group – meats, beans, and eggs. Moderately acculturated children reported eating more foods from this group than less acculturated children. It is possible that this is an income-effect: as acculturation rises, income rises and therefore families are able to afford "luxury" foods. Although we can only speculate about the reasons, Inmink and colleagues (1983) found that individuals who migrated to the U.S. permanently maintained diets higher in protein than groups of individuals who migrated to the U.S. then returned to their homeland and individuals who never migrated. Their study was conducted with Puerto Ricans, but a similar trend was certainly demonstrated. Furthermore, Hispanic HHANES research indicated that the top three fat sources for women and children, accounting for 25% of fat intake, were from hamburger, whole milk and eggs – all protein sources (Block et al., 1995). Murphy and researchers (1990) also found that Hispanic children from the HHANES study exceeded the recommended meat servings. In both of these latter studies, acculturation was not addressed. Still, these results illustrate trends and differences among Latinos and non-Latinos.

Another significant finding was that less acculturated children reported eating an average of almost two servings each of fruits and vegetables more than highly acculturated children. Other studies have indicated that differences in fruit and vegetable intakes exist between Hispanics and non-Hispanics. Otero-Sabogal, et al. (1995) found that Latinos were significantly less likely to report eating vegetables than non-Latinos, counter to our findings. Nevertheless, it was found that in another study that the mean number of servings of fruits and vegetables eaten per day by Hispanics was 2.8, higher than the overall average of 2.5 (Basch et al., 1994). Without looking at the different instruments used in these studies, it is unclear whether these discrepancies highlight differences between different Hispanic sub-groups or differences between evaluation tools.

Some similarities existed between children in our study – regardless of acculturation level. Over 75% of children in our study reported eating cereal, oranges, apples, and grapes and drinking orange juice almost everyday. Many of the children reported eating school breakfast. These foods are fairly standard school breakfast foods and therefore may account for this commonality across acculturation levels. Lactose intolerance did not prove to be an issue for Mexican American children in our study – over 75% of children drank milk almost everyday. The majority of children in our study also reported eating potato chips, fruit drink, ice cream, and soda almost every day – low nutrient-dense foods. This was comparable to reports of Hispanic children's core diets in New Mexico (Koehler et al., 1989). Results from the reliability test (reported in Chapter 5) found that there was a tremendously high agreement between test and re-test reports of these items, hinting that these items are consistent in their diets.

These snacks also point to the contribution of snacks to children's diets. This has been documented elsewhere. Approximately 82% of children aged 6 to 11 years consume snacks, accounting for 20% of total daily energy intake and 19% of total fat and saturated fat intake (Nicklas et al., 1995; US Department of Agriculture, 1997). Consumption of grain-based snacks such as crackers, popcorn, pretzels, and corn chips has increased in the U.S. by 200 percent since the 70s (US Department of Agriculture, 1997). Results from this study indicate that these statistics are not limited to just non-Hispanics.

Limitations. The main limitations of this study existed with the reliability and validity of the survey, along with design of the survey (as outlined in Chapter 5). In summary, the reliability involved a total of 12 students and the validity ten pairs of parents and children. The parent-child validity study also used a convenience sample in northern Colorado, not representative of our target Hispanic population. In some cases, a few foods were grouped together, which could have been confusing for children. The terminology, "almost everyday (2-7 days per week)" is not specific and allows for a wider range of foods to be included as "core" foods – possibly an over-estimate. The survey also did not include a comprehensive list of foods or serving sizes; therefore we could not assess overall diet quality.

Another limitation was the inclusion of ethnicities outside of just Mexican Americans. We used a convenience sample of children in classrooms – including Mexican Americans and other ethnicities. There were a number of reasons that justified this in our study. First of all, surveys were administered to children in school settings. We did not want to distinguish Mexican Americans from other ethnicities and races in the classroom setting. Secondly, our preliminary study indicated that children at this age find it challenging to assign an "ethnicity" to themselves and their friends. In the preliminary study, self-identified ethnicity was not a significant main effect for acculturation. And while conducting the paper-and-pencil surveys with the children, many children asked for assistance on the ethnicity questions (more than other questions). Trying to determine criteria, which would classify children as "Mexican American," would be challenging especially considering issues like generation number and "other" ethnicities.

Additionally, data on Mexican Americans alone would not provide insight into mutual acculturation and cross-sectional dietary habits of children in those geographic regions. By distinguishing between levels of acculturation through questions about language – tangible assessments of culture and ethnicity for children – we obtained significant differences in reported intakes. On this basis, our results and conclusions seem valid while still including children who were not Mexican American.

Two methods of administration -- paper-and-pencil and online – were also used to collect data. (See Chapter 6.) Notable differences were found between methods, highlighting possible differences in method of administration and individual variability. We still felt confident about making conclusions about the combined data, especially since we controlled for differences using logistic regression and still found significant differences based acculturation.

The biggest limitation is that the study was cross-sectional and not longitudinal. As a result, all of our observations are based on differences between acculturation levels and not necessarily indicative of changes in behavior with acculturation.

Future Studies. Our acculturation assessment did not allow us to look at how long children (or their parents) had been in the U.S. As a result, it is unclear how long dietary acculturation took place prior to our study and what types of dietary changes took place from before migration to now. Future studies should examine prospective eating patterns along with information on broader eating patterns -- through interviews and surveys of parents.

Follow-up studies with children who participated in our study would provide a wider time frame to view dietary acculturation. The follow-up should include a re-assessment of acculturation, diet, and willingness to try new foods. Food records would also benefit the validity of our study.

Finally, it is possible that ancestral origin may influence "traditional" dietary patterns and meals. When possible, ancestral information (place/region of origin, local specialties, etc.) should be gathered, along with ceremonial foods. Holidays may represent times when children eat and try foods not customarily in their diet.

Reflections. In part, the findings presented here – a cross-sectional study examining dietary differences based on acculturation – parallel many dietary concerns facing children, which have become apparent over the past 30 years with increasing economic prosperity in the U.S. Almost 70% of children 6 to 11 years old exceed the recommendations for total fat and saturated fat (US Department of Agriculture, 1997) and 91% of children aged 6 to 11 years are not consuming the recommended minimum of 5 servings of fruits and vegetables per day (US Department of Agriculture, 1998). While under-nutrition was once considered the largest nutrition-related problem facing adults and children in the US, over-nutrition or over-consumption is now a far greater problem (Kennedy et al., 1997). Understanding this historical framework helps us predict and prevent what may occur with acculturation and increased purchasing power related to acculturation. It is likely that the consequences of these dietary changes -- higher rates of overweight/obesity and diabetes – may become even a greater problem for those children who adopt behaviors outlined in this study, while moving from low to high acculturation. To date several studies have shown that increasing acculturation adversely effects risk behaviors and factors – smoking (Epstein et al., 1998), obesity (Hazuda, 1988; Popkin et al., 1998), cervical screening (Harmon et al., 1996), eating disorders (Pumariega, 1986), and drug use (Brindis et al., 1995). Increasing acculturation has been associated with a higher rate of access to medical care, though (Chesney et al., 1982; Wells et al., 1989).

Conclusions and Implications. Despite the limitations faced in this study, the findings reported here illustrate the dramatic dietary changes that result with increasing acculturation. These findings can help nutrition educators better understand the role of acculturation in dietary changes. These results can also help educators tailor their programs to individuals in all levels of acculturation by including examples of foods from all levels of acculturation in program materials and supporting healthful choices within the gamut of foods that are sensitive to change.

CHAPTER 8

Development and Evaluation of a Bilingual Computer Nutrition Education Program for Mexican American Children

Introduction

School-based nutrition education programs can play an important role in promoting healthy lifestyles and diets among students and teachers alike. These include formal health and nutrition curriculums and school lunch programs and other provisions of foods, respectively (Passmore, 1996). Every school day, 48 million young people attend more than 110,000 schools across the country -- 32.6 million of those are in elementary school (Centers for Disease Control, 1996; Current Population Reports, 1998; Centers for Disease Control, 2000). Because of the potential impact on long-term health in students, the U.S. Department of Agriculture's (USDA) Nutrition Education and Training (NET) Program urged in 1993 that "nutrition education be a major educational component of all child nutrition programs and offered in all schools, child care facilities, and summer sites" (Mandell, 1993).

Unfortunately, nutrition lessons are not included each year in school. The U.S. Department of Education reported that 88% of teachers reported teaching nutrition lessons to their students in the 1996-97 school year, with a higher percentage of kindergarten through second grade teachers teaching nutrition than third to fifth (Celebuski et al., 2000). Barriers to nutrition education include time, competition with other subject areas, up-to-date materials, lack of administrator or district support, and teacher training (Buege, 1999; Uhrich et al., 1995) (Dollahite et al., 1998) (Woodson et al., 1995) Nicklas and colleagues (Nicklas et al., 1997). In Nevada over one-third of elementary teachers surveyed reported that several types of print materials and audiovisual aids were completely unavailable, particularly computer software for elementary children (Woodson et al., 1995).

Interactive computer technology and multi-media have advanced in the past ten years as growing opportunities for nutrition education, especially in school settings. They have the flashiness of mass media – with animations, video, and music – while still providing avenues for education. According to Lytle and Achterberg (1995), computer-assisted nutrition education is also as an effective way of "promoting learning and behavior change." In comparison to other subject areas such as math and reading, however, few nutrition education computer programs exist for school-aged children.

In fact, a search of the National Agricultural Library's Food and Nutrition Software and Multimedia Programs Database for programs for grade school children yielded only four software programs (Food and Nutrition Information Center, 2000). Matheson and Spranger (2001) found a total of six nutrition education computer programs for school-aged children in a review of nutrition education curricula. Of these programs that do exist for this age group -- few have reported impact results in peer-reviewed journals – although they certainly illustrated the extent interactive computer programs can offer creativity and depth. Further, none of the programs were targeted to Hispanics, even though computer-assisted education is considered an effective medium for immigrant and Latino children (Bellman et al., 1990; Chavez, 1990; Chisholm, 1994). As one author stated, it provides a "risk free environment" for students to express their ideas without criticism (Padrón et al., 1996).

Several studies – outside of nutrition – have documented characteristics that promote children's interest in computer programs and curricula in general. Malone (1981) believes that the Theory of Intrinsically Motivating Instruction (TIMI) should be applied to the development of educational materials Translating theory into practice, Malone's research points to the inclusion of intrinsic – immediate and short-term – rewards in educational materials for children. Specifically he cites fantasy, curiosity, and challenge as key components of "effective" educational materials –defined as entertaining. In other studies, fantasy, curiosity, and challenge have equated with audiovisual effects, level of difficulty, randomness, surprise elements, and funny characters and voices (Buege, 1999; Matheson et al., 1994).

Definitions of "intrinsic" differs between Malone and health education research. Health education research has used these factors to explain health behaviors – such as locus of control -- while Malone uses them to describe qualities in educational materials. Still, there is value in applying TIMI to nutrition education. Intrinsic rewards may be more influential in engaging a child, since long-term benefits will not be seen in the short-run (Perry et al., 1985; Bandura A et al., 1981). Visual and auditory stimulation may also help children remember the messages better (Atkinson et al., 1971). To date, many curricula have applied these principles – even if unknowingly using the TIMI framework – to the development of materials. Matheson and Spranger (2001) found that in reviewing 30 curricula, over half of curricula included these intrinsic elements. They also suggested that it was easier to address these using media – such as computer programs and videotapes.

Still, it is unclear whether "entertainment" equates with improved health knowledge, attitudes, and behaviors. Matheson and Spranger reported only "content" of the programs, not impact. They also cautioned that "sugar-coating" content may discourage teachers from using that particular curriculum. Nevertheless, other studies have suggested that non-academic programs may be more likely to adopt such curricula if they are engaging and entertaining – which may in turn increase awareness (Cullen KW et al., 1997).

Factors other than entertainment are clearly important too. Buege and Serrano found that adoption characteristics of computer nutrition education programs could be framed by certain components of the Diffusion of Innovation theory – including compatibility, relative advantage, and flexibility (Buege, 1999). (Refer to Chapter 3 for complete review.) Computer programs need to be compatible with the school's existing computer platforms. Topics need to be matched with teachers' perceived needs and children's interest. The program needs to provide an advantage over existing educational techniques. In the case of nutrition education, it was found that incorporating nutrition with other topics, such as reading, writing, and math, would be considered a relative advantage. Finally, the program needed to be easy-to-use, while promoting children learning at their own pace and in their language of preference. These findings have been reported elsewhere (Simons-Morton et al., 1991; Passmore, 1996; Dollahite et al., 1998; Olson et al., 1986).

The main objectives of this study were: 1) to develop a culturally-appropriate CD-ROM nutrition education program for 4th and 5th grade Mexican American children in Colorado incorporating these described characteristics; and 2) evaluate its effectiveness on improving nutrition knowledge, attitudes, and behavior intentions in fifth grade children.

Methodology

Development of CD-ROM Program. An extensive formative evaluation (see Chapter 3) drove the development of the CD-ROM nutrition education program. The following criteria were used for developing the CD-ROM nutrition education program: 1) characters that have funny voices, interesting appearances, and animation; 2) a game or challenge element in which a goal is attained; 3) a storyline; 4) integration with other subject areas, namely reading, writing, and math; 5) easy, fun, and fast features which promote interactivity and limited instruction time; 6) the Spanish language; and 7) compatibility with existing computer platforms in schools.

The graphics, songs, animations, and programming were all done by New Mexico State University. Content was determined by Colorado State University and based on previous research and theoretical framework. Colorado State University was also responsible for writing scripts, developing nutrition concepts, establishing which foods would be included in the program, translating materials, and finalizing the evaluation instruments. The different foods that were included in the program were determined by: research on the most frequently consumed foods by children, Hispanic and non-Hispanic (Block et al., 1995; US Department of Agriculture, 1996; US Department of Agriculture, 1998); "core" foods from Koehler and colleagues' research with Hispanic children (Koehler et al., 1989); feedback from Food and Nutrition Specialists; and foods that were identified as "sensitive" to adoption and/or change as a result of acculturation (see Chapter 7).

In the end five modules were developed – two games and three songs – for Apple Macintosh computers. See Table 8.1 (See Appendices, pages A-86 to A-109, for sample screen shots and scripts to the program.) Infomercials were inserted between rounds of the game, "Super Sorter." Songs were animated and had words appear at the bottom of the screen, so children could follow the words. Infomercials appeared between rounds of Super Sorter.

Table 8.1: Outline of Computer Nutrition Education Program

Name	Format	Object	Evaluation
Super Sorter Organizador Estupendo	Game	Foods appear and the child clicks on the group of the Pyramid where the food belongs. The game gets faster and more complicated with each additional round.	Knowledge and attitude questions about the Food Guide Pyramid
More or Less Más o Menos	Game	A number of meals and menus are presented and the child needs to determine if he/she needs "more" or "less" foods from different food groups. The Food Guide Pyramid is reinforced in this game, as well as serving numbers.	Knowledge questions about applying the Food Guide Pyramid and food choice questions
The Food Guide Pyramid La Guía Piramide de Comidas	Song	Colorful graphics illustrate the importance of the Food Guide Pyramid and different food groups ..."When you get hungry where do you go, what do you eat."	Knowledge and attitude questions about the Food Guide Pyramid
The Food Adventurers Aventureros de Comida	Song	This space age animation features children taking the challenge of trying new foods... This is our mission, to find new foods."	An attitude question about trying new foods.
Variety Variedad	Song	This can-can song illustrates fruits, vegetables, and other foods dancing to the show-tune "variety" ... "Variety, variety, eat something new today"	An attitude question about choosing a variety of foods.
Infomercials Titulares	Animations	A total of six infomercials appeared teaching children about a range of topics: 1) Choose fruit juice instead of fruit drink; 2) Don't let an empty plate stare back at you – Eat breakfast; 3) Candy bars – the sometime but not always food; 4) Salsa – fun to say and fun to eat; 5) This game has been brought to you by water: the drink that goes with everything! 6) What are these french fries and chips hiding? Fat	NA

Ultimately we were able to incorporate the majority of characteristics outlined earlier into our program – including funny characters and voices, challenges, and curiosity. At the expense of integrating the program with other subject areas, however – particularly reading, writing, and math – we developed a program appropriate for less acculturated

Mexican American children. We feared that the nutrition concepts would be lost in the event that less acculturated children were not yet at 5th grade standards for these subjects.

All of the scripts and storyboards were translated by two native Spanish speakers and reviewed by a third translator for accuracy and appropriateness.

Recruitment. Techniques for recruiting schools to evaluate the CD-ROM program differed from the techniques used for the formative evaluation (Chapter 3) and the paper version of the Short Acculturation Scale for Hispanic Youth (SASH-Y) and dietary acculturation assessment (Chapters 4 and 5). Principals and teachers alike have busy schedules. It is difficult to contact them by phone, at an appropriate time and outside of class. Most of the principals and teachers in our targeted areas did not have email. Faxes were also difficult to transmit. Given these constraints, a different approach in recruitment was taken. We first contacted every principal by phone to gauge his or her interest in participating in the study. After that, all interested principals were visited in person by the researcher to discuss the project. This proved to be effective for several reasons: 1) the contact provided a face to the name and helped establish personal accountability on both sides; 2) the researcher was able to describe the program and immediately know if the principal was interested; 3) the researcher ensured that the computer program could be installed on the computers and the data files saved; and 4) the researcher could distribute information packets. Packets of information were assembled prior to meeting with the principals, which included a blank letter of interest for the school which could be photocopied onto the school's letterhead, enough consent forms for all of the children and their parents, a list of identification numbers for the children, identification cards for each child to use each time he or she used the computer program, and a set of protocols for using the program. (See below under implementation.)

Letters of interest were also obtained from schools. In the end four schools were recruited – two intervention and two control (matched for percentage of Hispanics and overall socio-economic level).

Implementation. The CD-ROM program was installed on all of the computers in the 5th grade classrooms or computer labs of the participating schools (depending on the school). Although the option was given to teachers and principals alike for the main researcher to administer the programs to the classes, all schools wanted to administer the program on their own. To provide some guidance in administering the program, each teacher was given a set of protocols to follow. For the control group, we requested that teachers and children not discuss the pre-test or nutrition topics in general until all of the children had completed the post-test. A minimum of two weeks between pre- and post-tests was also requested. The intervention groups were asked to separate pre- and post-tests by at least two weeks and to complete all of the games and songs prior to the post-test. Again, the teachers were asked not to talk about nutrition subjects until after the post-tests were completed.

Evaluation. The entire evaluation was completed on the computer (online). Each child was assigned a different user number. To enter the main menu and to take the pre- and post-tests, each child was required to enter his/her user number. Responses were automatically saved to the computer or network into a designated database file. The set-up of the online evaluation required that an item be clicked on before proceeding to the next page; this prevented children from skipping questions. As a result, all reported answers have the same sample size. The online evaluation was tested extensively prior to implementation to verify that it was recording data correctly.

Pre- and Post-Tests. The pre-test included questions in five areas: demographics, acculturation, nutrition knowledge, attitude towards nutrition practices, and dietary acculturation. Results from the online dietary acculturation component are reported in Chapter 8. The post-test included pre-test questions on nutrition knowledge and attitudes, along with an abbreviated dietary acculturation component (also reported in Chapter 8).

Acculturation Level. Acculturation level was assessed using the 12-point Short Acculturation Scale for Hispanic Youth (SASH-Y). In their preliminary report, Barona and Miller (Barona et al., 1994) reported an excellent internal consistency ($\alpha = .94$) and split-half reliabilities. The scale asks questions about language use, language preference, and ethnic social relations. Each answer is given a score of 1 to 5. Individual scores from all of the questions are added up to determine the total acculturation score. The total acculturation score can be compared to a normative data grid, which classifies the individual as low, moderate, or high acculturation. Total scores of 12 to 30 are indicative of "low" acculturation, 30 to 45 moderate, and 45 to 60 high.

The SASH-Y paper version was tested with Coloradan children and parents to determine its validity and reliability with our target population. There was a 90.3% agreement between parents and children's responses. We obtained a 66.7% agreement in test-retest scores (n=12) and an internal consistency of $\alpha = .89$ (n=137). (See Chapter 4.) The SASH-Y was adapted for online computer use and storage. Questions appeared on the screen as they did in the paper-and-pencil questionnaire. Children were asked to click on the most appropriate response. Once they clicked on an answer, the next screen appeared.

Knowledge Questions. Nutrition knowledge and attitude questions were extracted from a previously tested instrument, where test-retest correlations of .72 to .75 were obtained for questions (Auld et al., 1998). The survey was designed for kindergarten, fourth, and fifth grade children in predominantly Hispanic areas. The knowledge questions were divided into questions about the food groups in the Food Guide Pyramid and applications of the Food Guide Pyramid. There were a total of ten questions and 16 points possible.

Children were asked to click on the correct section of the Food Guide Pyramid for different food groups. Then they were asked to determine which food group from several pairs that they should eat more of (based on the Food Guide Pyramid). These were considered Food Guide Pyramid questions.

In the next section, they were asked to choose a food from a list, which would add fruit to a given breakfast. This question read: "Pretend you are going to eat breakfast. You have dry cereal with milk, toast with margarine, and apple juice. What food would you add if you wanted to eat more fruits?" Orange soda, grape jam on toast, sliced banana on cereal, and apple cake were the possible answers.

Finally, they were asked to figure out which food groups were contained in a combination food: "Pretend that you are planning on eating a bean burrito with cheese, lettuce, tomatoes, and salsa. What are all of the different food groups that this burrito contains?" All of the food groups were listed as possible answers – children could click on as many as they wanted. These two questions are referred to as "applications" questions.

Attitude Questions. In total, there were five attitude questions. Each question had five possible responses -- really agree, agree, not sure, disagree, and really disagree. (See Appendix.)

1. I can plan meals and snacks using the Food Guide Pyramid
2. I will use the Food Guide Pyramid to plan meals and snacks
3. I think I can eat vegetables 3 or more times each day
4. I like to try new foods
5. Choosing a variety of foods is important to me

Peripheral Foods. Additionally, a section was included in the post-test that requested children to click on all of the foods that they had "ever eaten." These were considered "peripheral" foods. This definition was modified from Jerome's original framework to be appropriate for children (Jerome NW, 1982).

Food Preference. In one of the modules -- More or Less – children were asked to select foods to add to a day's menu. In each case, children had to choose between two foods or meals – one represented low acculturation and the other high. The choices were determined based on results from a dietary acculturation food frequency questionnaire. See Chapters 6 and 7. Altogether children had to make the following choices: Mexican rice or English muffin; green salsa or tomatoes; mango or strawberries; eggs and peanut butter; atole or toast for breakfast; posole or bean burrito lunch; spaghetti or rice, beans, and sliced beef for dinner; custard or cheddar cheese; steak or fish; pineapple or watermelon; jicama or canned corn; and bread rolls and crackers. The jicama and canned corn question was not included in data analysis, because the corn that appeared on the screen during evaluation was corn-on-the-cob – rather than canned corn. Corn-on-the-cob is considered an indicator of low acculturation, while canned corn is considered a high acculturation food. Data from only one school is presented here. Unfortunately there was a computer glitch at one school during that module. That module was the only one affected. The pre- and post-tests were still retrievable.

Data Analysis. A number of statistical analyses were conducted to analyze the data. All analysis was conducted using SPSS™ for Windows 10.0. To determine if any differences existed between the control and intervention groups, chi-square analyses were run for all of the demographic variables and each question. Paired t-tests were run to determine differences within group from pre- to post-test time periods. A combination of repeated measures analysis and analysis of covariance were used to look at covariates and correlations between different factors and total scores. Spearman correlations were used to determine if significant differences existed between food choices (in More or Less) and total acculturation score.

Informed Consent. Informed consent was obtained from all children and their parents, per protocol set out by the Office of Regulatory Compliance at Colorado State University. Schools that participated were compensated with a complimentary copy of a nutrition education software program. Children who participated in the study were compensated for their time with a gift certificate.

Results

Participant Information. Fifth graders from a total of four schools – nine classrooms -- participated in the study. A total of 115 children participated in the study – 52 (45.2%) were in the control group and 63 (54.8%) in the intervention group. See Table 8.2. Chi-square tests indicated that children in the control and intervention groups were matched in terms of gender, age, ethnicity, and acculturation level – but not language of online tests. Significant differences (p =.031) existed between groups and selected language of online tests (using Fisher's Exact Test for small cell sizes).

Table 8.2: Participant Demographic Information

	Control n (%)	Intervention n (%)	*Total n (%)*
Gender			
Male	29 (55.8)	30 (47.6)	*59 (51.3)*
Female	23 (44.2)	33 (52.4)	*56 (48.7)*
Age			
10	11 (21.2)	19 (30.2)	*30 (26.1)*
11	38 (73.1)	37 (58.7)	*75 (65.2)*
12	3 (5.8)	6 (9.5)	*9 (7.8)*
13	0 (0)	1 (1.6)	*1 (.9)*
Ethnicity			
Mexican American	17 (32.7)	29 (46.0)	*46 (40.0)*
Other	35 (67.3)	34 (54.0)	*69 (60.0)*
Acculturation Level			
Low	1 (1.9)	5 (7.9)	*6 (5.2)*
Moderate	10 (19.2)	12 (19.0)	*22 (19.1)*
High	41 (78.8)	46 (73.0)	*87 (75.7)*
Language Selected			
English	52 (100.0)	57 (90.5)	*109 (94.8)*
Spanish	0 (0)	6 (9.5)	*6 (5.2)*
Total	*52*	*63*	*115*

Language of online test was highly correlated (p<.01) with total acculturation score and acculturation level. The proportions of children in different acculturation levels were not significantly different, though.

Food Guide Pyramid Knowledge Scores. Repeated measures tests indicated that knowledge about the Food Guide Pyramid (FGP) increased significantly for both control and intervention groups. See Table 8.3. The FGP score only increased by .57 points for control group participants, but was still found to be significant (p<.05) based on paired t-tests. There were no significant differences between groups at the pre-test time period – even when looking at each question separately.

The intervention post-test FGP scores were significantly higher ($p<.01$) than the control group's scores adjusting for pre-test scores. The intervention group had a mean increase of 4.1. A total of nine points was possible. The intervention group had a post-test FGP score equaling 89.1% of total possible points, while the control group only obtained 43.6% of all points.

Table 8.3: Food Guide Pyramid Knowledge Scores by Group

Group/Test	Control Mean ± SE (n=52)	Intervention Mean ± SE (n=63)
Pre-Test Score	$3.35 \pm .26^{a}$	$3.33 \pm .24^{b}$
Post-Test Score	$3.92 \pm .28^{ac}$	$8.08 \pm .15^{bc}$
Adjusted Post-Test Score	$3.92 \pm .22^{ac}$	$8.02 \pm .20^{bc}$

same letters represent significant differences, ^{a} $p<.05$ ^{b,c,d} $p<.01$; range = 0 - 9

Application Scores. A total of seven points was possible for the applications portion of the survey. On average, the children attained 64.1% of the total points, with the intervention group achieving 66.9% of total points and the control group 61.4%. See Table 8.4. The post-test scores where correlated ($p<.05$) to pre-test scores. There were no covariates found for pre-test scores, but acculturation was found to be a covariate for post-test scores with high acculturation children having a mean score of 4.67, low 4.50 and moderate 3.82. Still, significant differences existed between groups, controlling for acculturation.

Table 8.4: Food Guide Pyramid Application Scores by Group

Group/Test	Control Mean ± SE (n=52)	Intervention Mean ± SE (n=63)
Pre-Test Score	$4.62 \pm .17$	$4.38 \pm .12$
Post-Test Score	$4.27 \pm .17^{a}$	$4.68 \pm .15^{a}$
Adjusted Post-Test Score	$4.22 \pm .16^{a}$	$4.68 \pm .15^{a}$

same letters represent significant differences, ^{a} $p<.05$; range = 0 - 6

Total Knowledge Scores. Total knowledge scores were computed using questions from both groups described above -- the Food Guide Pyramid and applications using the

FGP. Using analysis of covariance to determine correlations between demographic variables (covariates) and total knowledge scores (dependent variables), we found that there were significant main effects ($p<.05$) for age and acculturation on pre-test scores. As age increased, mean scores decreased. See Table 8.5 and Figure 8.1. Although the proportions of children taking English and Spanish online tests differed between the control and intervention groups, language was not found to be a covariate. Additionally gender and ethnicity did not prove to be significant.

Table 8.5: Pre-Test Knowledge Scores by Age and Group

Age	Control Mean ± SE (n=52)	Intervention Mean ± SE (n=63)
10	9.27 ± .54	7.68 ± .48
11	7.76 ± .36	7.94 ± .37
12	5.00 ± 1.0	6.00 ± .89
13	---	6.00 ± NA
Total	*7.98 ± .32*	*7.67 ± .28*

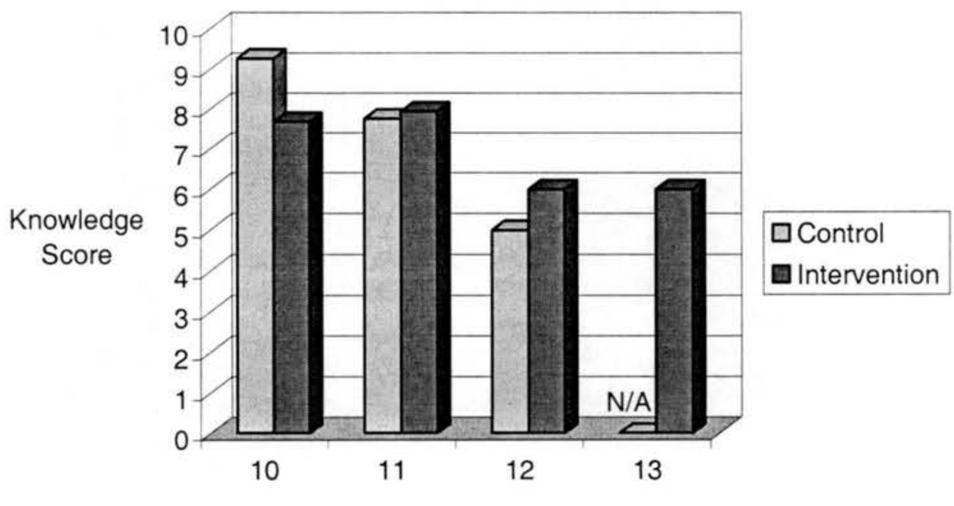


Figure 8.1: Pre-Test Knowledge Scores by Age

Analysis were done separately using acculturation levels and total acculturation scores. Both were found to be significant for pre-test knowledge scores. Unlike age, there did not appear to be a clear upward trend between acculturation and total scores, but rather a v-shaped distribution. See Table 8.6 and Figure 8.2.

Table 8.6: Pre-Test Knowledge Scores by Acculturation Level and Group

	Control Mean ± SE (n=52)	Intervention Mean ± SE (n=63)
Low	10.0 ± N/A	7.80 ± .37
Moderate	7.11 ± .39	5.83 ± .47
High	8.13 ± .38	8.16 ± .33
Total	*7.98 ± .32*	*7.67 ± .28*

range = 0 - 15

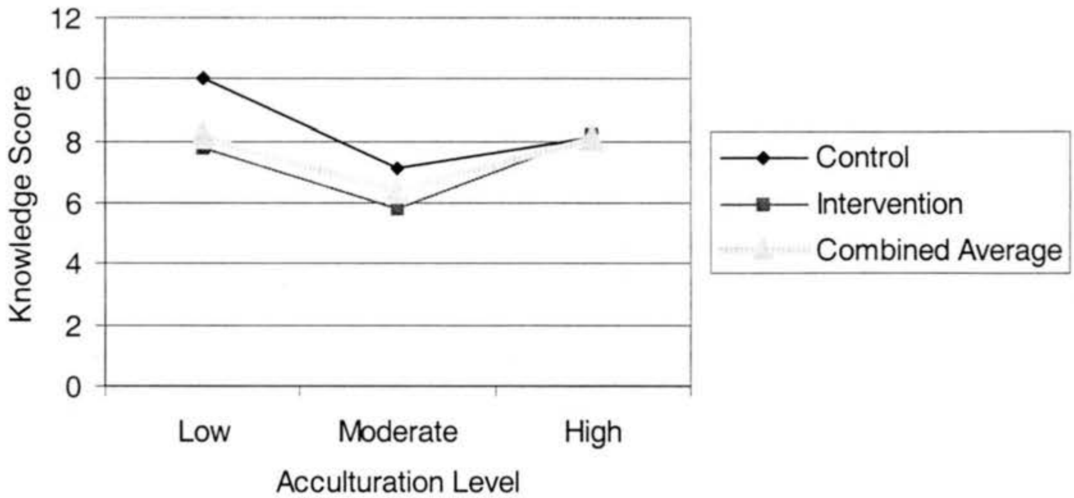


Figure 8.2: Pre-Test Knowledge Score by Acculturation Level

ANCOVA was also run with post-test as the dependent variable, group as the fixed effect, and pre-test and acculturation as covariates. (The other demographic variables were not found to be significant covariates at the $p<.05$ for this model.) Results of the analysis showed that the adjusted post-test means differed between control and intervention groups ($p<.01$), controlling for pre-test and acculturation. See Table 8.7 and

Figure 8.3. The percentage of total possible points was lower than that reported for the Food Guide Pyramid (FGP) portion – a mean of 74.7% compared to 89.1% for the FGP.

Table 8.7: Total Knowledge Scores by Group

Group/Test	Control Mean ± SE (n=52)	Intervention Mean ± SE (n=63)
Pre-Test Score	7.98 ± .32	7.67 ± .28[b]
Adjusted Post-Test Score	7.18 ± .52[a]	12.78 ± .45[a,b]

Same letters represent significant differences, p < .01; range = 0 - 15 (Some differences may exist between total knowledge scores and FGP scores based on rounding of numerals.)

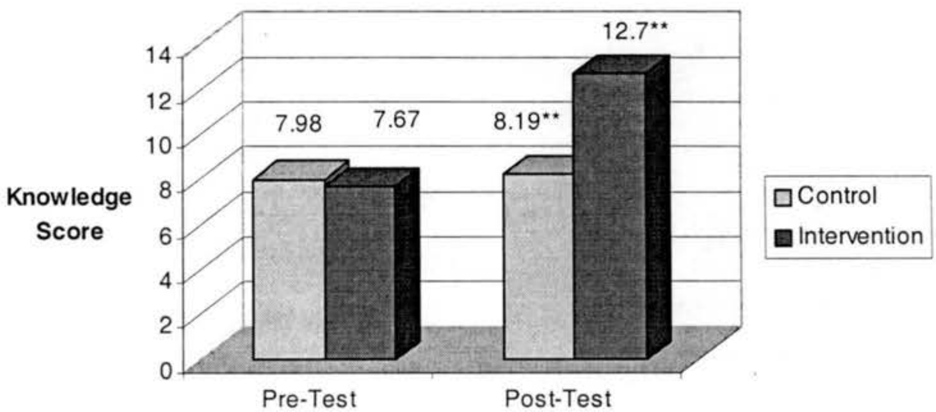


Figure 8.3: Pre and Post-Test Knowledge Scores

The following models were determined to be appropriate for our data (with factors and covariates being significant at the p<.05), based on univariate regression analysis:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \varepsilon, \ (R^2 = .118)$$

where Y = Pre-Test Knowledge Score, x_1= acculturation, x_2 =age

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \varepsilon, \ (R^2 = .566)$$

where Y = Post-Test Knowledge Score, x_1= group (control vs. intervention), x_2 =acculturation, x3 = pre-test

Attitude Scores. Many of the pre-test scores were correlated to each other, indicating that attitudes, perceived efficacy, and intention towards different nutrition concepts were associated with each other. For example, the question about using the FGP to plan meals was significantly correlated (p<.05) with all of the other questions. Gender, age, acculturation, level, acculturation level, and group were not found to be covariates for pre-test attitude scores and therefore not included in the post-test analysis of covariance model. Only one attitude improved significantly from pre- to post-test – the statement regarding planning meals using the Food Guide Pyramid. See Table 8.8. The intervention group had a mean score that was significantly higher at post-test than the control group for the question about using the Food Guide Pyramid to plan meals and snacks.

Table 8.8: Mean Attitude Scores

	Control Mean ± SE* (n=52)	Intervention Mean ± SE* (n=63)
Plan Meals		
Pre-Test	3.88 ± .12	3.97 ±.11[b]
Post-Test	3.85 ±.12[a]	4.24 ± .12[a,b]
Use FGP		
Pre-Test	3.35 ± .13[b]	3.75 ± .13[b]
Post-Test	3.44 ± .15[a]	3.90 ± .12[a]
Eat 3 Vegetables		
Pre-Test	3.79 ± .15	3.83 ± .14
Post-Test	3.81 ± .13	3.97 ± .13
Try New Foods		
Pre-Test	3.96 ± .13	4.14 ± .10
Post-Test	4.06 ± .15	4.32 ± .10
Choose a Variety		
Pre-Test	3.85 ± .15	4.05 ± .11
Post-Test	3.92 ± .14	4.08 ± .12

*Based on the range of 1 to 5 with 1 being strongly disagree and 5 being strongly agree. Same letters represent significant differences in means for that specific question, p<.05.

All post-test attitude scores were highly correlated (p<.01) to their respective pre-test scores. The coefficients ranged from .373 to .561. See Table 8.9.

Table 8.9: Correlation Coefficients between
Pre- and Post-Test Attitude Questions

Question	Correlation*
I can plan meals and snacks using the FGP [plan meals]	.463
I will use the FGP to plan meals and snacks [use FGP]	.561
I think I can eat vegetables 3 or more times each day [eat 3 vegetables]	.373
I like to try new foods [try new foods]	.407
Choosing a variety of foods is important to me [choose a variety]	.399

*All correlations were significant at p<.01

Peripheral Foods. A total of 57 foods were included in the peripheral foods list. Analysis of variance indicated that acculturation level was significantly correlated with the total number of foods ever eaten. Gender, age, and ethnicity were not found to influence the number of foods reported. As found with the core diets, less acculturated children reported trying more foods than moderately and highly acculturated children, controlling for differences between control and intervention groups. See Table 8.10. The differences between children at low and high levels of acculturation were found to be significant.

Table 8.10: Mean Number of Peripheral Foods Reported by Acculturation Level
Controlling for Group Differences

	Number of Foods Adj. Mean ± se (n=114)
Low Acculturation (n=6)	48.80 ± 5.86 [a]
Moderate Acculturation (n=22)	40.96 ± 3.02
High Acculturation (n=86)	35.82 ± 1.53[a]
Total	*37.49 ± 1.33*

Same letters indicate significant differences, p<.05

Results from Spearman correlations indicated that almost half of the foods – a total of 26 -- were found to be sensitive to acculturation. See Table 8.11. Only one food, apricots, had been tried more frequently by highly acculturated children than less and moderately acculturated children. For the other foods, as acculturation rose, frequency in trying those foods declined. Many foods that were sensitive to change in the core diet were also found to be acculturation-sensitive as peripheral foods – in fact, all but three foods. Tamales, green salsa, and fried pork rinds (chicharrones) were not considered to be sensitive to change in the core diet.

Table 8.11: Peripheral Foods Found to be Sensitive to Acculturation Controlling for Differences between Control and Intervention Groups (n=114)

Food Group	Foods				
Combination Foods	*Posole* Flautas	Tamales Chile Rellenos	Chilaquiles Rice pudding	*Taquitos*	*7*
Breads, Tortillas, and Cereals	Corn tortillas	Atole	Mexican white rolls (bolillos)	Sweet bread (pan dulce)	*4*
Vegetables	Green salsa	Jicama			*2*
Fruits	Mangoes	Apricots[a]	Guava	Papaya	*4*
Milk and Calcium Foods	Mexican cream	Mexican cheese	Custard (flan)		*3*
Meats, Beans, and Eggs	Eggs with chicken livers (higaditos)	Grilled beef (barbacoa)	Mole	Tripe	*4*
Soda and Snacks	Crullers (fritters)	Fried pork rinds (chicharrones)			*2*

[a]indicates an increase in consumption with acculturation

Differences in reporting varied greatly from food to food. Only 9.3% of highly acculturated children reported ever eating jicama compared with 83.3% of less acculturated children. (This was the food with the lowest percentage.) On the other hand, 72.1% of children at "high" levels of acculturation had ever eaten corn tortillas, while all children classified as "low" had tried them.

Food Choices. Data from twenty-eight children are included in the analysis of the food choices section of the More or Less module. Of these children, only one was considered moderately acculturated with the remainder being highly acculturated. No children were considered "low." The range of acculturation scores was from 44 to 60. Of the food selections, there were definite preferences towards highly acculturated foods – reflecting the sample population. The only two less acculturated foods preferred over the highly acculturated ones were pineapple and eggs. See Table 8.12. There were no significant correlations between individual foods and total acculturation scores based on spearman correlations. When scores were given to each food -- based on if it was considered "low" or "high" -- and a total score computed, acculturation was significantly correlated with the total score. The tendency was for higher acculturated children to choose highly acculturated foods and less acculturated children (relative to the range of scores) to select less acculturated foods more frequently.

Table 8.12: Food Choices in More or Less Game (n=28)

Foods	Number (%)
Mexican rice	8 (28.6)
English muffin	20 (71.4)
Green salsa	9 (32.1)
Tomatoes	19 (67.9)
Mango	4 (14.3)
Strawberries	24 (85.7)
Eggs	14 (50.0)
Peanut butter	13 (46.4)
Custard	7 (25.0)
Cheddar cheese	21 (75.0)
Steak	2 (7.4)
Fish	25 (92.6)
Pineapple	17 (60.7)
Watermelon	11 (39.3)
Bread rolls	1 (3.6)
Crackers	27 (96.4)
Atole (breakfast)	6 (21.4)
Toast (breakfast)	22 (78.6)
Posole (lunch)	8 (29.6)
Bean burrito (lunch)	20 (70.4)
Spaghetti (dinner)	16 (57.1)
Rice, beans, and sliced beef (dinner)	12 (42.9)

The first food that appears in each pair is considered "low" acculturation, the second "high."

Discussion and Conclusions

Gains in Knowledge. The CD-ROM nutrition education program proved to be highly effective in improving knowledge about the Food Guide Pyramid. The intervention group's knowledge of the Food Guide Pyramid increased by over 50% and was considered significantly higher than the control group at the p<.01 level. Questions pertaining to Food Guide Pyramid applications did not increase by as much, but still increased significantly in the intervention group. Although our program outlined the Food Guide Pyramid, it was apparently difficult for children to translate their knowledge into application and to determine which food groups identified a burrito and which food was the best choice as a fruit serving.

One of our objectives for this study was to determine if children at all levels of acculturation learned equally well with games and songs. Our findings demonstrate that, in the end, the games and songs were effective in strengthening knowledge about nutrition and the Food Guide Pyramid, regardless of acculturation level, language of online test, ethnicity, gender, and age.

Acculturation score – determined by the Short Acculturation Scale for Hispanic Youth -- was correlated with pre-test knowledge scores. Less acculturated children had the highest knowledge scores, followed by high then moderately acculturated. In our formative research (see Chapter 4), we found that language use was the biggest predictor of acculturation level. In fact, most of the children who were considered "low" acculturation, spoke Spanish at home. There are several programs in the communities where our study took place that help teach children to learn English. In these settings – including after-school programs and HeadStart -- it is possible that nutrition and the Food Guide Pyramid are also taught. Our finding contrasts with other studies indicating that knowledge was limited concerning food and health (Olvera-Ezzell et al., 1994).

Surprisingly, as age increased, nutrition knowledge decreased (at baseline). Research has found that nutrition education is typically offered in earlier grades than older (Celebuski et al., 2000). In our sample, though, the one child was 13 years old had a significantly lower score. Typically children who are 13 years old are in at least sixth grade. This may be reflective of problems with succeeding in school.

Gains in Attitudes. Of the five questions assessing attitudes towards different nutrition practices, only one question was found to increase significantly from pre- to post-test. This was the question related to planning meals and snacks using the Food Guide Pyramid (FGP). This illustrates two things. First of all, it demonstrates that our program was successful in improving self-efficacy related to using the FGP. This is not surprising, considering that our program strongly emphasized the FGP – as opposed to other messages measured through our attitude questions. Secondly, it shows that intensive messages are needed to produce changes in both knowledge and attitudes. This can be done, by using different teaching strategies, such as games and songs, to reinforce similar messages. Still, children's self-efficacy did not mirror their ability to use the Food Guide Pyramid. The Food Guide Pyramid application scores did not improve significantly from pre to post-test denoting an over-estimation of their self-efficacy.

Another finding was that children reported liking to try new foods. This question had the highest pre-test and post-test mean scores in the intervention group at 4.14 and 4.32, respectively. Children were less likely to agree with the statements about eating three vegetables a day and intending to use the FGP to plan meals and snacks. Providing games and songs – focused on these principles – may improve efficacy and attitudes towards these behaviors.

Learning from Songs. In our study, the majority of songs were assessed through attitude questions. In the end, only one attitude improved. The other attitudes that directly related to concepts outlined in songs, did not significantly improve. Either the songs did not yield impacts on attitude or we did not effectively measure the impact of songs on the children. During the follow-up, children expressed their excitement about the songs and could even sing them. Perhaps long-term effects are more reasonable through songs. In the case of the Food Guide Pyramid song, we could not isolate the impacts of the song versus the games.

<u>Peripheral Foods.</u> Lastly, results from the "peripheral" foods component of the study pointed to the concept of "availability" of foods. The majority of foods that were listed as sensitive to acculturation are difficult to find in most grocery stores and, if they are available, are often more expensive than in Mexico. Further, many of the combination foods – such as posole and higaditos (eggs with chicken livers) -- are rarely available at mainstream Mexican restaurant menus. Therefore it is unlikely that non-Mexican Americans and highly acculturated children would be easily exposed to those foods. Given these factors, it is not surprising that these foods were sensitive to acculturation. Romero-Gwynn and colleagues (1993) had similar conclusions. They felt that availability was a major factor in the disappearance of certain foods. Our results also indicate that our survey was sensitive and likely reflects eating patterns of children in our study.

Our definition of "peripheral" foods was ambiguous. We asked children if they had "ever eaten" the specified foods. It also differed from the definition initially used by Jerome (Jerome NW, 1982). According to Jerome's model, peripheral, ceremonial, and marginal diets consist of foods that are eaten infrequently and which "tend to enter and leave the established pattern more frequently." Peripheral is considered constant with moderately low "frequency-of-use" whereas ceremonial and marginal have "very low" frequencies and are differentiated from each other based on if the foods are constant or inconstant, respectively. The distinction between these definitions seemed difficult to grasp, especially for children between 9 and 13 years old. As a result, we essentially collapsed the three levels into one level and referred to it as "peripheral."

Based on analysis diets for a period of ten years, Jerome found that between "core" and "peripheral" diets, there is also a "secondary core" diet with foods that are still common, but not as common and stable as the "core" foods (Jerome NW, 1982)." We felt that children would find it difficult to distinguish between "core" and "secondary core" foods, so we chose instead to focus on extremes – the "core" and the "periphery." Another level of analysis with parents, however, could provide information on this missing link between these two extremes, while possibly distinguishing between peripheral, ceremonial, and marginal foods. It is likely that many of the foods that children had tried, but were not determined as "core" foods, would be considered secondary core foods.

Food Choices. Our goal in including food selections in More or Less was to look at what choices children -- at all levels of acculturation -- made when presented with two different foods -- low and high acculturation level foods. Based on computer problems, however, we had a restricted sample size, no children from low, and only one child classified as "moderate." This did not allow for any sophisticated comparisons between acculturation levels. In retrospect, this evaluation component had several confounding variables, even without computer problems. Without interviewing children about their choices, it is difficult to know if the selections were based on familiarity, taste, status, or other factors (such as allergies in the case of peanut butter). Despite these confounding variables, we did find that children chose foods according to acculturation -- indicating that familiarity was involved to some extent.

Program Feedback. Although we did not directly measure children's reactions to the computer program, in an informal follow-up with children, we found that the children still wanted to use the program, they enjoyed it, and they recommended it to other children in other classrooms. When asked which parts of the program they liked the most, children responded with the Super Sorter game, the songs, and the infomercials. Some children could recite the songs by memory. The children liked More or Less, but not as much as the others. This in part may relate to the lower scores in the "application" questions. A follow-up evaluation would help assess the long-term implications of the computer program on knowledge, attitudes, and behavior, along with continued use of the program beyond the project end date.

Another interesting finding from this informal discussion was that children – without prompting – said that they enjoyed taking the tests. They said the tests were "fun" and "easy." This supports the use of online evaluations with children from low to high acculturation level – as opposed to paper evaluations. This supports other research highlighting the usefulness and ease of online evaluations, particularly for low-literate audiences (Suitor et al., 1992).

Nutrition Education in Schools. School-based programs are not new. Because schools provide a "captive" audience, numerous nutrition education programs have targeted school-age children. According to Contento, et al. (Contento et al., 1992), the "direct" programs can be sorted into primarily two groups and approaches: general nutrition education programs and targeted behavioral change programs. General nutrition education programs cover more broad nutrition issues, such as the role of nutrients in the body. Targeted behavioral change programs attempt to initiate specific behavior changes to ultimately reduce the risk of chronic disease, such as cardiovascular disease. Based on an extensive evaluation of school-based nutrition programs around the country, they found that the "targeted" programs showed a more positive impact on behavior than the "general" programs. In many cases, however, the "targeted" programs were more intensive, provided larger doses of interventions, and involved various components of the child's environment. Our initial goal was to develop a targeted program. Since we had financial limitations we moved towards a general nutrition education program with a limited intervention time, since we did not have the financial capacity to develop an intensive computer program. In the end, this proved to be more beneficial relative to school acceptance (not necessarily outcomes).

We implemented the program with limited resource schools facing a multitude of challenges, including new standards-based policies, violence, abuse, and drugs. Additionally, with the influx of migrant farm workers in our target areas, English is the second language for many children. Reading and writing are often delayed due to seasonal migration from one school to another. Given these factors, most of the schools preferred shorter nutrition programs, which required little preparation and training time, so they could focus on other eminent issues. Our CD-ROM program certainly met these needs.

These findings also point to the concept of flexibility. Although health behavior models have shown that social interaction is a key element in influencing attitudes and behaviors of children (Bandura, 1986), computer programs may conveniently fit into available time slots in school and therefore be accessed more frequently than curriculums requiring preparation time. For teachers a computer program could be used as a fun incentive for children completing their homework, a back-up plan in the event they are sick, or as a stand-alone curriculum. Further, children can learn about nutrition at their own pace.

They may also use them in their spare time. Buege found that children participating in focus groups used the *Five A Day Adventures* CD-ROM program at home, if they had computers (Buege, 1999). Teachers may also choose to expand on concepts learned through the computer in classroom activities. In these cases, it's important to develop add-on materials for the computer program, as *Five A Day Adventures* did with their website (Produce for Better Health Foundation, 2001). Another benefit of a CD-ROM nutrition education program is that it provides consistent and reliable information (Gould et al., 1999). In our formative evaluation, we found that many teachers were still teaching the "four food groups." (See Chapter 3.)

Based on the current political climate in Colorado and around the country, it is likely that the administration of intensive nutrition education programs in classrooms will become even more challenging. This is especially true where schools are found in limited resource areas. These observations point to the importance of integrating nutrition with reading, writing, and math – which the standards are based on, or employing shorter, less intensive programs, like the one we developed.

For recent immigrants, creative approaches to teach about nutrition, while strengthening reading and writing skills, need to be explored. In our study, we were concerned about wide ranges of skills in reading and writing. For example, one child may be at fifth grade reading level while another may be at second grade reading level. To control for these differences, we chose not to address nutrition with this angle, but rather to minimize the need for extensive reading and writing skills altogether. Incorporating nutrition with reading and writing appears to be more challenging when working with older children who have more skills, but still larger disparities. In this case, it may be easier to develop interactive computer programs – incorporating nutrition with reading and writing -- for younger children, beginning at first grade, where the differences may not be as extreme.

Computer Technology. Prior to developing the CD-ROM program, we assessed computer platforms in classrooms. At that time, most schools had Apple Macintosh computers. From the time of assessment to the time of administration, many of the schools had switched over to IBM computers in order to be compatible with the platforms used by high schools and in many businesses. As the internet becomes increasingly capable of supporting sophisticated graphics and videos, future programs may want to focus on developing interactive multi-media programs for the web or using DVD. This would avoid compatibility issues and reduce costs in developing dual platform programs.

Limitations. One of the biggest barriers we encountered when developing the software was how to address serving sizes, especially since we were focusing on the Food Guide Pyramid. We decided to subtly address serving sizes visually rather than devote a module entirely to that topic. We felt that it would be difficult to address this topic on a computer screen rather than through interactive hands-on activities, particularly the idea of fractions, which are just being taught in fourth and fifth grade. We also believed that the overriding themes and messages might be lost, by emphasizing what constitutes a serving size. Other research has shown that children have difficulty determining serving sizes (Baranowski et al., 1986; Baranowski et al., 1991). In Super Sorter, each food that appeared was the equivalent to one serving size. The same was true in More or Less.

Compliance was a major limitation in implementing the program, since we did not administer the program directly. The teachers chose to administer the program themselves, even though we set up the software on the computers. The teachers preferred to be flexible about what days and times they actually conducted the study. The schools were also located in remote areas of Colorado and therefore difficult to travel to during the winter season, especially on short notice. Based on informal conversations with teachers and students, we gathered that they had complied fully with the outlined protocols – including not discussing nutrition topics until after the program had been completed. One school indicated that their classrooms were studying research projects, so used our program as an example of a "control group." Considering the control group's knowledge and attitudes did not improve overall we can assume that neither the teachers nor the students from the control group discussed the topics from pre- to post-test time periods. It is unclear whether the children in the intervention group discussed the program with each other. In any case, significant differences existed between the control and intervention groups indicating that the program – possibly in combination with interactions among children – improved knowledge and attitudes towards nutrition. Further research may wish to quantify interactions among children and their impact on knowledge and attitudes.

The main evaluation limitations were that we did not ask any formal questions about the infomercial topics. We wanted to limit the number of questions in the pre- and post-tests, especially since we were assessing diet online. (See Chapter 8.) The infomercials were only about 30 seconds in length. Still, discussions with children indicated that they enjoyed these as much as, if not more than, the games. They thought they were funny and clever and they claimed that they learned things they hadn't known. Two examples were, "I didn't know that fruit drink wasn't fruit juice!" and "Wow! I didn't know that French fries were hiding fat."

Another limitation with the evaluation component was that behavior change and intent to change were not measured. According to the School Health Education Evaluation, 50 hours are required to achieve consistent levels in knowledge, attitudes, and behavior (Connell et al., 1985). Our program resulted in about four hours of intervention time, not sufficient for behavior change. Therefore we chose not to measure behavior change.

Finally, although computer programs reduce the amount of teacher training needed in nutrition, interactive multi-media programs require a substantial financial commitment at the start. Following development, however, the CD is self-sustainable outside of marketing and distribution.

Conclusions. Our research showed that a computer nutrition education program -- developed using the Theory of Intrinsically Motivating Instruction framework and other logistical issues for adopting the program -- is a successful way of teaching children about nutrition. Games and songs were viable options for children at all acculturation levels – indicating that learning styles, when using computers, may not differ among children.

CHAPTER 9

Discussion and Conclusions

Computer technology. With the growth in accessible entertainment for all, nutrition educators need to be "competitive" about avenues to reach target populations. Computer nutrition education programs provide a forum for accomplishing this. Our program provided an element of entertainment along with education, so that children may choose to use the program outside of a school setting. This may also be illustrative of an effective model within schools, where children may quickly become engaged with the program and therefore require little monitoring.

For teachers, a CD-ROM nutrition education helps overcome many barriers. It requires little training in nutrition education or technology. It can easily be installed and easily used. In our target areas, many teachers act as surrogate mothers and social workers on top of their responsibilities as teachers. Expecting literacy in nutrition information – a growing and changing field – isn't necessarily realistic. Presenting nutrition information in an easy-to-use format is, however, reasonable.

Technology is exploding and moving at a much quicker pace. What was once considered "innovative," CD-Rom programs are widespread and almost always included in new computers. Future programs dealing with new technology may not find that there is such a hurdle prior to the "adoption of new innovations." Our project also demonstrated that self-administered programs were viable.

Interactive Multi-Media Development Issues. There is a delicate balance between research/evaluation and creative programming in computer-assisted education and interactive multi-media. As Lytle and Achterberg caution, special effects should not be used at the expense of content and overall nutrition messages (Lytle et al., 1995). Rigorous research requires, to some extent, controlled settings where outcomes can be clearly measured and documented. In the case of computer-assisted education or instruction, this is easily achieved through linear programming – where content is controlled by programming and the users are directed through the program in a fairly pre-defined route. Using this approach, users receive identical information and similar levels of exposure. This approach also allows for valid comparisons between individuals who go through the educational computer program with those who don't (or those who receive the same information but from a different method of education).

Typically, developers of educational computer programs and games prefer to design non-linear programs that provide users with complete control of options, including what content is covered, what order it is presented in, and how much information they receive. It is believed that user-control allows for tailored and individualized information. Further, there is the assumption that interactivity and entertainment will interest users more and will, in turn, equate with learning. This may be true, depending on the context and location of the computer program. To date, in the field of nutrition, research has neither proven nor disproved this hypothesis. Our study suggested that as long as the games and songs were fun, challenging, and interesting, children learned by using a linear program in a classroom setting.

Regardless of these differences in perspectives, successful computer programs can be developed that are entertaining and sound in research and evaluation. To accomplish this, however, it is important for developers and researchers to mutually arrive at an agreement about the program's expectations. In this project, we (the researchers) provided the programmers with the key nutrition messages – that the computer program should be based upon – and evaluation questions. We also provided ideas and guidance in how to successfully teach children these messages through computer programs. Based on the outlined messages and evaluation questions, the developers drafted a few ideas for the computer modules, which were attainable given our funding and mutual resources (animators, graphic artists, narrators, singers, etc.). From there, final decisions were mutually made about the overall program, the scripts, and final evaluation questions, consistent with our initial goals.

It should be noted that this process is not necessarily easy and can at times be a tug-of-war between creativity and content. It is important to work in concert with each other throughout the conception and development processes to ensure that the messages are conveyed appropriately. For example, one of the draft infomercials contained an image of a plate piled high with fat with a sassy waitress saying, "You wouldn't order a plate of fat now would you?! That's what you get when you order a cheeseburger and fries." Although the message was clear and comical to some degree, the message of "good" versus "bad" foods was emphasized. In the past five years, the nutrition field has urged professionals to move away from this concept and instead to focus on the inclusion of all foods as part of a healthy diet (The Dietary Guidelines Alliance, 1996). In the end, this infomercial was not used, but it still illustrates the idea of creativity versus content and the importance of constant communication and monitoring.

<u>Limitations of Computer-Assisted Education.</u> Although there are strengths to computer-assisted education (as discussed earlier), there are several limitations as well. First of

all, not all subject matter lends itself to computers as the mode of communication. The Food Guide Pyramid is based on extensive research highlighting the importance of different foods and relative quantities in providing the nutrients and energy for optimal health and the prevention of disease. The concept of the Food Guide Pyramid can easily be taught using interactive multi-media. Serving sizes are challenging, however. A computer can present information on what constitutes a serving size for different foods. Hands-on activities -- using real foods and exhibiting different volumes – make the concept easier to teach (although still challenging) and certainly more enjoyable to grasp.

In addition, computers pose certain challenges when attempting to employ "social" components of behavior change. For example, when using Social Learning Theory, a successful theoretical framework for school-based nutrition education programs (Contento et al., 1992), attempts should be made to involve family and intervene in the school environment. These are not entirely possible with interactive multi-media.

Finally, it is important to recognize when personal interaction is advantageous over computers (and technology in general). Although teachers may not find time to spend 15 minutes responding to email (or filling out a survey), they will certainly meet with someone who visits with them at school for 15 minutes or longer. By nature, teachers are social people – thus their choice of careers. In our study, direct contact with teachers and principals in the implementation and evaluation phases of the project proved to be more fruitful than any technology or other form of communication, including email, phone calls, and mailed-out surveys. The major limitations were distance to schools, weather, and time.

Acculturative stress. Smart and Smart (1995) believe that there may be certain characteristics with the Hispanic culture, which may actually impede movement through the stages of adjustment and acculturation. For children, acculturative stress may be even more devastating. They are faced with demands to perform well in school, along with demands to psychosocially adjust to new surroundings. Prewitt-Diaz and Santiago (1998) perceived that migrant children's performance in school and learning were lower and that they exhibited more anxiety. To address some of these concerns, Smart and Smart (1995) encourage counselors and social service workers to assess stress level, address unique language needs, and provide social support and social skill building. Schools should also address adjustment issues for recent immigrant children.

Although it would be difficult to address all of these concerns in a nutrition curriculum, it would certainly be feasible to integrate dietary acculturation issues with existing programs that address these issues. With declining resources for programming, collaboration is becoming increasingly important in order to sustain efforts in the social services.

A review of the literature reported no computer programs on nutrition that were available in Spanish and that specifically targeted recent immigrants and less acculturated children. Although computer technology may not be a personal or comprehensive approach to meeting many of the needs of less acculturated or migrant children, a culturally appropriate program with pictures of traditional foods may provide some level of comfort to those children, especially in the school setting. It certainly drives the message home that their preferences and needs are addressed in one manner or another.

Integration of Theoretical Models. Although several theories drove our research agenda, a few – in the end -- were not extensively evaluated. For example, the Diffusion of Innovation theory was used, in part, to determine what issues to consider when developing the interactive multi-media program in order to promote its "diffusion." Once the program was developed, however, we evaluated it in somewhat "artificial" circumstances. We personally recruited schools and encouraged them to participate in the project. We provided incentives – which typically would not be available. We also installed the computer program on their computers. As a result we weren't able to determine the computer program's efficacy in minimizing barriers and promoting widespread diffusion. To pursue this research angle, I would suggest following up with schools, who participated in the program, to evaluate teachers' use and perceptions of the program – using the Diffusion of Innovation as a framework.

This was also the case with the Theory of Intrinsically Motivating Instruction (TIMI), which led to the inclusion of fantasy, curiosity, and challenge into the computer program. We did not formally evaluate children's responsiveness to these factors, although we received informal feedback indicating that they enjoyed the programs. Some children even cited some of these aspects. At the expense of assessing nutrition knowledge and attitudes or dietary acculturation, we could have assessed attitudes about these different elements. There are definitely challenges related to evaluating TIMI. There are so many confounding factors to whether children like a computer program. Plus, it proves to be challenging to determine criteria for assessing what constitutes fantasy, curiosity, and challenge. What one considers fantasy may be curiosity to another. Ultimately the most important factor is if children enjoyed the program and learned important nutrition information, which is what we measured.

Conclusions. Our study involved an extensive formative evaluation – involving surveys of classroom teachers, media teachers, and children. Results from the evaluation, in turn, drove the design and development of the computer program. In the end, it led to the program's effectiveness in teaching children about the Food Guide Pyramid and related topics. It also highlights the importance of integrating results from formative evaluations in order to develop viable programs – interactive multi-media and other. Further our findings point to the acceptability of computer programs with Latino children at all levels of acculturation.

A subsequent – but important – finding was that dietary changes exist between children at different acculturation levels. In some ways, the results are surprising. We live in an increasingly global and Hispanic world with the availability of any international product and food at our fingertips. McDonald's can be found in nearly every country of the world. Still, our research illustrates the value we place on food. It shows how food reflects our attitudes about our own culture (along with other cultures) and how our choice in foods can mirror those changes that take place in our own lives. Jerome believes that culture is the most important determinant of eating behavior (Jerome et al., 1981). But culture itself is vast and complex. As Nestle, et al, state, "A blend of many factors, ranging from biological to anthropologic, interact in complex and changing ways to influence the development and maintenance of food choices" (Nestle et al., 1998).

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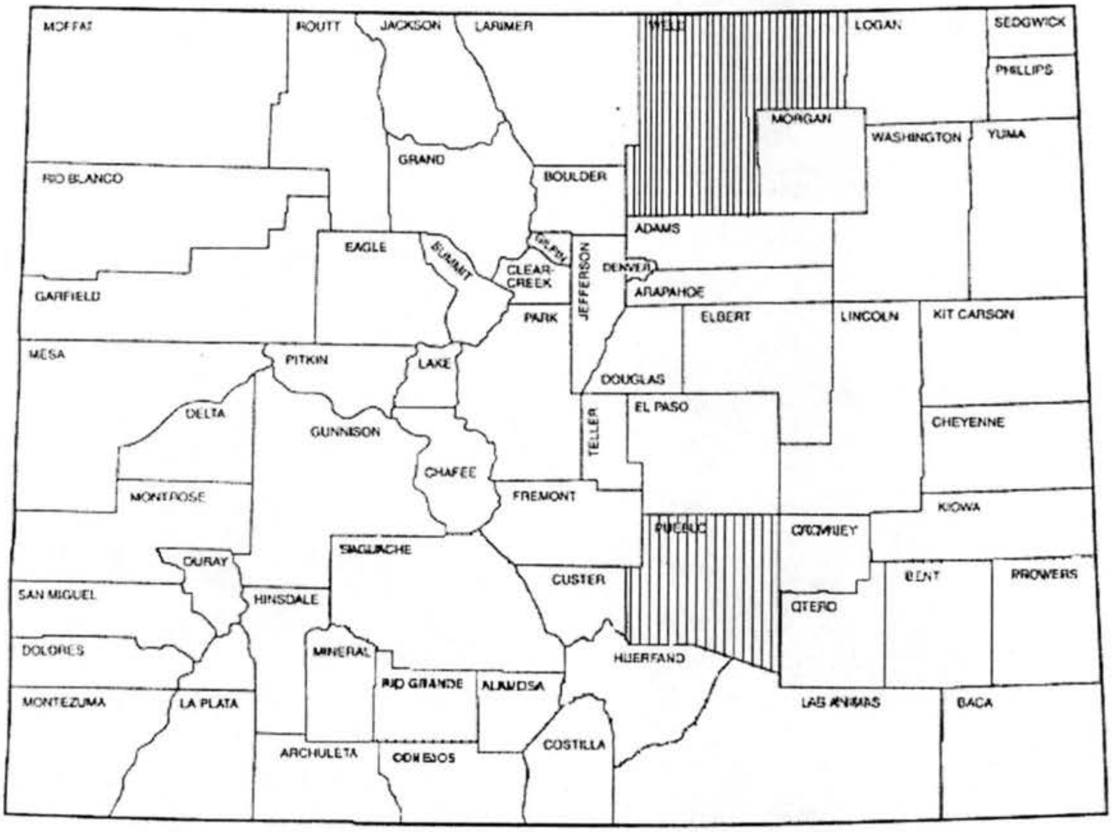
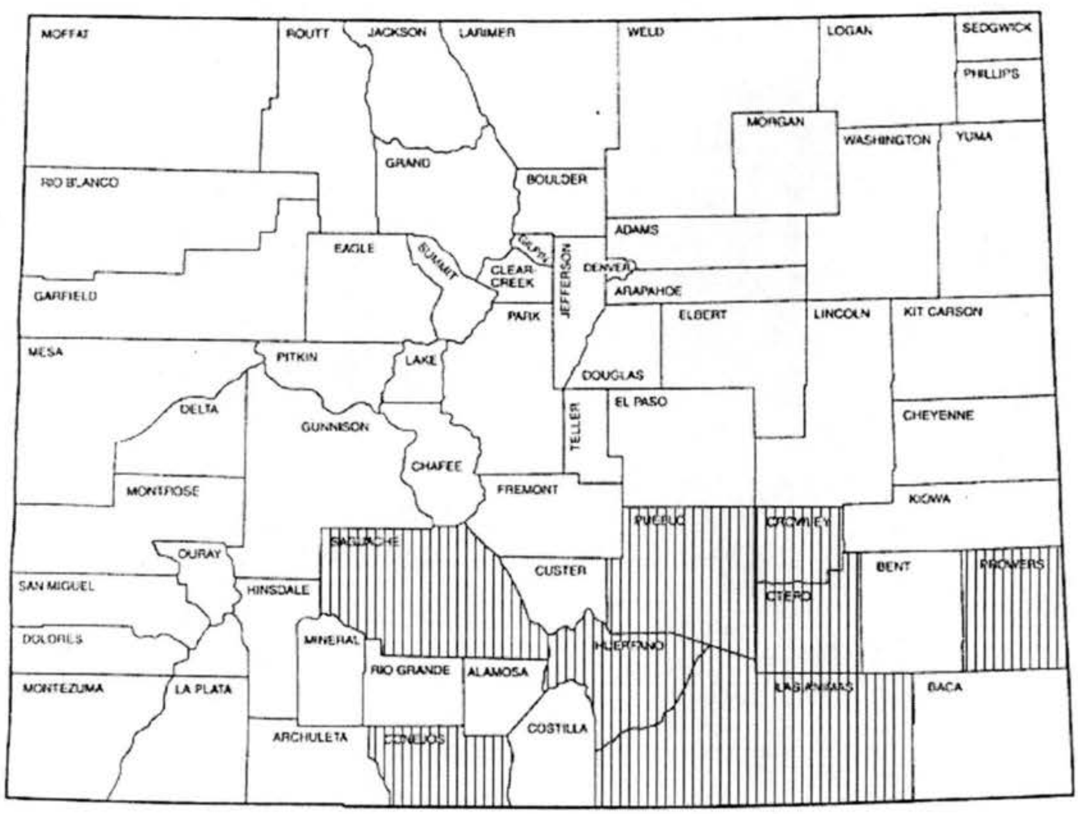
LIST OF APPENDICES

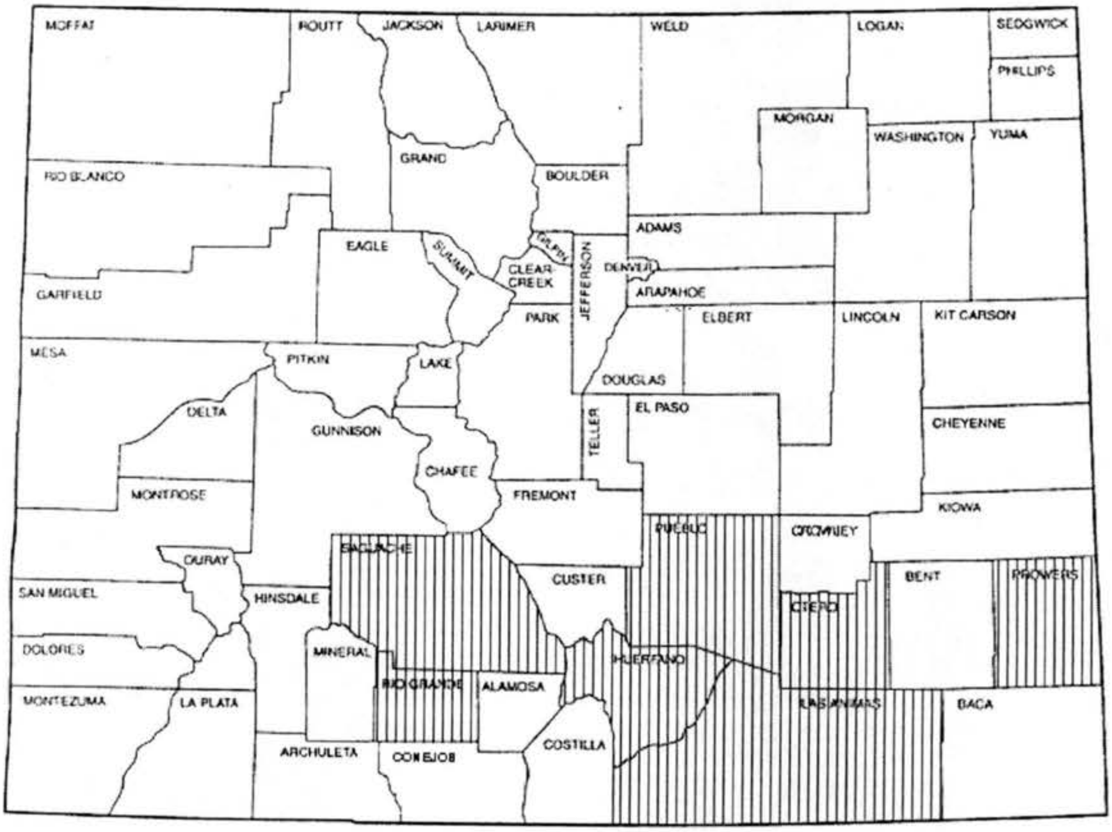
COUNTIES WHERE FOCUS GROUP DISCUSSIONS WERE CONDUCTED



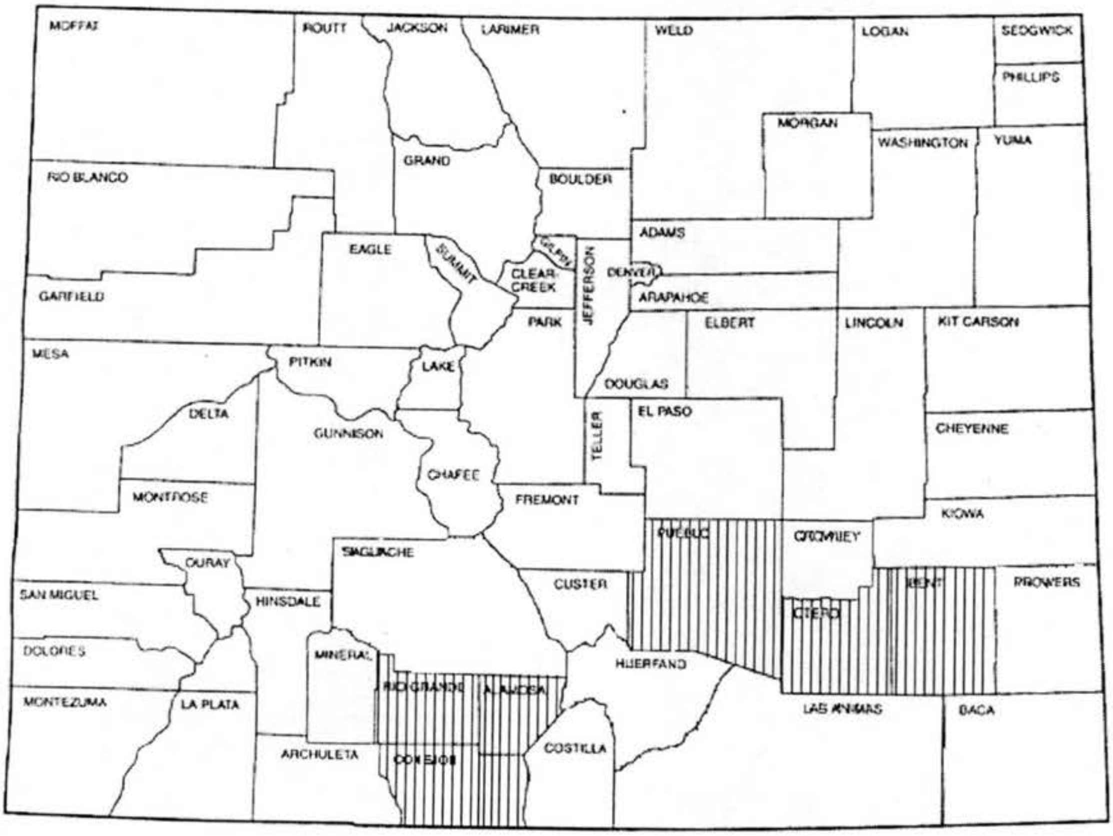
LOCATION OF CLASSROOM TEACHER SURVEYS IN COLORADO



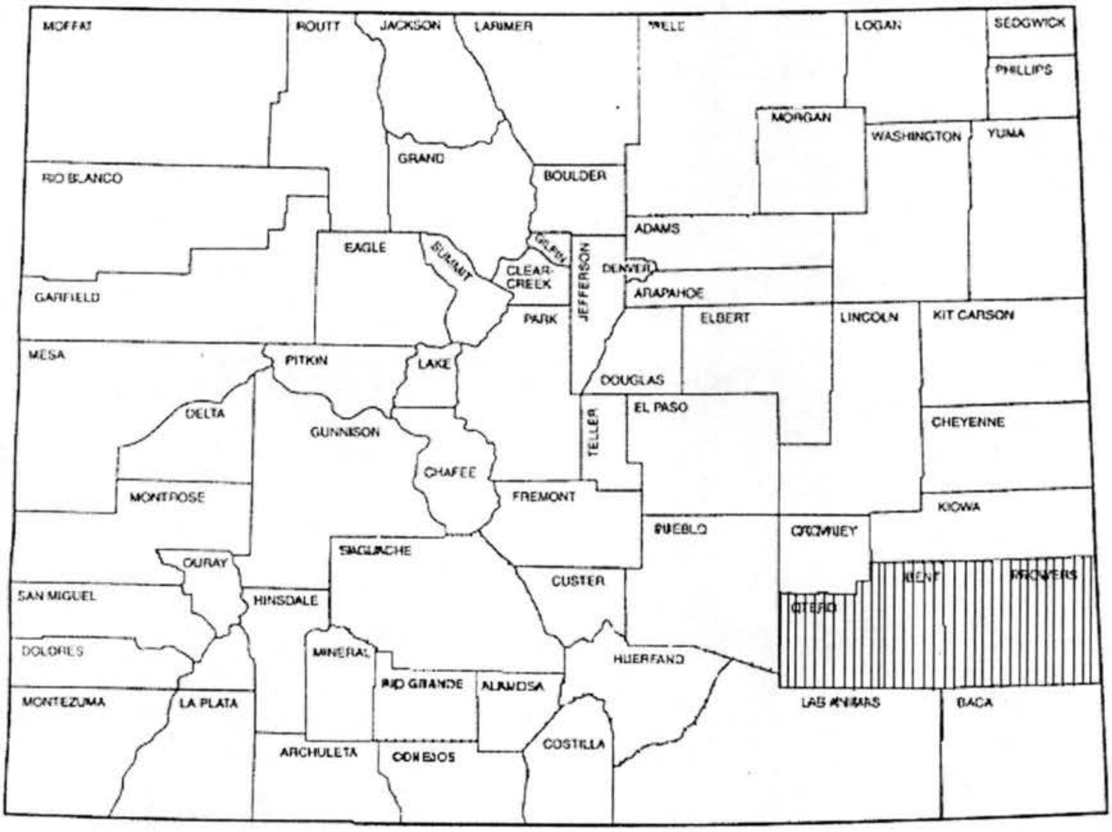
COUNTIES WHERE MEDIA TEACHER SURVEYS WERE CONDUCTED



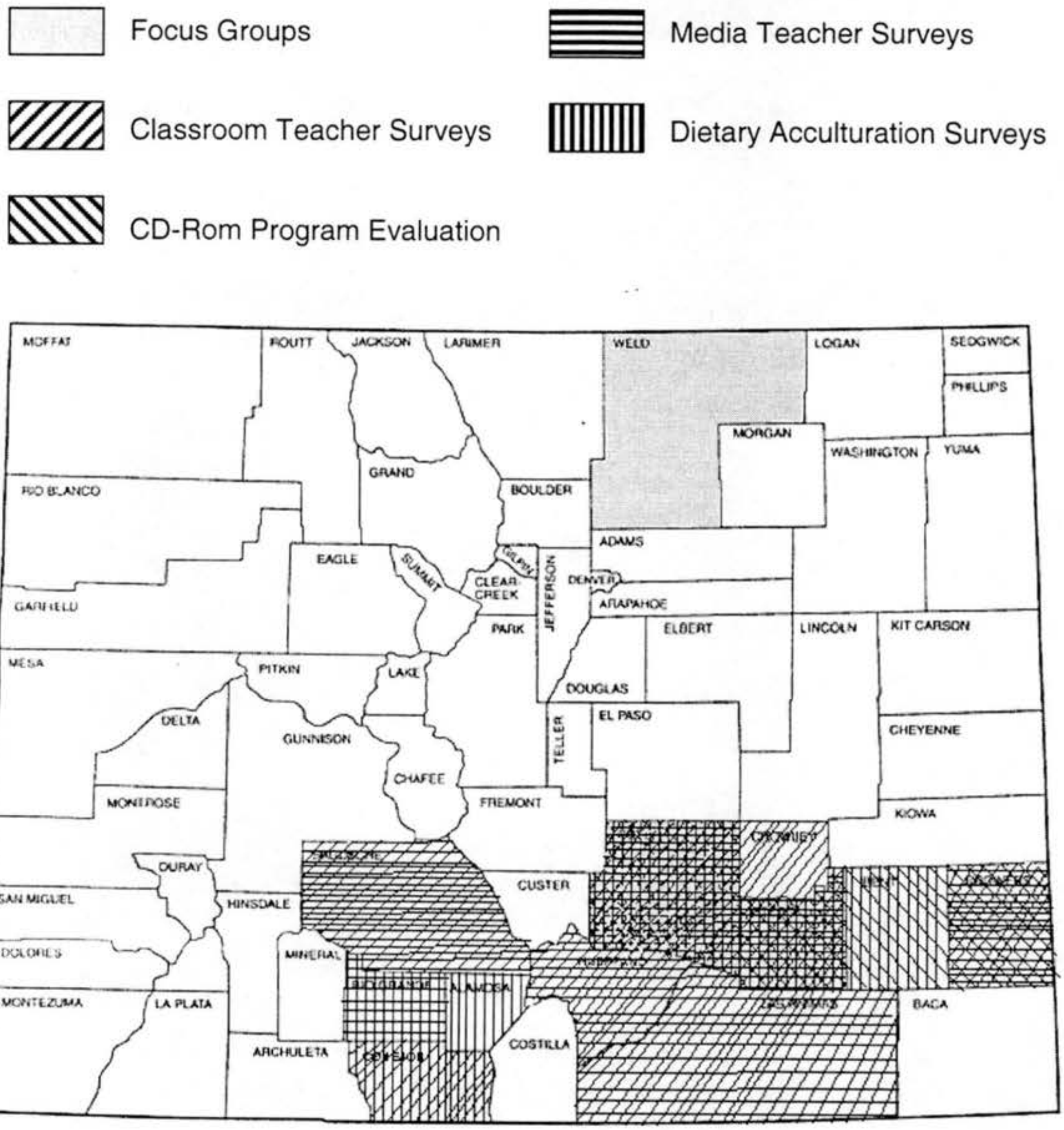
COUNTIES WHERE DIETARY ACCULTURATION SURVEYS WERE CONDUCTED



COUNTIES WHERE EVALUATIONS OF THE CD-ROM NUTRITION EDUCATION PROGRAM TOOK PLACE



COMPOSITE MAP OF COUNTIES WHERE RESEARCH ACTIVITIES TOOK PLACE



MAR 0 6 1998

Colorado State University

Office of Regulatory Compliance
Office of Vice President for Research
and Information Technology
Fort Collins, CO 80523
(970) 491-1563
FAX (970 491-2293

MEMORANDUM

TO: Jennifer Anderson, Food Science and Human Nutrition

FROM: Celia S. Walker, Administrator CSWalker
Human Research Committee

SUBJECT: PROJECT APPROVAL
Title: Development of a Nutrition Education CD-Rom Program for Children of Low Income Hispanics and Migrant Farm Workers
Protocol No.: 97-147H
Funding Agency: U.S. Department of Health and Human Services
Funding Agency Deadline: 5/20/97

DATE: March 2, 1998

I am pleased to inform you that the above-referenced project was approved by the Human Research Committee on February 17, 1998 for the period February 17, 1998 through February 17, 1999 with the condition that the attached consent forms are signed by the subjects and each subject is given a copy of the form and letters of support from school (s) be provided when available. It is the investigator's responsibility to obtain these consent forms from all subjects. NO changes may be made to this document without first obtaining the approval of the Committee.

A status report of this project will be required within a 12-month period from the date of approval. The necessary form (H-101) will be mailed to you prior to that date.

It is the responsibility of the investigator to immediately inform the Committee of any serious complications, unexpected risks or injuries resulting from this research.

It is also the investigator's responsibility to notify the Committee of any changes in experimental design or consent procedures (file Form H-101).

Any questions about the Committee's action on this project should be directed to me.

Attachment
Xc: Elena Serrano w/attachment
Gretchen Buege w/attachment

Colorado State University

Office of Regulatory Compliance
Office of Vice President for Research
and Information Technology
Fort Collins, CO 80523-2046
(970) 491-1563
FAX: (970) 491-2293

MEMORANDUM

AUG 10 1999

TO: Jennifer Anderson, Food Science and Human Nutrition, 1571

FROM: Celia S. Walker, Administrator
Human Research Committee CSWalker

SUBJECT: PROJECT APPROVAL
Title: Development of a CD-ROM Nutrition Education Program for Hispanic Children
Protocol No.: 99-065H
Funding Agency: Dept. of Health and Human Services (DHHS)
Funding Agency Deadline: 03/26/99

DATE: August 5, 1999

I am pleased to inform you that the above-referenced project was approved by the Human Research Committee on August 2, 1999 for the period August 2, 1999 through August 2, 2000 with the condition that the attached consent form is signed by the subjects and each subject is given a copy of the form. It is the investigator's responsibility to obtain this consent form from all subjects. *NO changes may be made to this document without first obtaining the approval of the Committee.* The consent form must be typed on CSU letterhead. Approval is for **225 9-11 year old subjects.**

As an additional condition, the questionnaire and the letters of agreement must be provided to our office.

A status report of this project will be required within a 12-month period from the date of approval. The necessary form H-101 is available on the Human Research Committee web page.

It is the responsibility of the investigator to immediately inform the Committee of any serious complications, unexpected risks or injuries resulting from this research.

It is also the investigator's responsibility to notify the Committee of any changes in experimental design or consent procedures (file Form H-101).

This approval is issued under Colorado State University's OPRR Multiple Projects Assurance M-1153-01 issued August 1, 1996.

Please direct any questions about the Committee's action on this project to me for routing to the Committee.

Attachment
XC: ELENA SERRANO

Colorado State University

Office of Regulatory Compliance
Office of Vice President for Research
and Information Technology
Fort Collins, CO 80523-2046
(970) 491-1563
FAX: (970) 491-2293

MEMORANDUM

JUL 26 2000

TO: Jennifer Anderson, Food Science and Human Nutrition, 1571

FROM: Linda Kovar, Regulatory Coordinator for the Human Research Committee LLKovar csw

SUBJECT: PROJECT APPROVAL
Title: Development of a CD-ROM Nutrition Education Program for Hispanic Children.
Protocol No.: 99-065H
Funding Agency: Dept. of Health and Human Services (DHHS)
Funding Agency Deadline: N/A

DATE: July 18, 2000

I am pleased to inform you that the above-referenced project was approved by the Human Research Committee on July 10, 2000 for the period August 2, 2000 to August 2, 2001 with the condition that the attached consent form is signed by the subjects and each subject is given a copy of the form. It is the investigator's responsibility to obtain this consent form from all subjects. *NO changes may be made to this document without first obtaining the approval of the Committee.*

A status report of this project will be required within a 12-month period from the date of approval. You will be sent a reminder approximately two months before the protocol expires. The Principal Investigator will report on the numbers of subjects who have participated this year and project-to-date, about problems encountered, and provide a verifying copy of the consent form or cover letter used. The necessary form (H-101) is available from the Regulatory Compliance web page (see below). Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.

It is the responsibility of the investigator to immediately inform the Committee of any serious complications, unexpected risks, or injuries resulting from this research. It is also the investigator's responsibility to notify the Committee of any changes in experimental design, participant population, or consent procedures or documents. This can be done with a memo which completely describes the changes and their consequences (new consent form or cover letter, or altered survey instrument, for example). Students serving as Co-Principal Investigators may not alter projects without first obtaining PI approval. The PI is ultimately responsible for the conduct of the project.

This approval is issued under Colorado State University's OPRR Multiple Projects Assurance M-1153-01 issued August 1, 1996. If approval did not accompany a proposal when it was submitted to a sponsor, it is the researcher's responsibility to provide the sponsor with the approval notice.

Please direct any questions about the Committee's action on this project to me for routing to the Committee.

Additional information is available from the Regulatory Compliance web site at www.research.colostate.edu/regulatory/

Attachment
xc: Elena Serrano w/attachment

CHILD'S INFORMED CONSENT FORM

Title of Project: Development of a CD-ROM Nutrition Education Program for Hispanic Children (Focus Group)

I AM ASKING IF YOU WOULD LIKE TO PARTICIPATE IN A FOCUS GROUP. THIS MEANS YOU WILL BE ASKED QUESTIONS WITH OTHER STUDENTS AND CHILDREN IN A GROUP. IT WILL TAKE ABOUT AN HOUR. THERE SHOULD BE NO RISK FOR PARTICIPATING. IF YOU WANT TO PARTICIPATE IN THE FOCUS GROUP, PLEASE SIGN BELOW AND INCLUDE THE DATE. THANK YOU!

NAME: ______________________________________

DATE: ______________________________________

CONSENTIMIENTO INFORMADO DEL HIJO

Título de Proyecto: Desarollo de Un Programa de CD-ROM de Educación Nutricional para Niños Hispanos (Grupos de Discusión)

YO ESTOY PREGUNTANDO, SI TÚ QUIERES PARTICIPAR EN UN DISCUSIÓN EN UN GRUPO. TÚ TIENES QUE DISCUTIR ALGUNAS PREGUNTAS CON OTROS ESTUDIANTES Y NIŇOS. SE DEBE DURAR UNA HORA. NO DEBE SER NINGÚN RIESGO. SI TÚ QUIERES PARTICIPAR EN ESTA DISCUSIÓN, FAVOR DE ESCRIBIR TU NOMBRE Y LA FECHA ABAJO. GRACIAS.

NOMBRE: ______________________________

FECHA: ______________________________

COLORADO STATE UNIVERSITY
INFORMED CONSENT TO PARTICIPATE IN A RESEARCH PROJECT
(Focus Groups)

TITLE OF PROJECT: Development of a CD-ROM Nutrition Education Program for Hispanic Children

NAME OF PRINCIPAL INVESTIGATOR: Jennifer Anderson, Ph.D., R.D.

CO-INVESTIGATOR: Elena Serrano, M.S., Ph.D. candidate

CONTACT NAME AND PHONE NUMBER FOR QUESTIONS/PROBLEMS: Dr. Jennifer Anderson, (970) 491-7334.

SPONSOR OF PROJECT: Department of Health and Human Services (DHHS)

PURPOSE OF THE RESEARCH: The purpose of this research is to understand childrens likes and dislikes with computer programs. Based on these focus groups, we will develop a computer program on CD-ROM to be used within 4th and 5th grade classrooms.

PROCEDURES/METHODS TO BE USED: Your child will be asked to participate in a 1-hour long focus group in which a light meal will be provided. Focus groups provide an opportunity for a group of about ten people to talk about certain topics. Focus groups will be led by a trained facilitator who will ask questions about phytochemicals and nutrition. Focus groups will be audio-taped in order to transcribe and evaluate at a later date. After transcription and evaluation, all tapes will be destroyed about 6 months from the time of the focus groups.

RISKS INHERENT IN THE PROCEDURES: None expected. It is not possible to identify all potential risks in research procedures, but the researcher(s) have taken reasonable safeguards to minimize any known and potential, but unknown, risks.

BENEFITS: Potential benefits to participants will be the opportunity to talk about certain topics with other children.

CONFIDENTIALITY: Confidentiality cannot be guaranteed in group settings. All results from information presented in oral form will be used for research purposes only. All information provided by the participants through questionnaires will be fully confidential and used for research purposes only. Participants will be assigned a code name or number which will be used to identify them.

LIABILITY: The Colorado Governmental Immunity Act determines and may limit Colorado State University's legal responsibility if an injury happens because of this study. Claims against the University must be filed within 180 days of the injury.

Page 1 of 2 Parent's Initials ____________ Date

Questions about subjects' rights may be directed to Celia S. Walker at (970) 491-1563.

PARTICIPATION:

Your child's participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent for your child's participation and have him/her stop participating at any time without penalty or loss of benefits to which you are otherwise entitled.

Your signature acknowledges that you have read the information stated and willingly sign this consent form. Your signature also acknowledges that you have received, on the date signed, a copy of this document containing _2_ pages.

____

Child's name (printed)

____

Child's date of birth

______________________________ _______________

Investigator or co-investigator signature Date

PARENTAL SIGNATURE FOR MINOR

As parent or guardian you authorize _________________________ (print name) to become a participant for the described research. The nature and general purpose of this project have been satisfactorily explained to you by ______________________ and you are satisfied that proper precautions will be observed.

____

Parent/Guardian name (printed)

______________________________ _______________

Parent/Guardian signature Date

COLORADO STATE UNIVERSITY
INFORMED CONSENT TO PARTICIPATE IN A RESEARCH PROJECT/
CONSENTIMIENTO INFORMADO PARA PARTICIPAR EN UN PROYECTO DE INVESTIGACIONES
(Grupos de Discusión)

TÍTULO DEL PROYECTO: Desarollo de Un Programa de CD-ROM de Educación Nutricional para Niños Hispanos (Development of a CD-ROM Nutrition Education Program for Hispanic Children)

INVESTIGADORA PRINCIPAL: Jennifer Anderson, Ph.D., R.D.

CO-INVESTIGADORA: Elena Serrano, M.S., Ph.D. candidate

NOMBRE Y NÚMERO DEL TELÉFONO PARA INFORMACIÓN Y PREGUNTAS:
Dra. Jennifer Anderson, (970) 491-7334

PATROCINADOR DEL PROYECTO: Departamento de Servicios de Humanos y de Salud (Department of Health and Human Services)

OBJETIVOS DEL PROJECTO: El propósito de este proyecto es comprender lo que niños le gustan y no le gustan sobre computadoras. Después de los grupos de discusión, podemos desarrollar un programa computadora para niños.

PROCEDIMIENTOS: Su hijo(a) hará preguntado particpar en un grupos de discusión para una hora. Cada hijo(a) recibirá un bocadillo/snack. Grupos de discusión (focus groups) proveen una oportunidad de como diez personas hablar sobre algunas temas. Hará una persona para facilitar la discusión sobre quimas y comida y nutrición. Cada grupo de discusión hará grabado para evaluar más tarde. Después de seis meses todas cintas serán destruido.

RIESGOS: No esperamos ningún riesgo. Aunque no es posible identificar todos los riesgos posibles en un procedimiento experimental, las investigadoras tratan de impartir todas medidas de seguridad para minimizar ambos los riesgos conocidos y los riesgos potenciales que no podemos identificar.

BENEFICIOS: Cada niño(a) puede discutir algunas temas.

CONFIDENCIALIDAD: Toda la información que nos da es confidencial y será usada solamente para los propósitos del proyecto. Solamente los investigadores propios tendrán acceso a la información. Para proteger a las participantes se usará un número o codigo de identificación en lugar de los nombres.

LIMITACIÓN DE RESPONSABILIDAD: La Acta Gubernamental de Inmunidad (the Colorado Governmental Immunity Act) dirige y limita la resonsabilidad legal de la Universidad del Estado de Colorado si resulta una accidente de esta investigación. Tendrá que hacer reclamaciones entre 180 días del accidente. Preguntas sobre los derechos de los participantes se pueden dirigir a Celia S. Walker a (970) 491-1563.

Página 1 de 2 Iniciales de Padre ____________ Fecha __________

PARTICIPACIÓN: Ud. entiendes que la participación de su hijo(a) en esta investigación es voluntario. Si su hijo decide participar en la investigación, Ud. y su hijo pueden retirar su consentimiento y dejar de participar sin pena o perdida de beneficios. Ud. ha leido y entiende la información exponida y firma voluntariamente. Su firma también reconoce que recibe una copia en la fecha firmada este documento de 2 páginas.

____
Nombre del(a) participante (Letra de Molde)

____
La fecha de los cumpleaños del(a) niño(a)

_______________________________ _______________
Firma de la Investigadora o Co-investigadora Fecha

FIRMA DEL PADRE PARA NIÑOS
PARENTAL SIGNATURE FOR MINOR

Como padre o guardian, yo autorizo ______________________________
(nombre en letra de molde) participar en el proyecto descrito. El objectivo del project le ha explicado por ______________________________ y estoy satisfecho(a) con las medidas de seguridad para minimizar ambos los riesgo conocidos.

____
Nombre de Padre/Guardian (Letra de molde)

_______________________________ _______________
Firma de Padre/Guardian Fecha

FOCUS GROUP QUESTIONS

1. Tell me about the "Math Blaster" program.
   Probe: What did you like about it?
   Probe: What did you NOT like about it?

2. Tell me about the "Math Journey" program.
   Probe: What did you like about it?
   Probe: What did you NOT like about it?

3. What did you think about the characters in the programs?
   Probe: What did you like about them?
   Probe: What did you NOT like about them?

4. What did you think about the pictures/background in the programs?
   Probe: What did you like?
   Probe: What did you NOT like?

5. What did you think about the sounds and/or voices in the programs?
   Probe: What did you like?
   Probe: What did you NOT like?

6. What do you like about using a computer?

7. What do you NOT like about using a computer?

8. What do you think about using a mouse?
   Probe: Why do you like/dislike it?

9. What do you think about using the keyboard?
   Probe: Why do you like/dislike it?

10. Tell me about learning from a computer in school?
    Probe: What do you like about it?
    Probe: What do you NOT like about it?

11. Tell me about any nutrition computer programs you have used.
    Probe: What do you like/dislike about it?

12. What computer programs and games are your favorites?
    Probe: What is it about them that you like?

13. Name some of your favorite characters.
    Probe: What about them do you like?

14. Have you ever used any programs with human-beings like yourselves in them?
    Probe: Would you rather use a program with "real" people or "made-up" characters in it?

15. What do you usually eat for breakfast?

16. What is your favorite food?

17. What do you usually bring to school for snack-time?

18. Do you ever cook meals for yourself?
    Probe: How often?
    Probe: What do you make?

CLASROOM TEACHER SURVEY

February 22, 1999

TEACHER'S NAME
SCHOOL
ADDRESS

Dear Classroom Teacher:

Enclosed you will find a survey which asks you questions about your school's computers and computer programs. We are sending this to you as part of a research project at Colorado State University titled, "Development of a CD-ROM Nutrition Education Program for Hispanic Children."

We are asking you to fill out this survey so we can develop an effective nutrition education CD-ROM program for 4th and 5th grade children (focusing on Hispanics). The survey should take approximately 10-15 minutes to fill out. We have included a stamped envelope for you to easily send the survey back to us.

Your participation is completely voluntary. There are no known risks for completing the survey and no direct benefits. Indirectly, however, you will help by providing us with valuable information to develop a CD-ROM nutrition program. All of your answers will be confidential. Once we receive your survey, we will assign a code number to it. From that point on, all references to your answers will be based on the code number. Any questions about this process can be directed to me at (970) 491-7334.

To show our appreciation for your time and effort, we have included a free Hispanic Food Guide Pyramid magnet for you to keep. Once we receive your survey, we will send you another free gift too!

Thank you in advance,

Jennifer Anderson, Ph.D., R.D.
Principal Investigator
Professor and Extension Specialist

Original formatting has been changed slightly to conform to margin requirements.

GENERAL QUESTIONS

1. What grade do you teach?

2. How many children are in your class?

3. How much time do you plan for a science lesson? ________ minutes

4. On average, how often do you teach science (times per week; or times per month)?

   __________per week **OR** _________per month

5. What are the *three most important skills* a child needs to learn before starting 5th grade?

   1. ______________________________________
   2. ______________________________________
   3. ______________________________________

6. Do *you* use computers in your classroom to present information?

   Yes (go to question 7) _________ No (go to question 8) _________

7. What type of information do you present with computers?

   Why do you think computers are effective or ineffective in teaching children information? (go to question 8)

8. Do the children in your class have a computer class offered in school?

   Yes (continue) _________No (go to question 9) __________

   How many times per week? ______per week
   How long is each computer class? ______minutes

Original formatting has been changed slightly to conform to margin requirements.

Do *you* decide what software programs are used?

Yes _______ No _______

If not, who decides? Name ______________________________

Title ______________________________

NUTRITION AND COMPUTER QUESTIONS

9. Do you teach nutrition in any of your lessons?

   Yes (go to question 10 and skip question 11) _____ No (go to question 11) _____

10. Is it a stand-alone nutrition class or is it covered under a different subject area?

    nutrition ________ different subject _______

    With which subject area(s) is it taught?

    What nutrition topics do you cover?

    What types of resources and/or methods do you use to teach nutrition? (videotapes, games, lecture/discussion, textbooks, computers)

11. What are some reasons you don't teach nutrition?

    What would you need to teach nutrition?

12. Would you use a computer program to teach nutrition?

    Yes _______ No _______

    Why or why not?

Original formatting has been changed slightly to conform to margin requirements.

13. What subject areas would you want to integrate with nutrition?

_____Health _____Social Studies _____Reading

_____Math _____Science _____Geography

_____Other (Please list):

14. What types of nutrition activities would you recommend?

15. Do you see a need for Spanish information within your classes?

Yes _______ No _______

THANK YOU SO MUCH FOR YOUR TIME!

Original formatting has been changed slightly to conform to margin requirements.

MEDIA TEACHER SURVEY

February 22, 1999

TEACHER'S NAME
SCHOOL
ADDRESS

Dear Media Teacher:

Enclosed you will find a survey which asks you questions about your school's computers and computer programs. We are sending this to you as part of a research project at Colorado State University titled, "Development of a CD-ROM Nutrition Education Program for Hispanic Children."

We are asking you to fill out this survey so we can determine an appropriate platform for a CD-ROM program for 4th and 5th grade children (focusing on Hispanics). The survey should take approximately 10-15 minutes to fill out. We have included a stamped envelope for you to easily send the survey back to us.

Your participation is completely voluntary. There are no known risks for completing the survey and no direct benefits. Indirectly, however, you will help by providing us with valuable information to develop a CD-ROM nutrition program. All of your answers will be confidential. Once we receive your survey, we will assign a code number to it. From that point on, all references to your answers will be based on the code number. Any questions about this process can be directed to me at (970) 491-7334.

To show our appreciation for your time and effort, we have included a free Hispanic Food Guide Pyramid magnet for you to keep. Once we receive your survey, we will send you another free gift too!

Thank you in advance,

Jennifer Anderson, Ph.D., R.D.
Principal Investigator
Professor and Extension Specialist

Original formatting has been changed slightly to conform to margin requirements.

TECHNOLOGY QUESTIONS

1. Considering a child's attention span and the length of class, what do you think is an optimal length of time for a computer module for 4^{th} & 5^{th} graders?
   ________ minutes

2. Given class size and computer availability, would the optimal computer program for 4^{th} & 5^{th} graders target:
   one child per computer _______ OR $\geq$ 2 children per computer ______

3. Please list the number of the following computers you *use* in your classroom along with the MHz and Operating System.

Apple/Macintosh (please specify what model):______________________________

IBM 486:	____________	MHz:	______	Operating System (3.1, 95, 98, NT, OS/2):	__________
IBM 586:	____________	MHz:	______	Operating System (3.1, 95, 98, NT, OS/2):	__________
IBM Pentium I:	____________	MHz:	______	Operating System (3.1, 95, 98, NT, OS/2):	__________
IBM Pentium II:	____________	Hz:	______	Operating System (3.1, 95, 98, NT, OS/2):	__________
Other:	________________	MHz:	______		

4. For what computer platform would you like a computer program developed, given the types of computers available at your school and your preference?

5. Do you know of any long-term projections at your school, which will change the number of computers or types of computers? Yes ______ No ______
   If yes, please describe proposed changes.

6. Are the computers in your classroom equipped with? (If yes, please fill in the number of computers equipped with them.)

speakers:	Yes (# of computers)	________	No	_______
headphones:	Yes (# of computers)	________	No	_______
CD-ROM drives:	Yes (# of computers)	________	No	_______

7. Would you use a CD-ROM computer program? Yes ______ No _______
8. Do you have access to the web within your classroom? Yes _______ No _______

   If so, what kind of access? T1 _____ modem ______

Original formatting has been changed slightly to conform to margin requirements.

If through a modem, what speed is the modem (28.8 kbps, 14.4 kbps, ...)? __________

Which would you prefer using in your classroom: CD-ROM ______ OR the web ____

CONTENT

9. Name three computer programs you use *the most* in your 4th and 5th grade classrooms.

   1. ______________________________
   2. ______________________________
   3. ______________________________

   Are there *storylines* within in these programs? Yes________ No ________

   Are there *games*? Yes________ No ________

   What do you think the children *like most* about these programs?

10. Do you choose which computer programs are used within your classrooms?
    Yes_________ No ________ *If not,* who chooses?

11. What criteria are used to choose computer programs in classrooms?

12. Have you ever used a *nutrition computer* program in your classroom?
    Yes (go to question 13) ________ No (go to question 14) ________

13. Which computer program(s) did you use?

    What do you think the children *liked* about it (them)?

    What do you think the children *disliked* about it (them)?

Original formatting has been changed slightly to conform to margin requirements.

14. Would you be interested in using a nutrition computer program in your class?

    Yes _______ No_______

    What would *increase* your chance of using a nutrition computer program? Please explain.

15. What other subject areas would you like to be incorporated within a nutrition program?

    _____Health _____Social Studies _____Reading

    _____Math _____Science _____Geography

    _____Other (Please list):

Original formatting has been changed slightly to conform to margin requirements.

CHILD'S INFORMED CONSENT FORM

Title of Project: Development of a CD-ROM Nutrition Education Program for Hispanic Children (Acculturation Study)

I AM ASKING IF YOU WOULD BE WILLING TO TAKE A TEST. THE TEST WILL HAVE QUESTIONS ABOUT WHAT LANGUAGE YOU SPEAK AND WHAT FOODS YOU EAT. THERE SHOULD BE NO RISK FOR PARTICIPATING. IF YOU DON'T WANT TO, YOU DON'T HAVE TO TAKE THIS TEST. IF YOU WANT TO TAKE THE TEST, PLEASE WRITE YOUR NAME BELOW ALONG WITH THE DATE. THANK YOU!

NAME: ______________________________

SIGNATURE: ______________________________

DATE: ______________________________

CONSENTIMIENTO INFORMADO DEL HIJO

Título de Proyecto: Desarollo de un Programa de CD-ROM de Educacion Nutricional para Ninos Hispanos (Estudio de Acculturación)

YO ESTOY PREGUNTANDO, SI TÚ QUIERES TOMAR UN EXÁMEN. EL EXÁMEN ES SOBRE LA LENGUA QUE TÚ HABLAS Y LA COMIDA QUE COMES. NO DEBE SER RIESGO EN PARTICIPAR. SI TÚ NO QUIERES, TÚ NO TIENES QUE PARTICIPAR Y TOMAR ESTE EXÁMEN. SI TÚ QUIERES TOMAR ESTE EXÁMEN, FAVOR DE ESCRIBIR TU NOMBRE Y LA FECHA ABAJO. GRACIAS.

NOMBRE: ______________________________

FIRMA: ______________________________

FECHA: ______________________________

COLORADO STATE UNIVERSITY
INFORMED CONSENT TO PARTICIPATE IN A RESEARCH PROJECT
(Acculturation Study)

TITLE OF PROJECT: Development of a CD-ROM Nutrition Education Program for Hispanic Children

NAME OF PRINCIPAL INVESTIGATOR: Jennifer Anderson, Ph.D., R.D.

NAME OF CO-INVESTIGATOR: Elena Serrano, M.S., Ph.D. candidate

CONTACT NAME AND PHONE NUMBER FOR QUESTIONS/PROBLEMS: Dr. Jennifer Anderson, (970) 491-7334.

SPONSOR OF PROJECT: Department of Health and Human Services (DHHS)

PURPOSE OF THE RESEARCH: The purpose of this research is to determine food choices of children based on acculturation level (such as what language the child speaks). Information from this study will help develop a culturally-sensitive CD-ROM program on nutrition for 4th grade children, which includes graphics of foods that children eat.

PROCEDURES/METHODS TO BE USED: Participants (your children) will be asked to complete a questionnaire. It will ask your child about the language he/she speaks at school, with family, and with friends, as well as the foods he/she eats. It should take approximately 15 minutes to fill out the questionnaire.

RISKS INHERENT IN THE PROCEDURES: None expected. It is not possible to identify all potential risks in research procedures, but the researcher(s) have taken reasonable safeguards to minimize any known and potential, but unknown, risks.

BENEFITS: The child will receive either $5 or a $5 gift certificate for filling out the questionnaire. The school will receive a free CD-ROM program, once the CD-ROM is developed.

CONFIDENTIALITY: All information provided by the participants (your child) through questionnaires will be fully confidential and used for research purposes only. Participants will be assigned a code name or number, which will be used to identify them.

 Parent's Initials __________ Date

LIABILITY: The Colorado Governmental Immunity Act determines and may limit Colorado State University's legal responsibility if an injury happens because of this study. Claims against the University must be filed within 180 days of the injury. Questions about subjects' rights may be directed to Celia S. Walker at (970) 491-1563.

PARTICIPATION: Your child's participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent for your child's participation and have him/her stop participating at any time without penalty or loss of benefits to which you are otherwise entitled.

Your signature acknowledges that you have read the information stated and willingly sign this consent form. Your signature also acknowledges that you have received, on the date signed, a copy of this document containing _2_ pages.

____

Child's name (printed)

____

Child's date of birth

______________________________ _______________

Investigator or co-investigator signature Date

PARENTAL SIGNATURE FOR MINOR

As parent or guardian you authorize ___________________________ (print name) to become a participant for the described research. The nature and general purpose of this project have been satisfactorily explained to you by ___________ _________________ and you are satisfied that proper precautions will be observed.

____

Parent/Guardian name (printed)

______________________________ _______________

Parent/Guardian signature Date

 Parent's Initials __________ Date ____________

COLORADO STATE UNIVERSITY
INFORMED CONSENT TO PARTICIPATE IN A RESEARCH PROJECT
(CONSENTIMIENTO INFORMADO PARA PARTICIPAR EN UN PROYECTO DE INVESTIGACIONES)
(Estudio de Aculturación)

TÍTULO DEL PROYECTO: Desarollo de un Programa de CD-ROM de Educación Nutricional para Niños Hispanos

INVESTIGADORA PRINCIPAL: Jennifer Anderson, Ph.D., R.D.

CO-INVESTIGADORA: Elena Serrano, M.S., Ph.D. cand.

NOMBRE Y NÚMERO DEL TELÉFONO PARA INFORMACIÓN Y PREGUNTAS: Dra. Jennifer Anderson, (970) 491-7334

PATROCINADOR DEL PROYECTO: Departamento de Servicios de Humanos y de Salud (Department of Health and Human Services)

OBJETIVOS DEL PROJECTO: El propósito de este proyecto es investigar comidas que niños comen por cada nivel de acculturacion (como la lengua que una persona habla). Los resultados de este programa ayudarán desarrollar una programa computadora nutritiva (CD-ROM) por niños del 4 grado con pinturas o fotos de comidas, que niños comen.

PROCEDIMIENTOS: Los participantes (tu hijo(a)) harán preguntado completar un cuestionario. El cuestionario tiene preguntas sobre la lengua que tu niño habla y las comidas que él (ella) come. Se require solamente 15 minutos para completar el cuestionario.

RIESGOS: No esperamos ningún riesgo. Aunque no es posible identificar todos los riesgos posibles en un procedimiento experimental, las investigadoras tratan de impartir todas medidas de seguridad para minimizar ambos los riesgos conocidos y los riesgos potenciales que no podemos identificar.

BENEFICIOS: Tu hijo(a) recibirá $5.00 cuando complete el cuestionario. La escuela recibirá una programa computadora (CD-ROM) de nutrición cuando está completado.

CONFIDENCIALIDAD: Toda la información que nos da es confidencial y será usada solamente para los propósitos del proyecto. Solamente los investigadores propios tendrán acceso a la información. Para proteger a las participantes se usará un número o codigo de identificación en lugar de los nombres.

LIMITACIÓN DE RESPONSABILIDAD: La Acta Gubernamental de Inmunidad (the Colorado Governmental Immunity Act) dirige y limita la resonsabilidad legal de la Universidad del Estado de Colorado si resulta una accidente de esta investigación. Tendrá que hacer reclamaciones entre 180 días del accidente. Preguntas sobre los derechos de los participantes se pueden dirigir a Celia S. Walker a (970) 491-1563.

Página 1 de 2 Iniciales de Padre ____________ Fecha ___________

PARTICIPACIÓN: Ud. entiendes que la participación de su hijo(a) en esta investigación es voluntario. Si su hijo decide participar en la investigación, Ud. y su hijo pueden retirar su consentimiento y dejar de participar sin pena o perdida de beneficios. Ud. ha leido y entiende la información exponida y firma voluntariamente. Su firma también reconoce que recibe una copia en la fecha firmada este documento de 2 páginas.

____

Nombre del(a) participante (Letra de Molde)

____

La fecha de los cumpleaños del(a) niño(a)

____________________________________ __________________

Firma de la Investigadora o Co-investigadora Fecha

FIRMA DEL PADRE PARA NIÑOS
PARENTAL SIGNATURE FOR MINOR

Como padre o guardian, yo autorizo ____________________________________ (nombre en letra de molde) participar en el proyecto descrito. El objectivo del project le ha explicado por ______________________________ y estoy satisfecho(a) con las medidas de seguridad para minimizar ambos los riesgo conocidos.

____

Nombre de Padre/Guardian (Letra de molde)

____________________________________ __________________

Firma de Padre/Guardian Fecha

Development of a CD-ROM Nutrition Education Program for Hispanic Children

(Acculturation-Nutrition Component)

Colorado State University

This survey is designed to help us understand more about what you eat. So, we will ask you what foods you usually eat.

You don't have to participate in this study if you don't want to. You may also stop and withdraw your participation from this study at any time.

In order to participate in this research project, you and one of your parents must sign the attached consent forms.

Thank you!

This section of the survey asks you about your LANGUAGE , FOOD, and SOCIAL choices. *Circle* the letter below each question that best answers the question. Please answer every question! Thanks!

1. What language(s) do you read and speak?

only Spanish A	Spanish better than English B	both equally C	English better than Spanish D	only English E

2. What language(s) do you speak to your parents in?

only Spanish A	more Spanish than English B	both equally C	more English than Spanish D	only English E

3. What language(s) do you usually speak at home?

only Spanish A	more Spanish than English B	both equally C	more English than Spanish D	only English E

4. In which language(s) do you usually think?

only Spanish A	more Spanish than English B	both equally C	more English than Spanish D	only English E

5. What language(s) do you speak with your friends?

only Spanish A	more Spanish than English B	both equally C	more English than Spanish D	only English E

6. In what language(s) are the TV Programs you usually watch?

only Spanish	more Spanish than English	both equally	more English than Spanish	only English
A	B	C	D	E

7. In what language(s) are the radio programs you listen to?

only Spanish	more Spanish than English	both equally	more English than Spanish	only English
A	B	C	D	E

8. In what language(s) are the movies, TV, and radio programs you want to watch or listen to?

only Spanish	more Spanish than English	both equally	more English than Spanish	only English
A	B	C	D	E

9. In what language(s) do your parents speak with their parents?

only Spanish	more Spanish than English	both equally	more English than Spanish	only English
A	B	C	D	E

10. What type of food do you prefer?

all Mexican-American	more Mexican-American than Euro-American	both Equally	more Euro-American than Mexican-American	only Euro-American
A	B	C	D	E

Examples
Mexican-American = enchiladas, rice, beans
Euro-American = hamburgers, pasta, potatoes

For the next three questions, Latino or Hispanic refers to anyone of Hispanic origin, such as Mexican Americans, Central Americans, South Americans, and Puerto Ricans.

Non-Latino (non-Hispanic) means African American, White, American Indian, Asian American, or any other person who is not Latino/Hispanic.

11. Your close friends are:

all Latinos or Mexican Americans	more Latino than non-Latino	both Equally	more non-Latino than Latino	only non-Latinos
A	B	C	D	E

12. You like going to parties at which the people are:

all Latinos or Mexican Americans	more Latino than non-Latino	both Equally	more non-Latino than Latino	only non-Latinos
A	B	C	D	E

13. The people you visit or who visit you are:

all Latinos or Mexican Americans	more Latino than non-Latino	both Equally	more non-Latino than Latino	only non-Latinos
A	B	C	D	E

14. What do you consider yourself?

______ Mexican American ______ African American
______ Asian ______ American Indian
______ Other ________________

15. Are you?

______ Male or ______ Female

16. How old are you? ______ years

This page shows you examples of how to fill out the next section. This section of the survey asks you about how often you EAT or DRINK each of the foods or beverages listed.

Only put an X in the "YES" column if you eat that *food almost everyday.*

- **Please mark *one* X per line--for *each* food or drink.**
- **Include meals and snacks.**
- **Fill in an X on every line**
- **If you don't know the food or drink, place an X in the "NO" column next to the food.**

Example 1:

If you drink a glass of milk each day, you would put an X here:

Do you eat this food or drink this beverage ALMOST EVERYDAY (2-7 days per week)?	NO	YES
Milk		X

Example 2:

If you eat Mexican sweet bread only on special occasions like Christmas, you would mark an X in the following box:

Do you eat this food or drink this beverage ALMOST EVERYDAY (2-7 days per week)?	NO	YES
Mexican sweet bread (pan dulce)	X	

Lets begin now. Think about how often you eat these foods.

Do you eat this food or drink this beverage ALMOST EVERYDAY (2-7 days per week)?	NO	YES
Pork green chile (stew)		
Posole		
Tamales		
Burritos		
Enchiladas		
Tacos		
Chilaquiles (tortilla casserole)		
Taquitos		
Tostadas		
Quesadillas		
Pizza		
Flautas		
Chiles Rellenos		

Now try to remember how often you eat <u>tortillas, pasta, grains, and cereals:</u>

Do you eat this food or drink this beverage ALMOST EVERYDAY (2-7 days per week)?	NO	YES
Corn tortilla		
Flour tortilla		
Pasta soup (sopas de fideos, macarones, o vermicelli)		
Spaghetti, pasta		
Mexican rice (sopa de arroz)		
Rice		
Rice pudding (arroz con leche)		
Ready-to-eat cereal (like Corn Flakes or Cheerios)		
Mexican-style oatmeal (atole, champurrado)		
Oatmeal		
Mexican rolls (bolillos)		
Sliced white bread		
Bagels or English muffins		
Mexican sweet bread (pan dulce)		
Crackers		
Donuts or pastries (pasteles)		
Fry bread (sopapillas)		
Pancakes, waffles		

Now try to remember how often you eat <u>vegetables</u>:

Do you eat this food ALMOST EVERYDAY (2-7 days per week)?	NO	YES
Fresh roasted corn		
Canned or frozen corn or boiled corn on the cob		
Red Salsa		
Green Salsa		
Green tomatoes/tomatillos		
Tomatoes/jitomates		
Spaghetti sauce		
Jicama		
Chile Peppers (red and green)		
Green Peppers		
Guacamole, avocado		
Cabbage		
Sweet potatoes, yams		
Broccoli, cauliflower		
Spinach		
Potato Chips/French Fries		
Potatoes (not chips or fries)		
Squash--orange or winter (chayote), zucchini (calabacitas)		
Peas		
Yucca/cassava		
Carrots		
Lettuce salad		
Vegetable salad		
Vegetable soup (caldo de verduras)		

Now try to remember how often you eat **fruit or drink fruit juice:**

Do you eat this food or drink this beverage ALMOST EVERYDAY (2-7 days per week)?	NO	YES
Orange juice		
Apple, grape, or grapefruit juice		
Fruit drinks (Hi-C, Kool-Aid, Tang, Sunny Delight, Tampico)		
Mexican-style fruit drinks (aguas frescas o naturales o de limón)		
Oranges or grapefruits		
Bananas		
Apples		
Mangos or mango juice		
Pineapple or pineapple juice		
Cantaloupe (when in season)		
Watermelon (when in season)		
Raisins or prunes		
Grapes		
Strawberries (when in season)		
Peaches, nectarines		
Apricots		
Guavas or guava juice		
Prickly pear (nopales) or young cactus leaves (nopalitos)		
Papayas or papaya juice		

Now try to remember how often you drink
milk or eat dairy products:

Do you eat this food or drink this beverage ALMOST EVERYDAY (2-7 days per week)?	NO	YES
Milk		
Canned milk or evaporated milk		
Chocolate milk or Ovalmaltine (ovalmaltina)		
Atole		
Smoothie with milk (licuado or batido de leche)		
Mexican crema		
Sour cream		
Mexican cheese (queso blanco, fresco, cotija)		
Monterey Jack cheese		
Cheddar cheese		
American sliced cheese		
Mozzarella cheese or string cheese		
Cottage cheese		
Custard (flan)		
Yogurt		
Ice cream		

Now try to think of how often you eat **meats and beans**:

Do you eat this food ALMOST EVERYDAY (2-7 days per week)?	NO	YES
Beans (boiled and refried)		
Eggs		
Eggs with chicken livers (higaditos)		
Meat soup with vegetables (cocido or sopa de albondigas)		
Mexican-style spicy sausage (chorizo)		
Ham		
Pork or pork chops		
Thin Mexican style steak (bistek)		
Steak		
Sliced beef strips Mexican-style (carne asada)		
American-style barbecued beef		
Mexican-style grilled and barbecued beef (barbacoa)		
Hamburgers		
Hot dogs		
Fish and seafood		
Chicken		
Goat (chevos, birria)		
Mole (pipian, poblano, negro, amarillo, verde)		
Tripe, menudo		
Peanut butter		

Now try to remember how often you drink
<u>these beverages or eat these snack foods</u>:

Do you eat this food or drink this beverage ALMOST EVERYDAY (2-7 days per week)?	NO	YES
Soda or Coke		
Hibiscus water (agua de jamaica)		
Crullers or fritters (churros, buñuelos)		
Cookies		
Cake		
Candy		
Fried pork skins/rinds (chicharrones)		

Do you eat the school's breakfast? ______ **Yes** ______ **No**
(the breakfast provided by the school)

Do you eat the school's lunch? ______ **Yes** ______ **No**
(the lunch provided by the school)

Thank you for your time!

Please make sure to check that you haven't skipped any pages.

CHILD'S INFORMED CONSENT FORM

Title of Project: Development of a CD-ROM Nutrition Education Program for Hispanic Children (Evaluation)

I AM ASKING IF YOU WOULD BE WILLING TO USE A COMPUTER PROGRAM ON NUTRITION. THERE ARE THREE LESSONS IN TOTAL. THIS MEANS YOU WILL BE ASKED TO TAKE TWO TESTS. THERE SHOULD BE NO RISK FOR PARTICIPATING. IF YOU DON'T WANT TO, YOU DON'T HAVE TO TAKE THESE CLASSES. IF YOU WANT TO TAKE THESE CLASSES, PLEASE WRITE YOUR NAME BELOW ALONG WITH THE DATE. THANK YOU!

NAME:____________________________________

DATE:____________________________________

CONSENTIMIENTO INFORMADO DEL HIJO

Título de Proyecto: Desarollo de un Programa de CD-ROM de Educacion Nutricional para Ninos Hispanos (Evaluación)

YO ESTOY PREGUNTANDO, SI TÚ QUIERES PARTICIPAR EN UNA CLASE EN NUTRICIÓN USANDO COMPUTADORAS. HAY TRES CLASES EN TOTAL. TÚ TIENES QUE TOMAR DOS PRUEBAS CON PREGUNTAS SOBRE NUTRICIÓN. NO DEBE SER RIESGO EN PARTICIPAR. SI TÚ NO QUIERES, TÚ NO TIENES QUE PARTICIPAR EN ESTAS CLASES. SI TÚ QUIERES PARTICIPAR EN ESTAS CLASES, FAVOR DE ESCRIBIR TU NOMBRE Y LA FECHA ABAJO. GRACIAS.

NOMBRE: ______________________________

FECHA: ______________________________

COLORADO STATE UNIVERSITY
INFORMED CONSENT TO PARTICIPATE IN A RESEARCH PROJECT
(Evaluation)

TITLE OF PROJECT: Development of a CD-ROM Nutrition Education Program for Hispanic Children

NAME OF PRINCIPAL INVESTIGATOR: Jennifer Anderson, Ph.D., R.D.

NAME OF CO-INVESTIGATOR: Elena Serrano, M.S., Ph.D. candidate

CONTACT NAME AND PHONE NUMBER FOR QUESTIONS/PROBLEMS:
Dr. Jennifer Anderson, (970) 491-7334.

SPONSOR OF PROJECT: Department of Health and Human Services (DHHS)

PURPOSE OF THE RESEARCH: The purpose of this research is to: 1) develop a computer program on CD-ROM to be used within 4^{th} and 5^{th} grade classes; and 2) evaluate the effectiveness of this computer program in teaching children about nutrition.

PROCEDURES/METHODS TO BE USED: Participants (your children) will be asked to complete a nutrition education course including three modules on the computer. They will also be asked to complete a questionnaire before the program and after using the program. The pre- and post-tests will be administered on the computer.

RISKS INHERENT IN THE PROCEDURES: None expected. It is not possible to identify all potential risks in research procedures, but the researcher(s) have taken reasonable safeguards to minimize any known and potential, but unknown, risks.

BENEFITS: Potential benefits to participants will be the opportunity to learn about nutrition through a fun and creative computer program.

CONFIDENTIALITY: Confidentiality cannot be guaranteed in group settings. All results from information presented in oral form will be used for research purposes only. All information provided by the participants through questionnaires will be fully confidential and used for research purposes only. Participants will be assigned a code name or number which will be used to identify them.

LIABILITY: The Colorado Governmental Immunity Act determines and may limit Colorado State University's legal responsibility if an injury happens because of this study. Claims against the University must be filed within 180 days of the injury. Questions about subjects' rights may be directed to Celia S. Walker at (970) 491-1563.

Page 1 of 2 Parent's Initials ____________ Date ____________

PARTICIPATION: Your child's participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent for your child's participation and have him/her stop participating at any time without penalty or loss of benefits to which you are otherwise entitled.

Your signature acknowledges that you have read the information stated and willingly sign this consent form. Your signature also acknowledges that you have received, on the date signed, a copy of this document containing __2__ pages.

____
Child's name (printed)

____
Child's date of birth

______________________________ ______________
Investigator or co-investigator signature Date

PARENTAL SIGNATURE FOR MINOR

As parent or guardian you authorize ________________________ (print name) to become a participant for the described research. The nature and general purpose of this project have been satisfactorily explained to you by ______________________ and you are satisfied that proper precautions will be observed.

____
Parent/Guardian name (printed)

______________________________ ______________
Parent/Guardian signature Date

Page 2 of 2 Parent's Initials __________ Date __________

COLORADO STATE UNIVERSITY
INFORMED CONSENT TO PARTICIPATE IN A RESEARCH PROJECT/
CONSENTIMIENTO INFORMADO PARA PARTICIPAR EN UN PROYECTO DE INVESTIGACIONES
(Evaluación)

TÍTULO DEL PROYECTO: Desarollo de un Programa de CD-ROM de Educacion Nutricional para Ninos Hispanos

INVESTIGADORA PRINCIPAL: Jennifer Anderson, Ph.D., R.D.

CO-INVESTIGADORA: Elena Serrano, M.S., Ph.D. cand.

NOMBRE Y NÚMERO DEL TELÉFONO PARA INFORMACIÓN Y PREGUNTAS: Dra. Jennifer Anderson, (970) 491-7334

PATROCINADOR DEL PROYECTO: Departamento de Servicios de Humanos y de Salud (Department of Health and Human Services)

OBJETIVOS DEL PROJECTO: El propósito de este proyecto es: 1) desarrollar un programa computadora; y 2) evaluar el efectivo de este programa en proveer información nutritiva a esta población y en cambiar las dietas.

PROCEDIMIENTOS: Los participantes harán preguntado completar un programa computadora de tres segmentos con información nutricional durante clase. Incluye dos examenes: uno antes de completar el program y uno después de completar el programa. Los dos examenes serán en el computadora.

RIESGOS: No esperamos ningún riesgo. Aunque no es posible identificar todos los riesgos posibles en un procedimiento experimental, las investigadoras tratan de impartir todas medidas de seguridad para minimizar ambos los riesgos conocidos y los riesgos potenciales que no podemos identificar.

BENEFICIOS: Este proyecto ayudará a las participantes tener una oportunidad obtener información nutricional por un programa interactiva tan creativo y divertido, que considera los costumbres, normas y valores de los niños Hispanos.

CONFIDENCIALIDAD: Toda la información que nos da es confidencial y será usada solamente para los propósitos del proyecto. Solamente los investigadores propios tendrán acceso a la información. Para proteger a las participantes se usará un número o codigo de identificación en lugar de los nombres.

LIMITACIÓN DE RESPONSABILIDAD: La Acta Gubernamental de Inmunidad (the Colorado Governmental Immunity Act) dirige y limita la resonsabilidad legal de la Universidad del Estado de Colorado si resulta una accidente de esta investigación. Tendrá que hacer reclamaciones entre 180 días del accidente. Preguntas sobre los derechos de los participantes se pueden dirigir a Celia S. Walker a (970) 491-1563.

Página 1 de 2 Iniciales de Padre ____________ Fecha ___________

PARTICIPACIÓN: Ud. entiendes que la participación de su hijo(a) en esta investigación es voluntario. Si su hijo decide participar en la investigación, Ud. y su hijo pueden retirar su consentimiento y dejar de participar sin pena o perdida de beneficios. Ud. ha leido y entiende la información exponida y firma voluntariamente. Su firma también reconoce que recibe una copia en la fecha firmada este documento de 2 páginas.

____
Nombre del(a) participante (Letra de Molde)

____
La fecha de los cumpleaños del(a) niño(a)

____________________________________ __________________
Firma de la Investigadora o Co-investigadora Fecha

FIRMA DEL PADRE PARA NIÑOS
PARENTAL SIGNATURE FOR MINOR

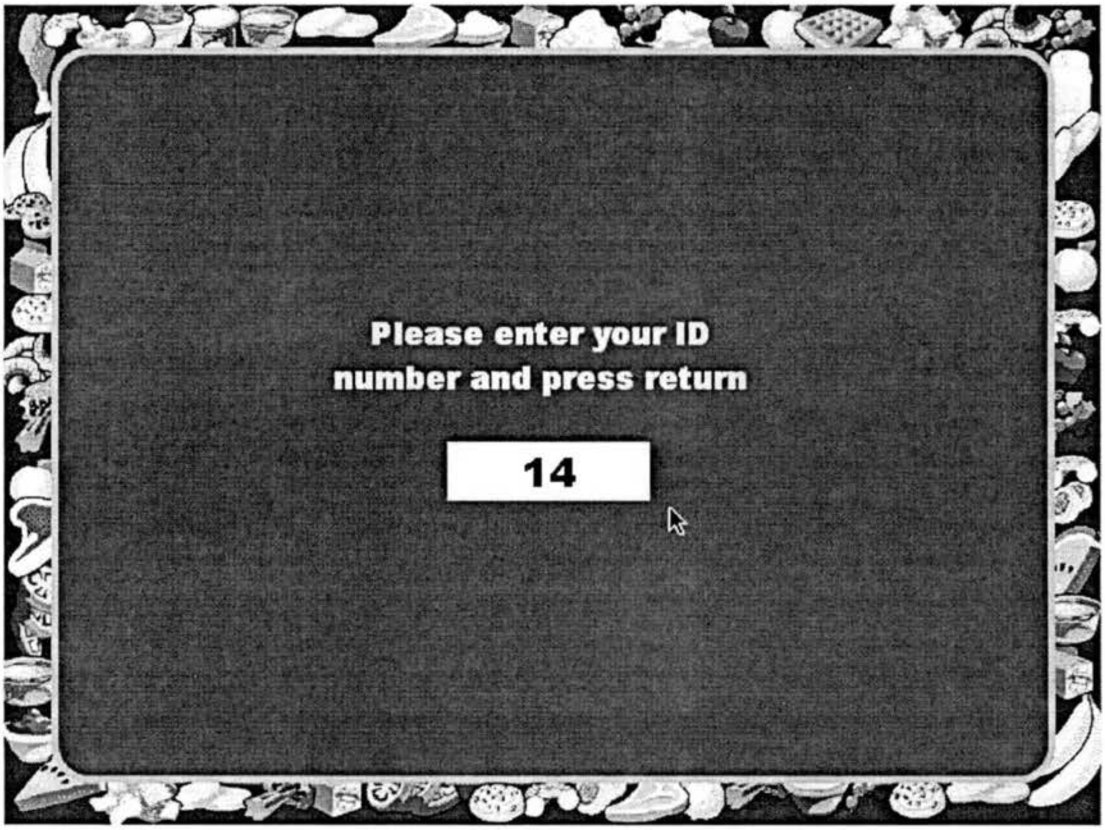
Como padre o guardian, yo autorizo ___________________________________
(nombre en letra de molde) participar en el proyecto descrito. El objectivo del project le ha explicado por ______________________________ y estoy satisfecho(a) con las medidas de seguridad para minimizar ambos los riesgo conocidos.

____
Nombre de Padre/Guardian (Letra de molde)

____________________________________ __________________
Firma de Padre/Guardian Fecha

Página 2 de 2 Iniciales de Padre ____________ Fecha __________

Online Evaluation Screens for Pre-Test



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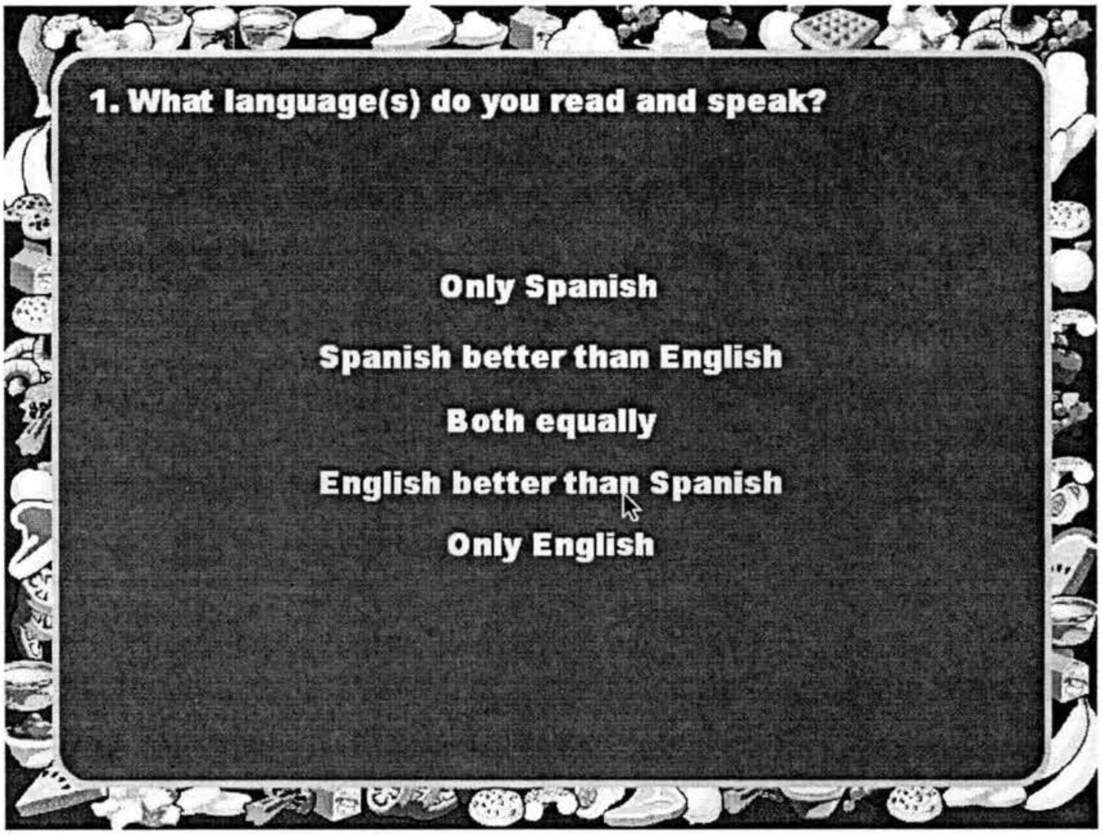

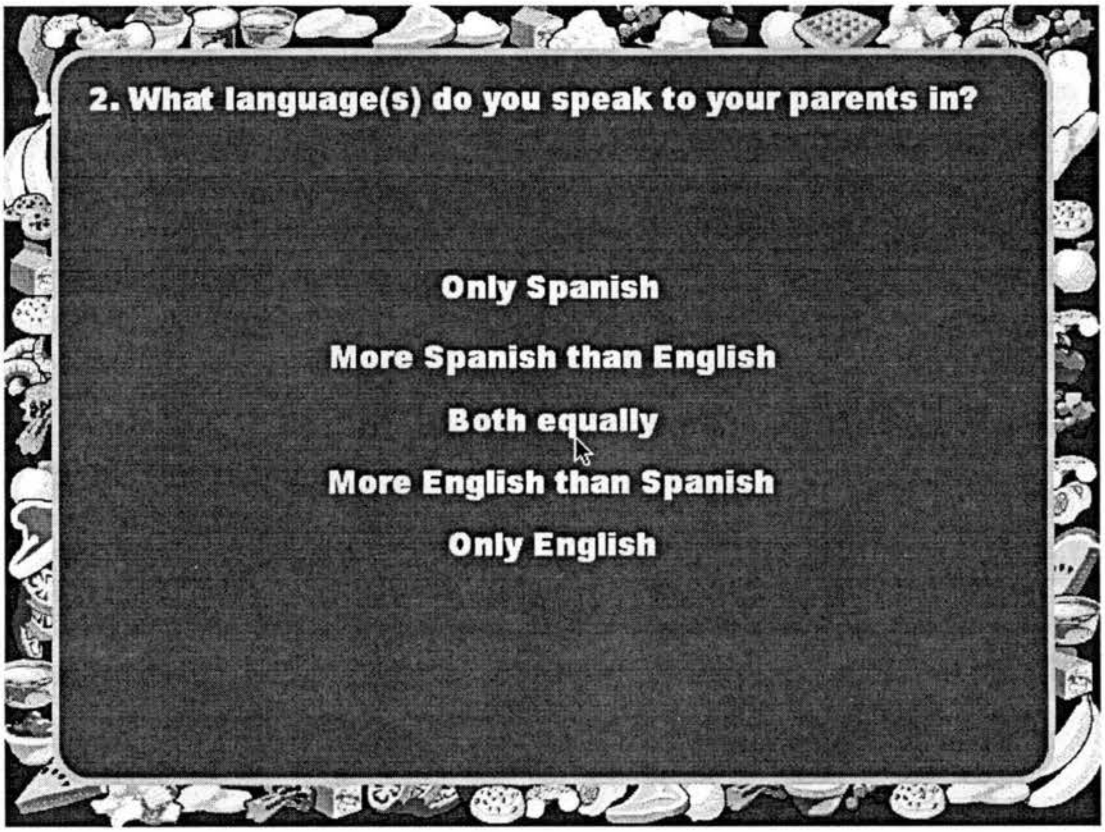

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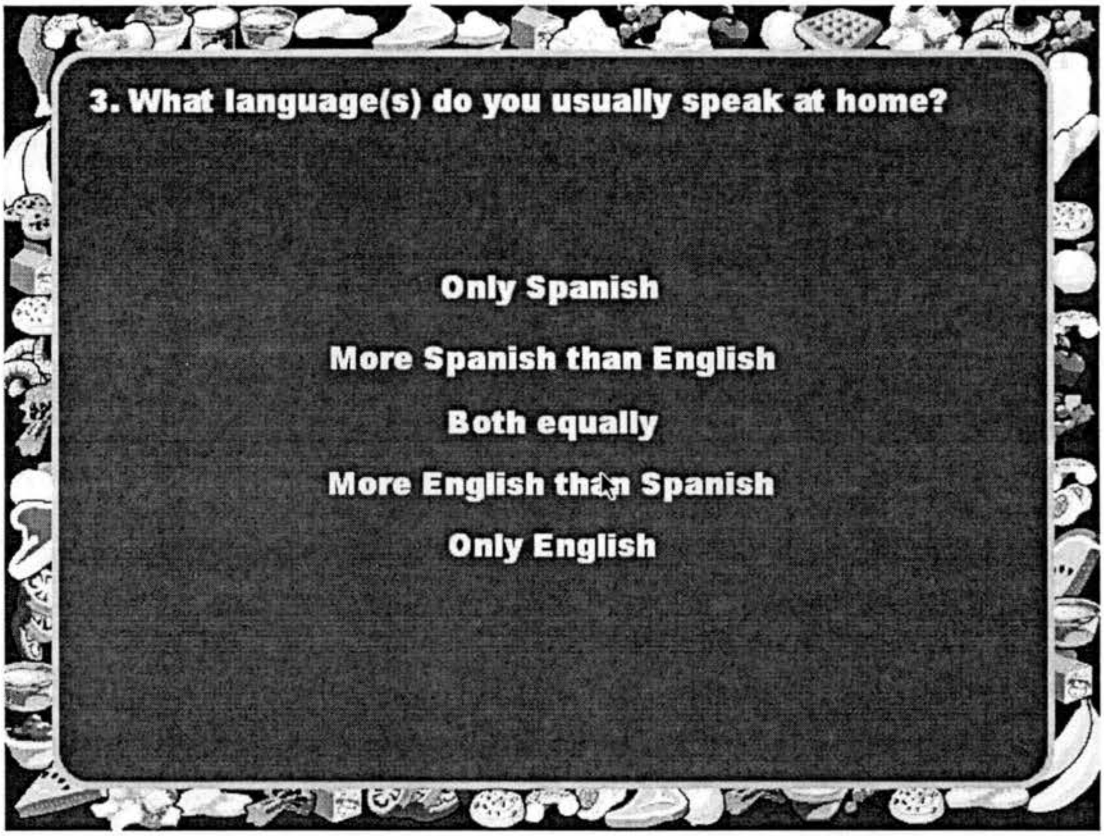

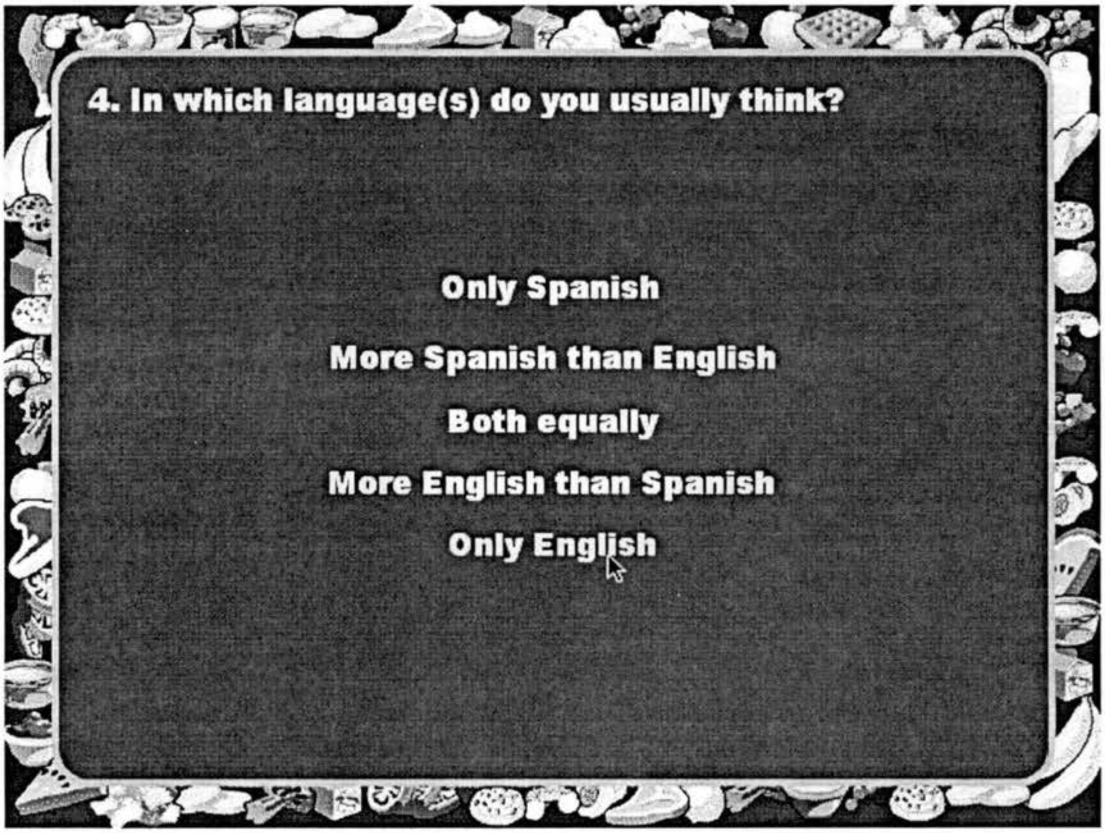

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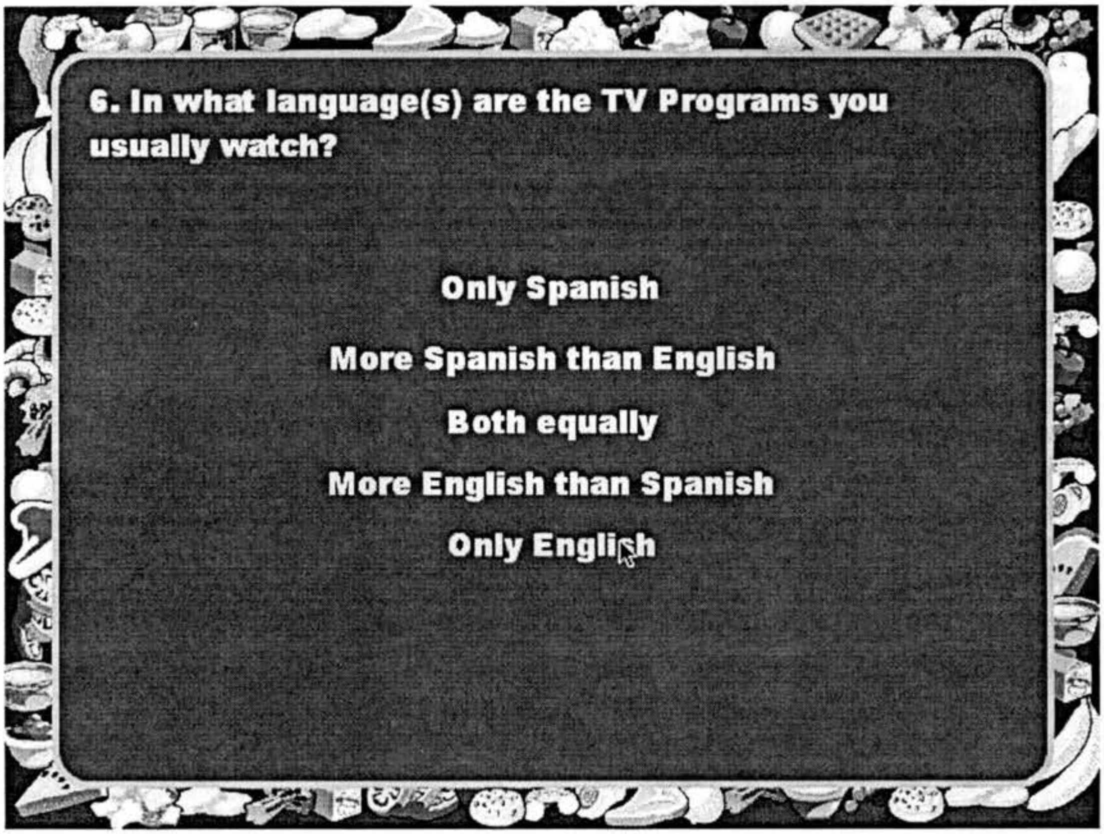

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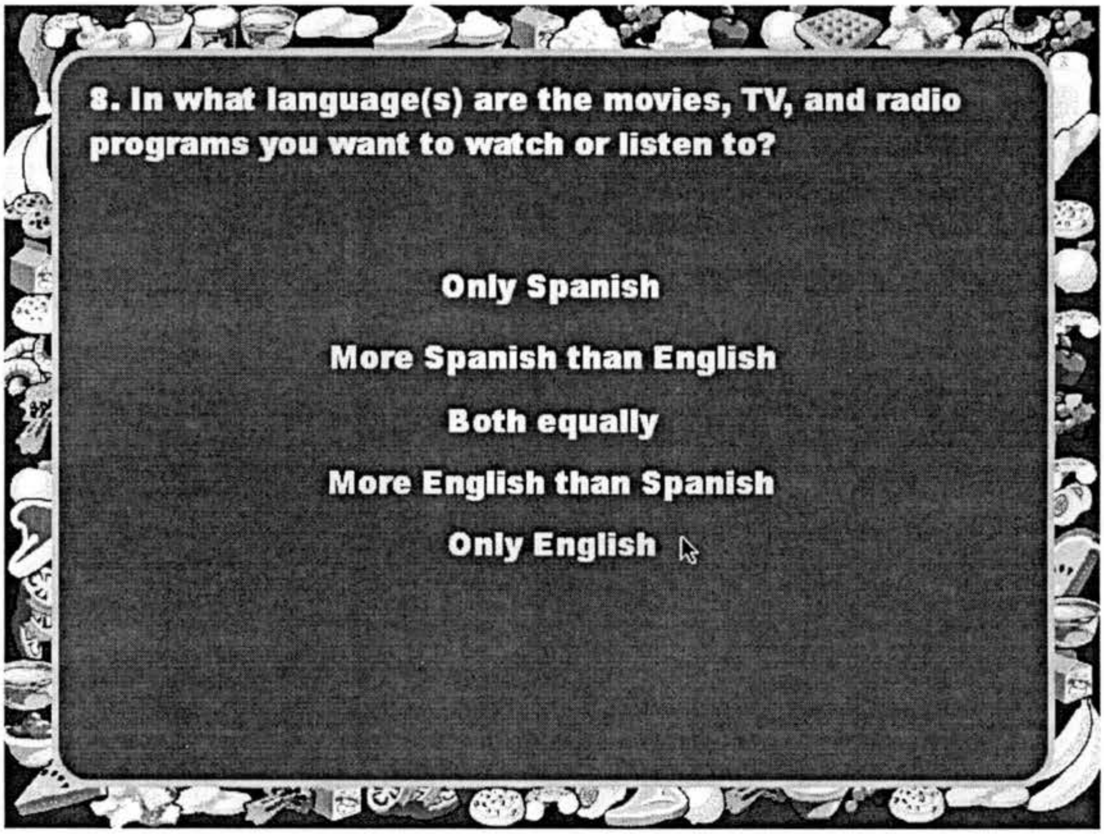

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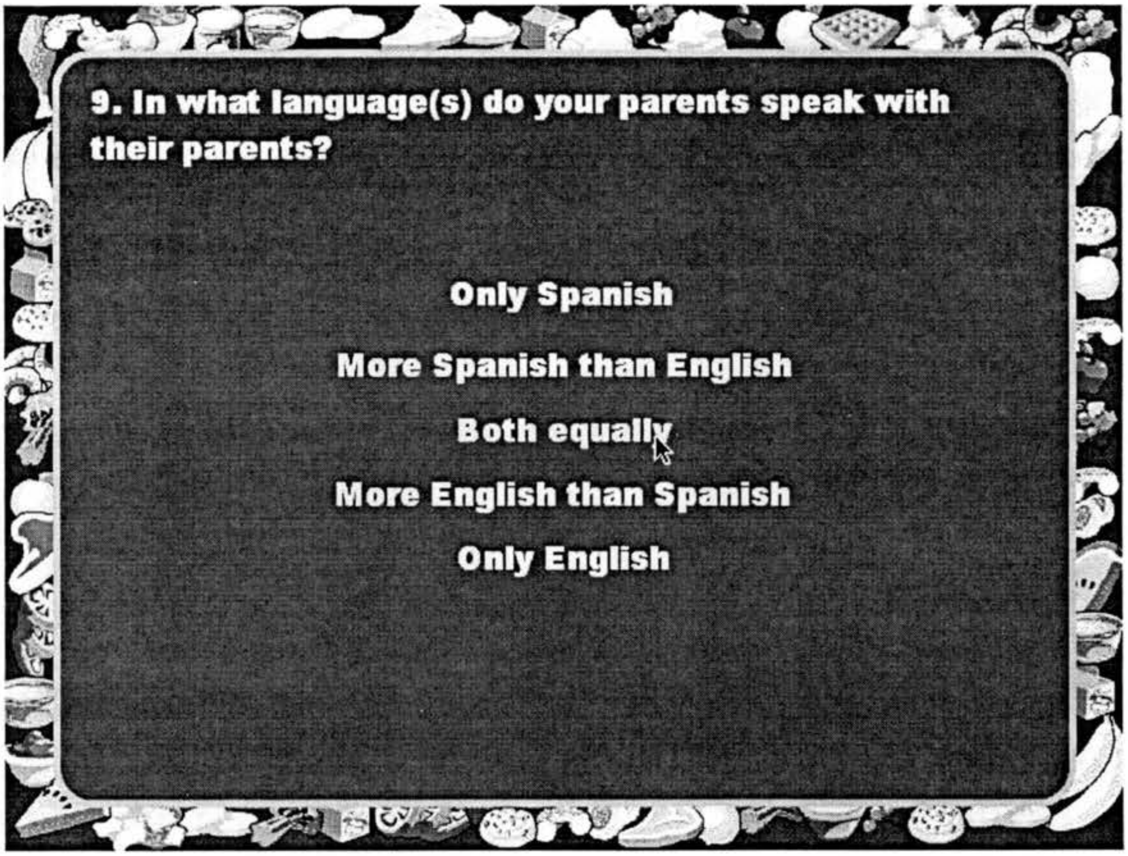

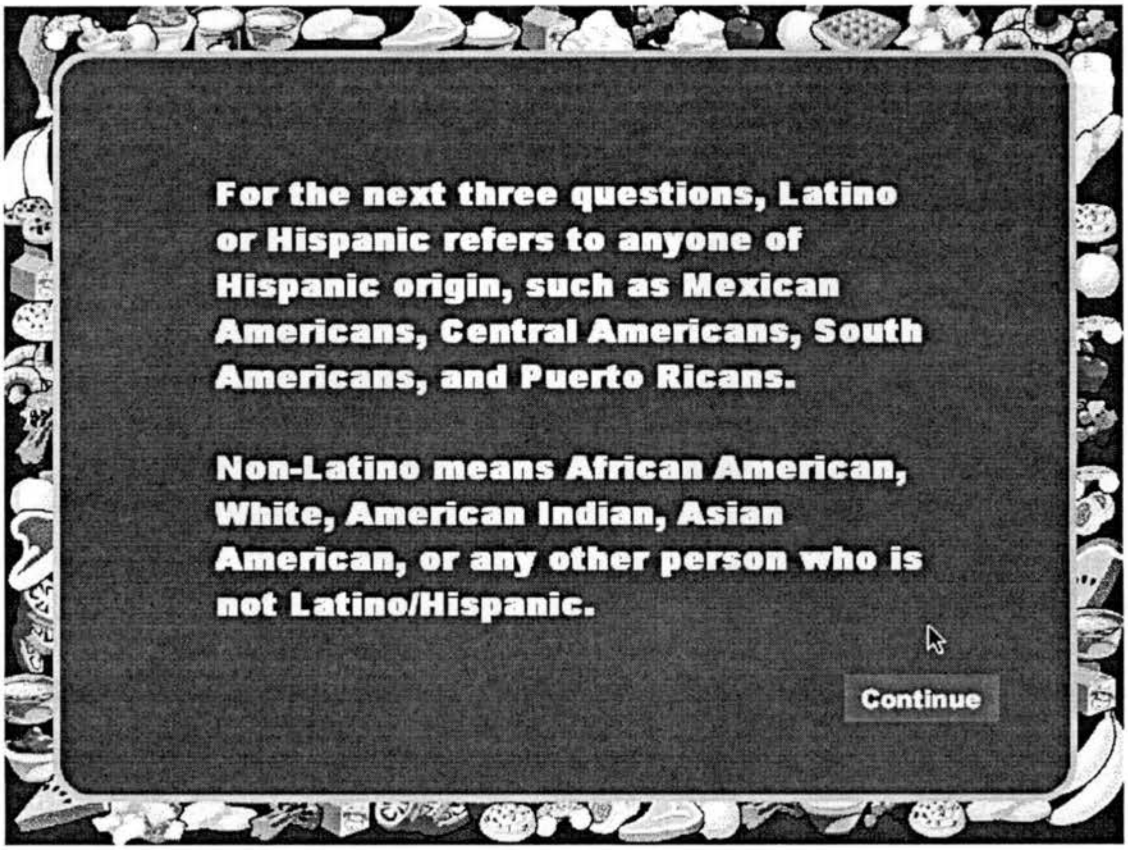

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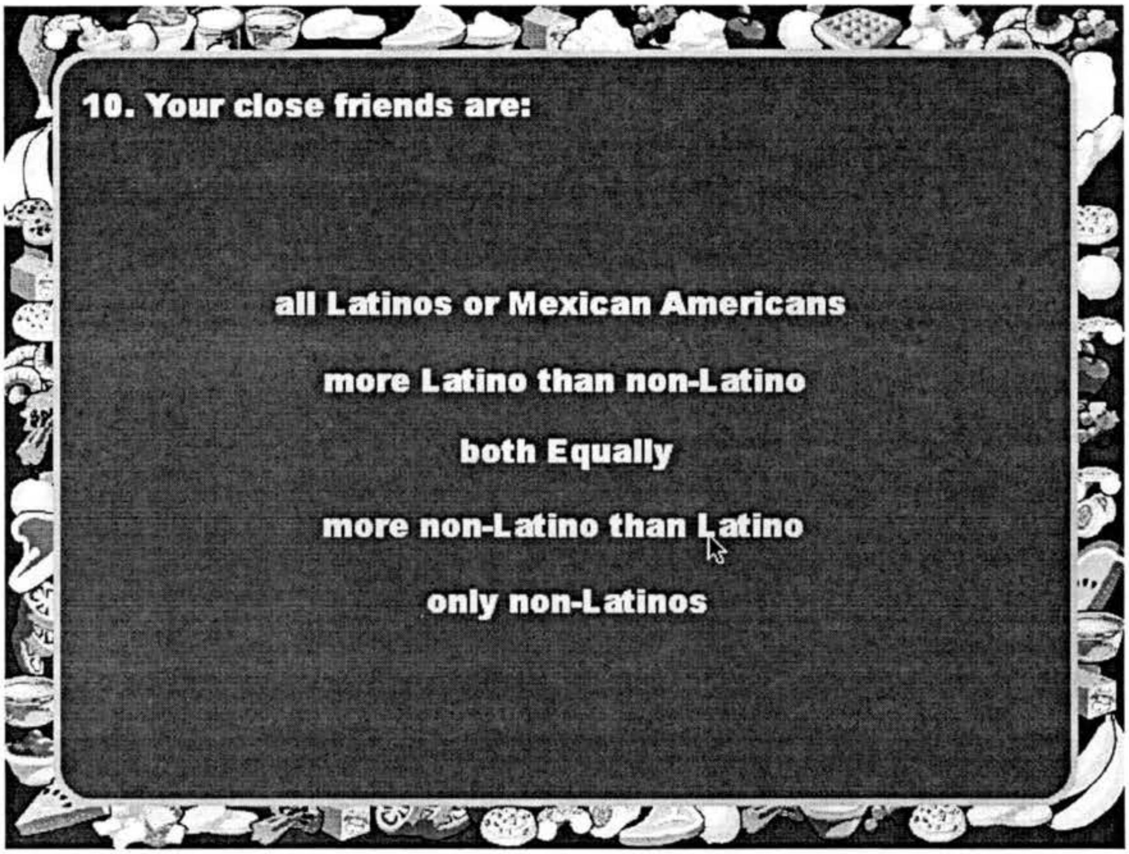

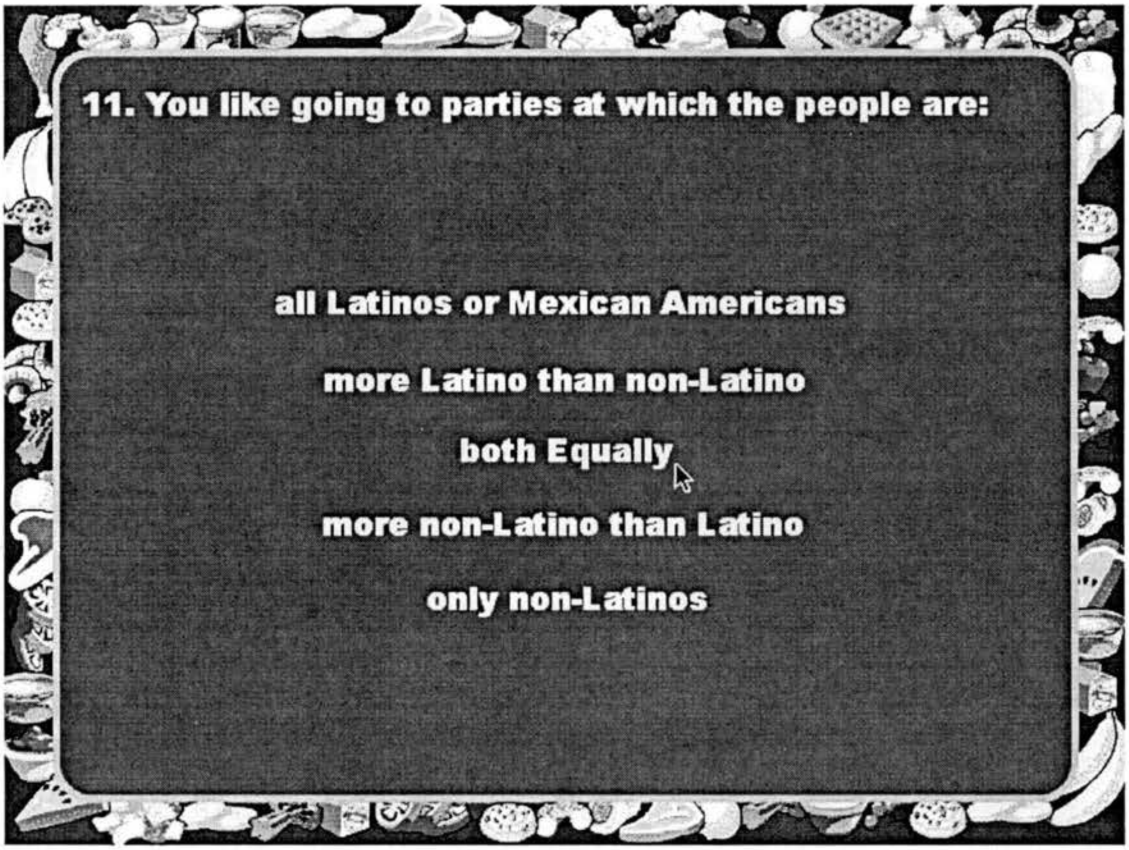

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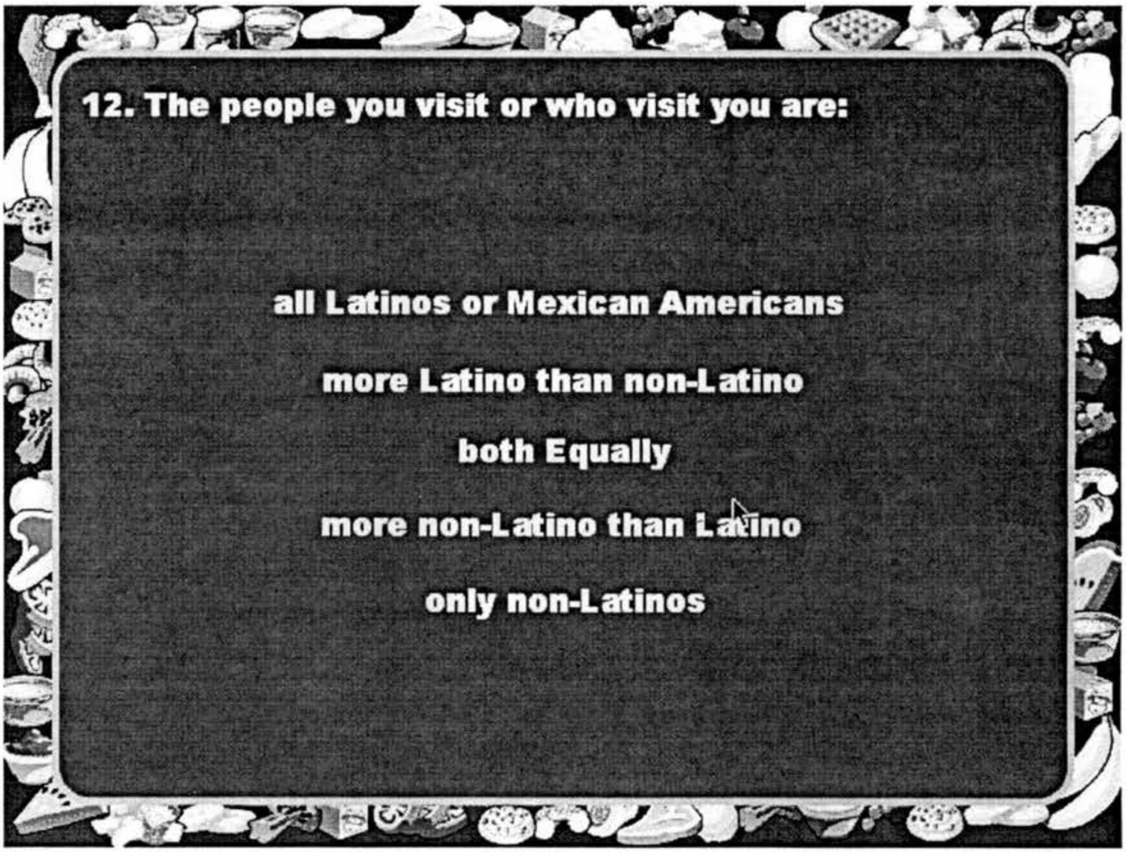

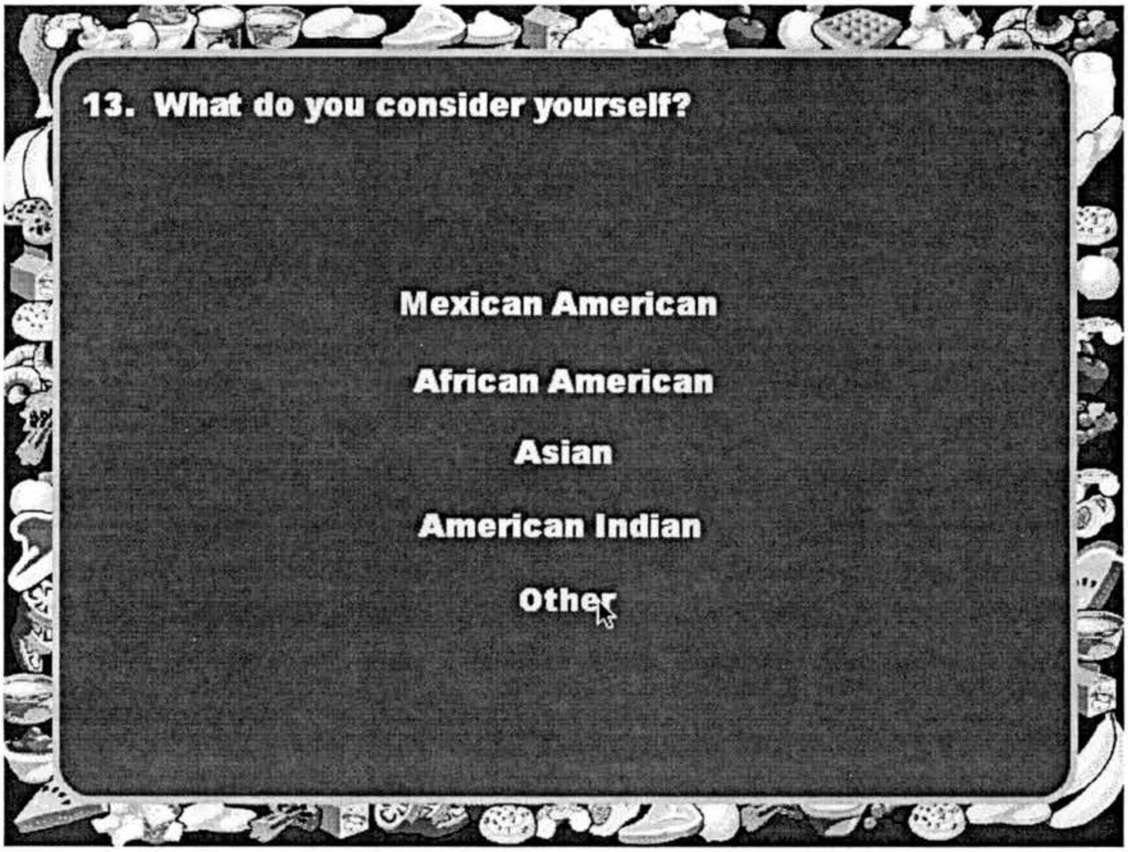

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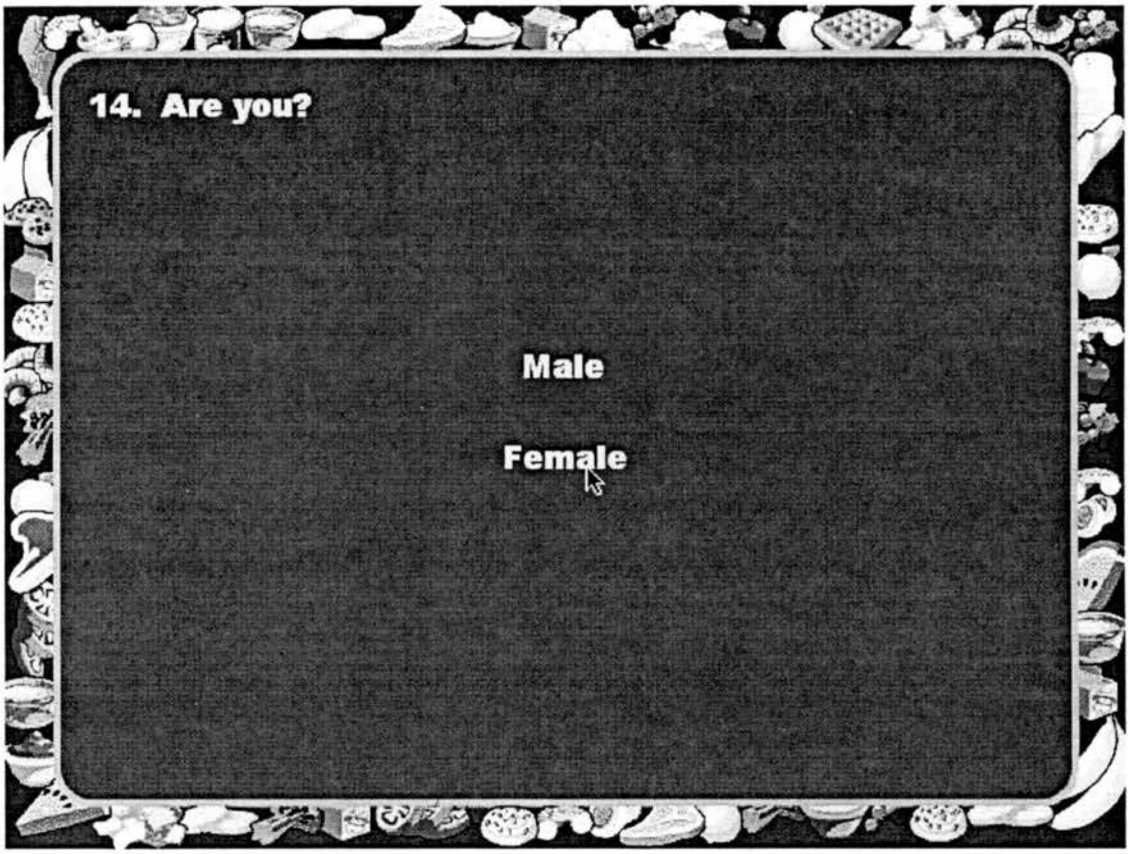

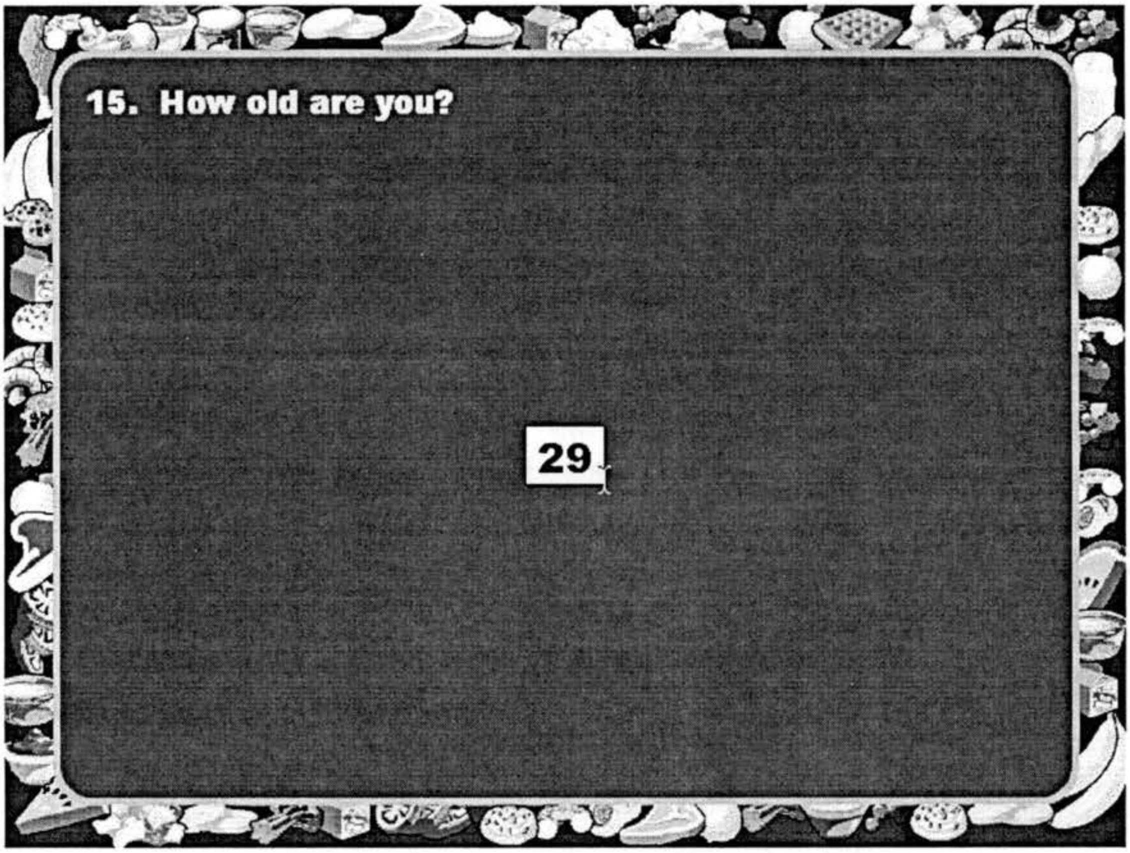

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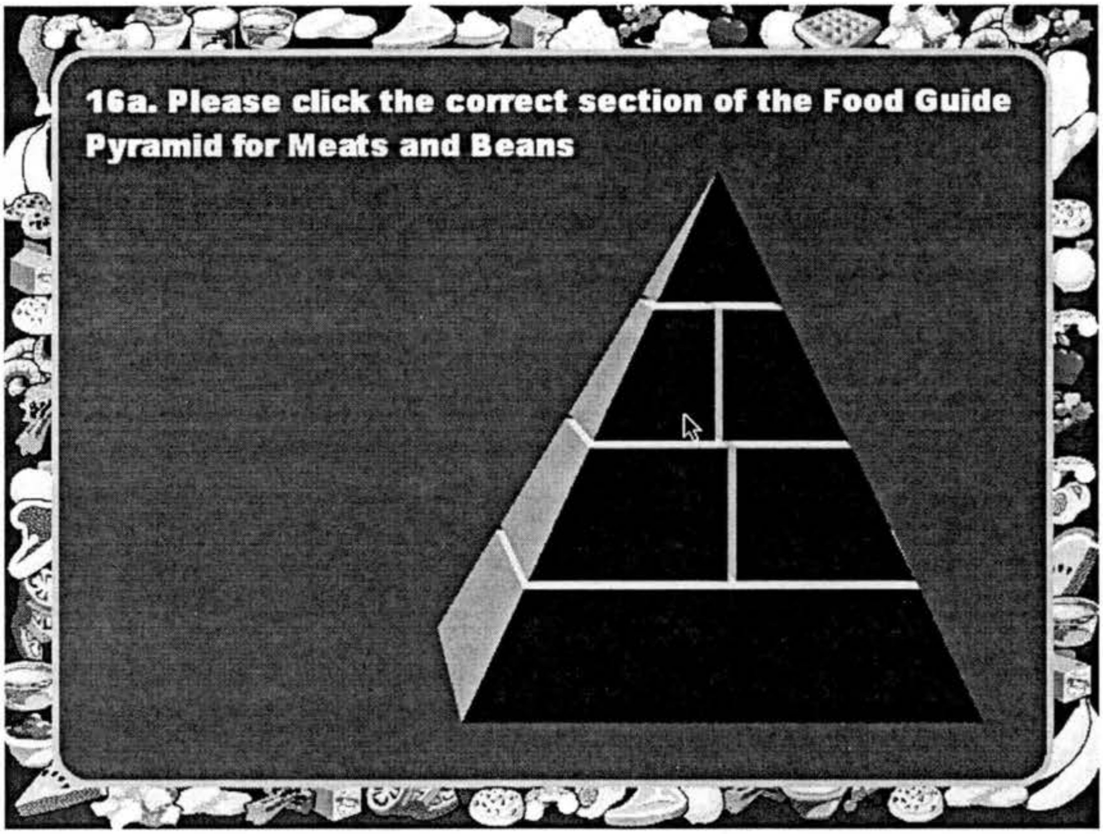

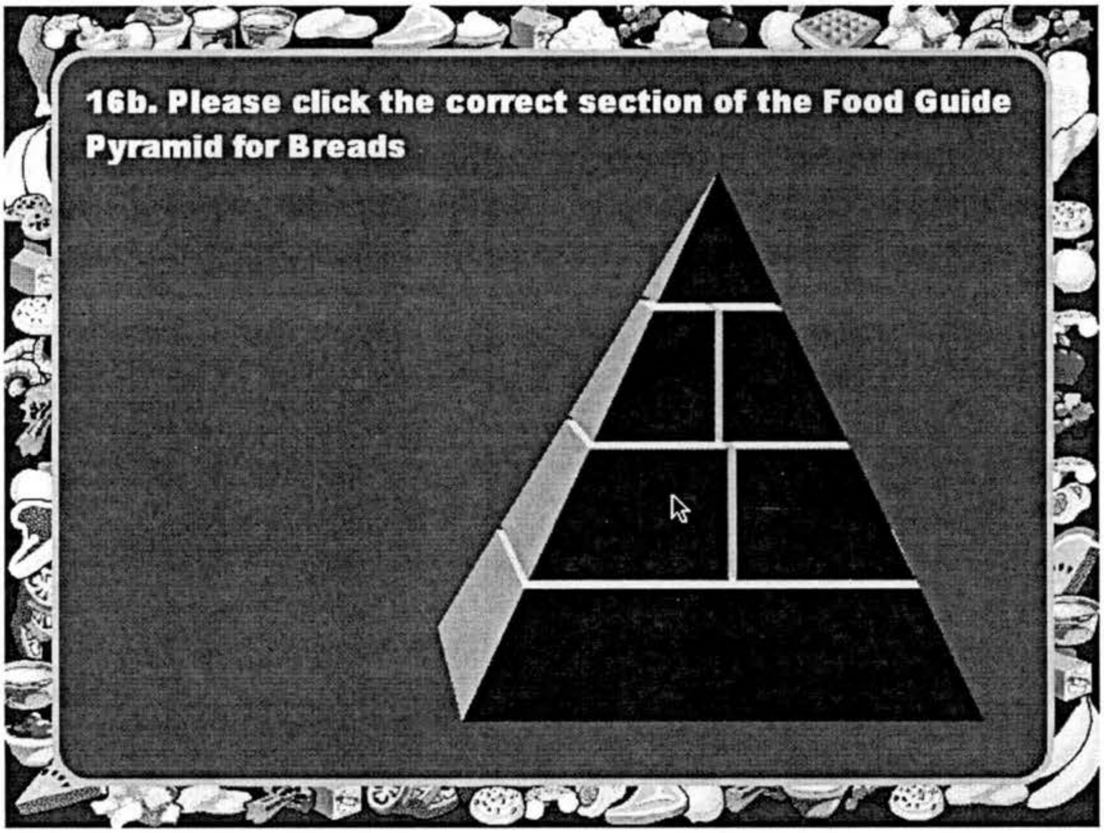

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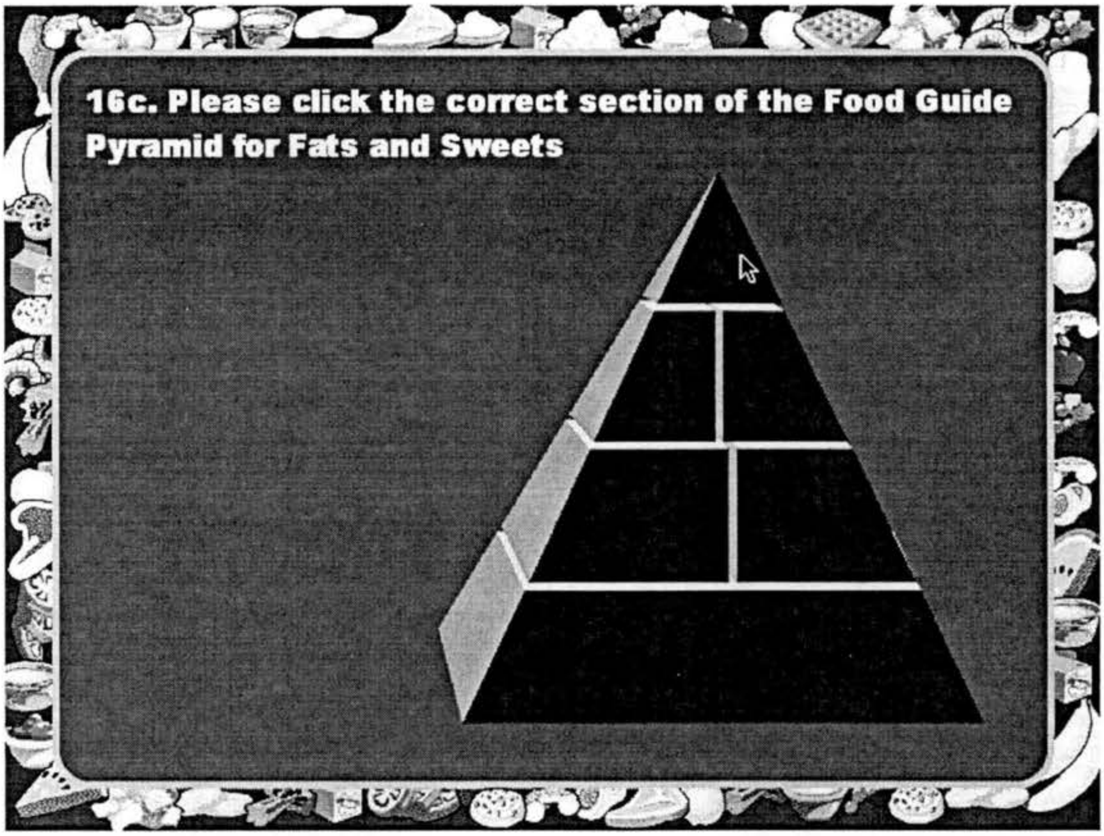

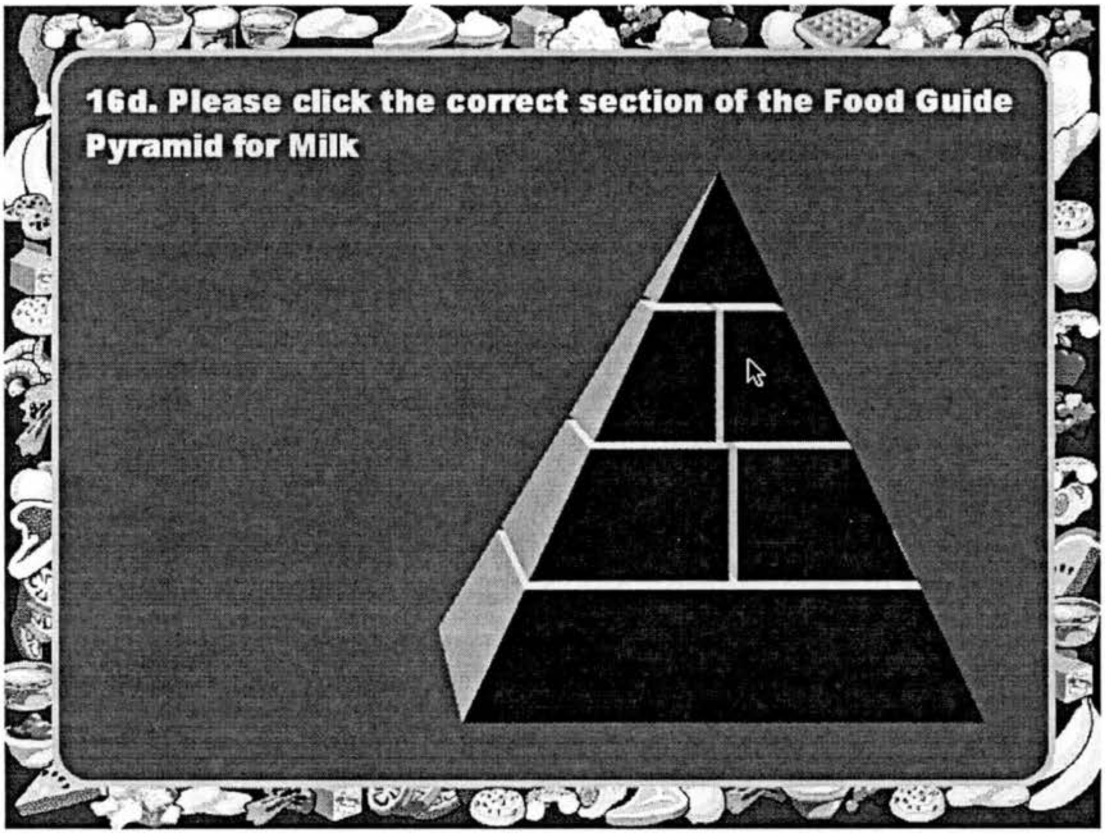

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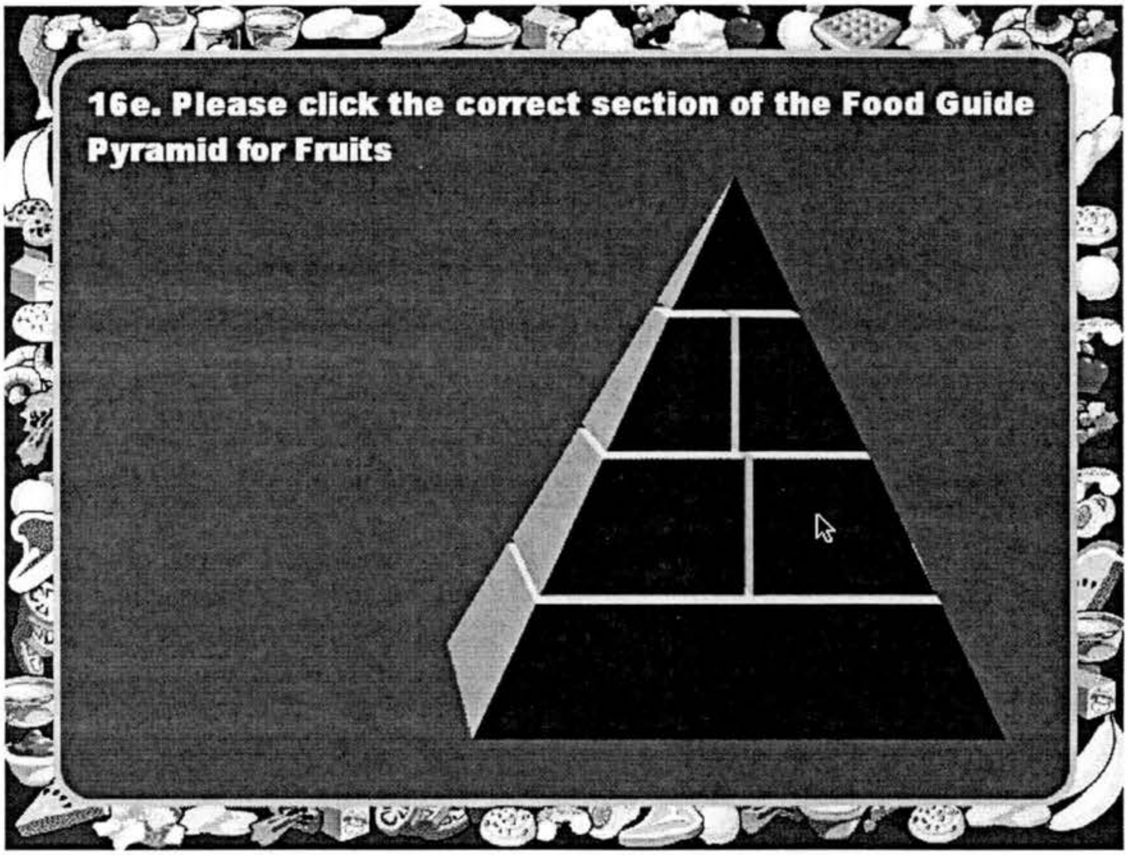

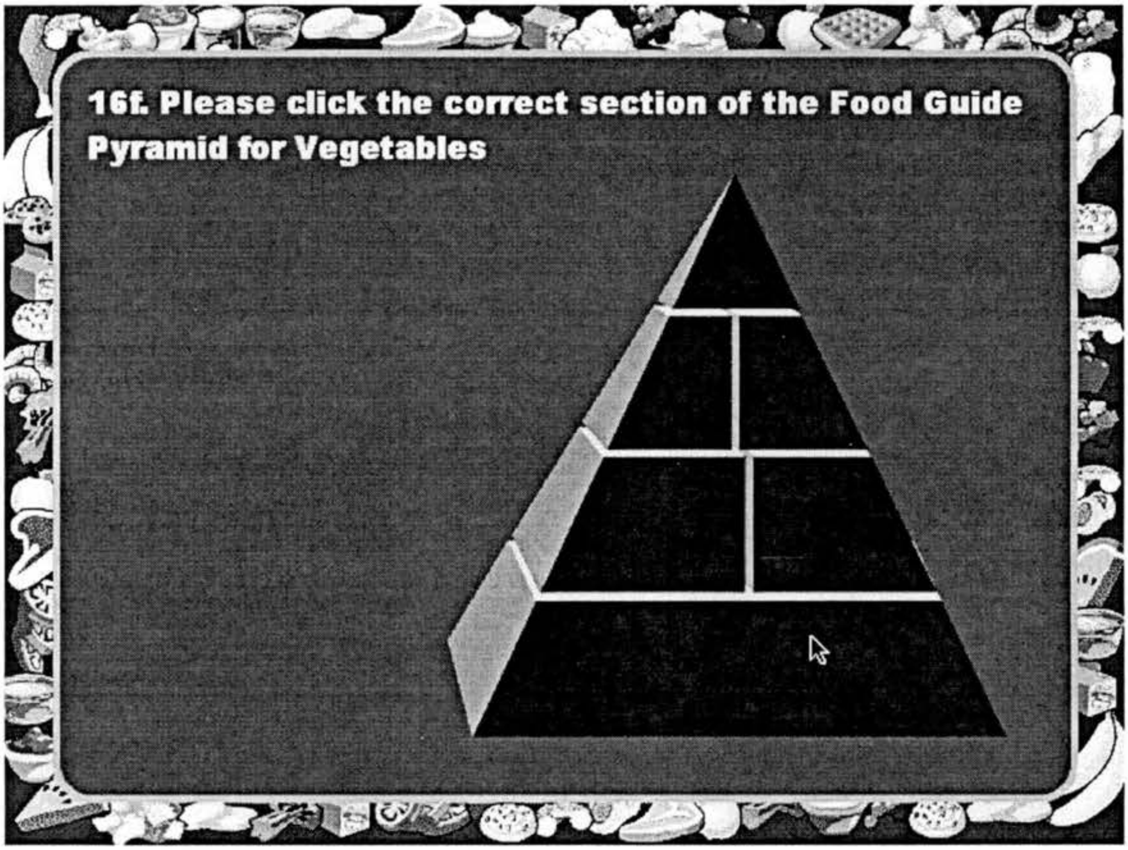

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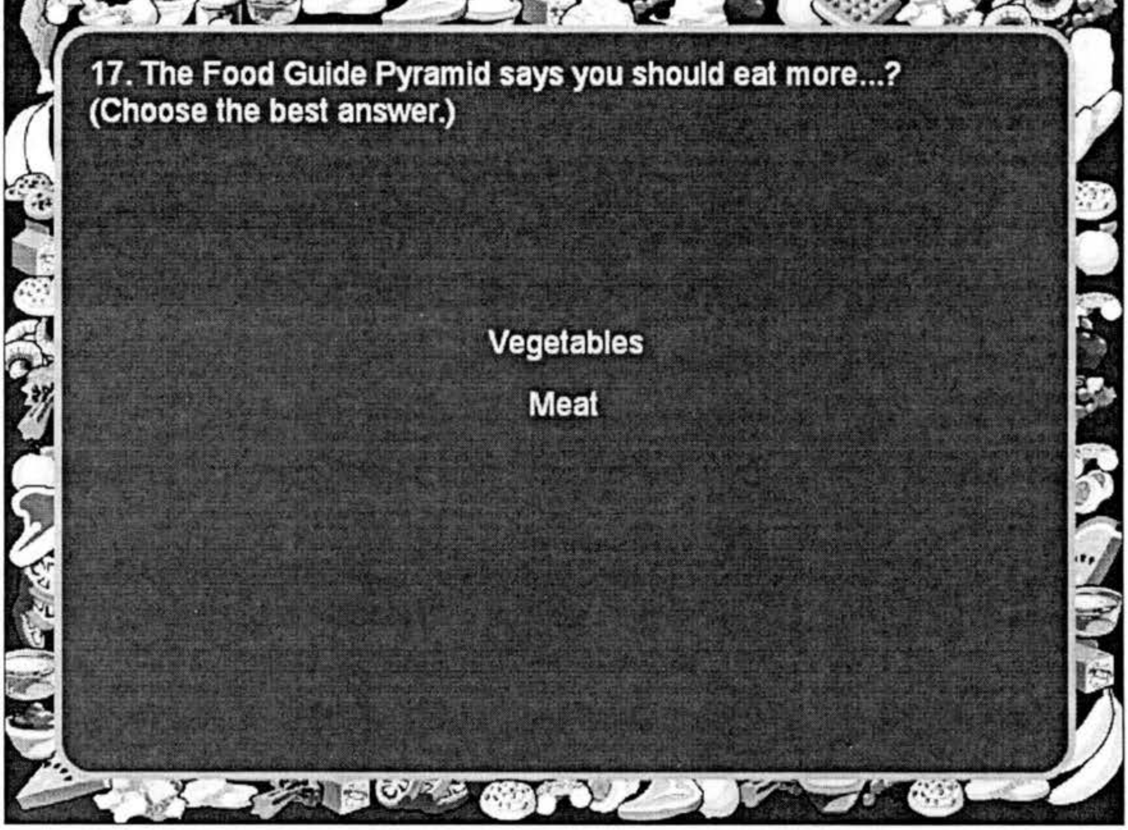

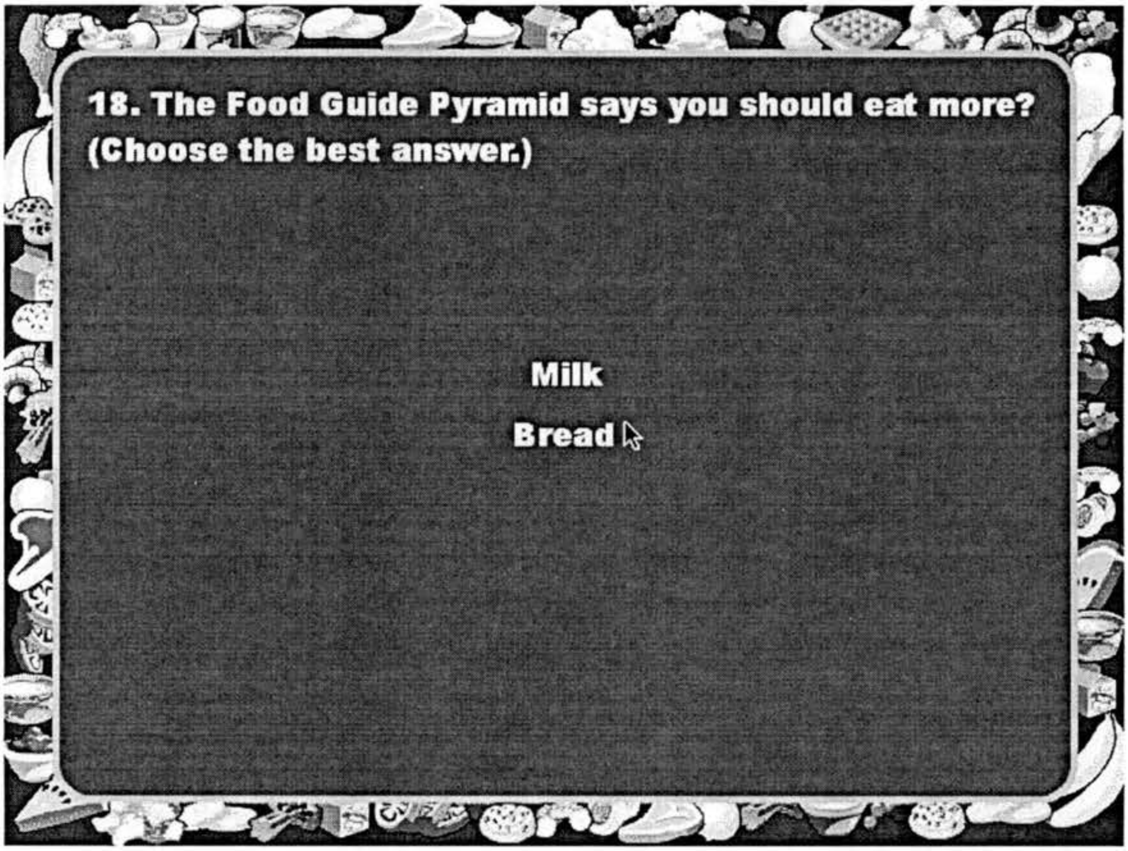

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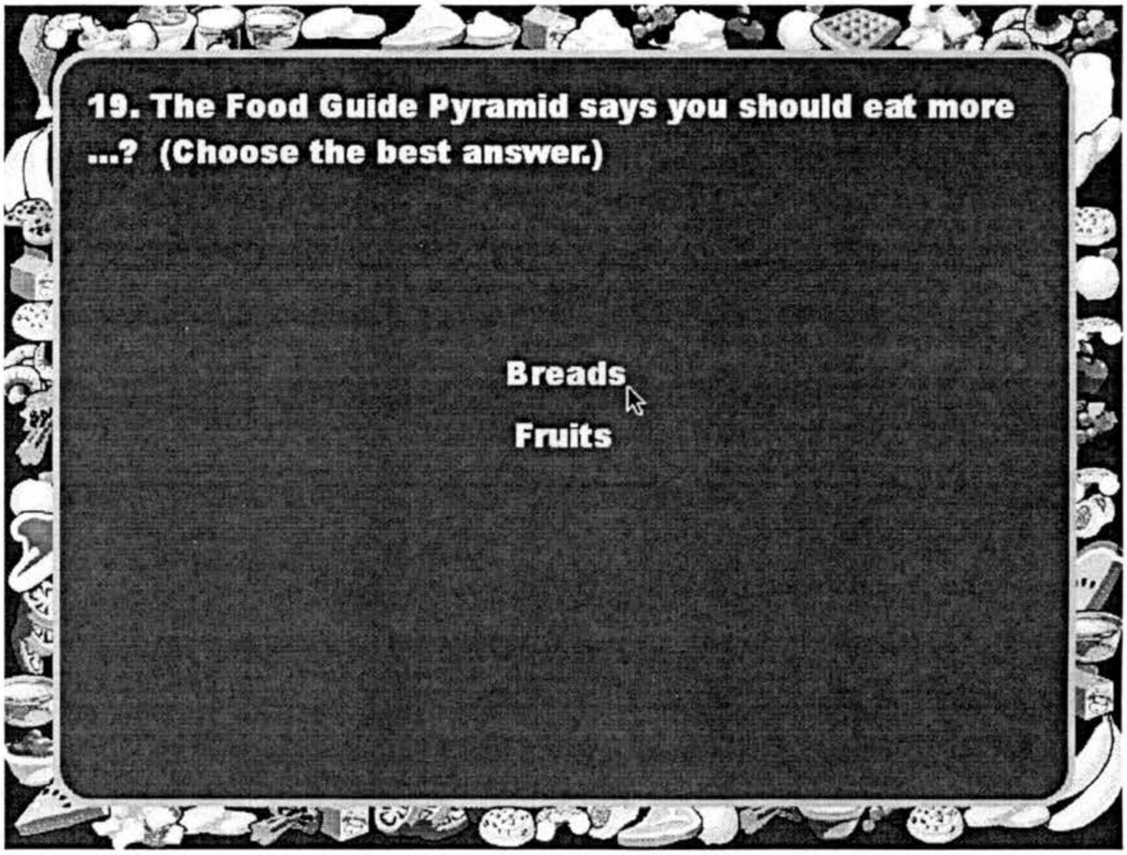

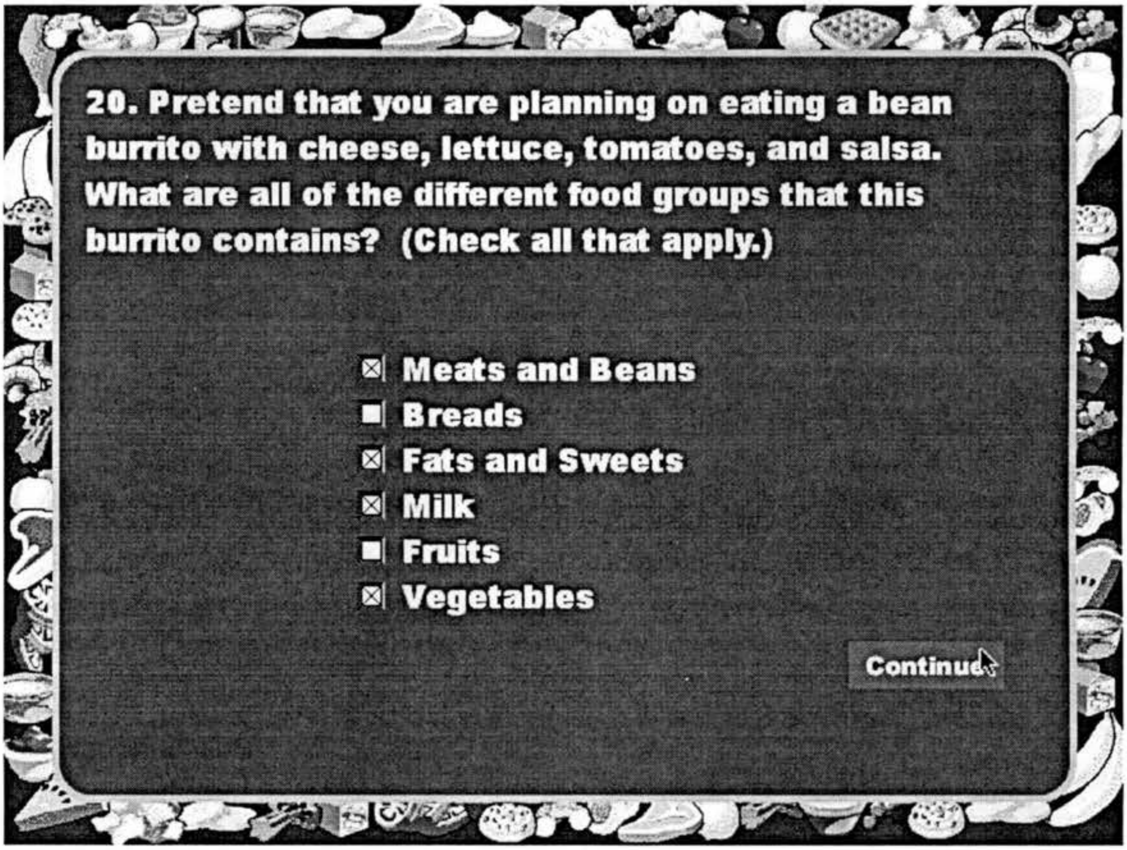

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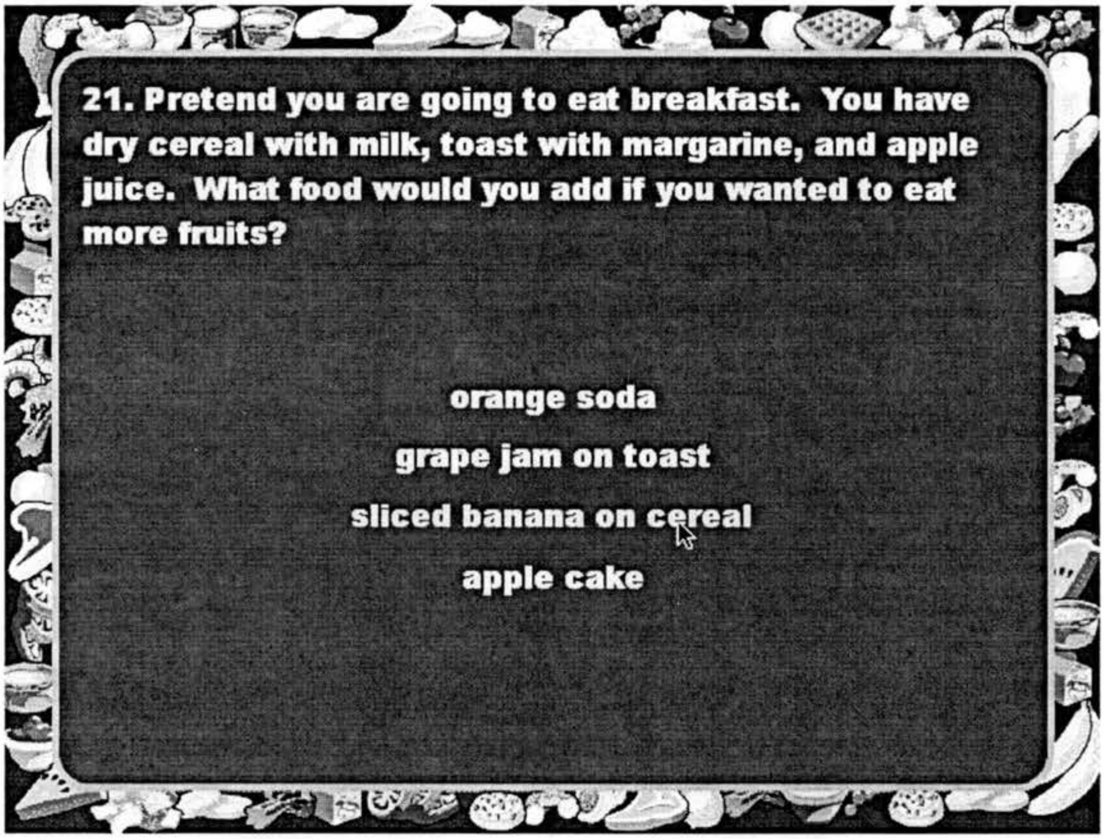

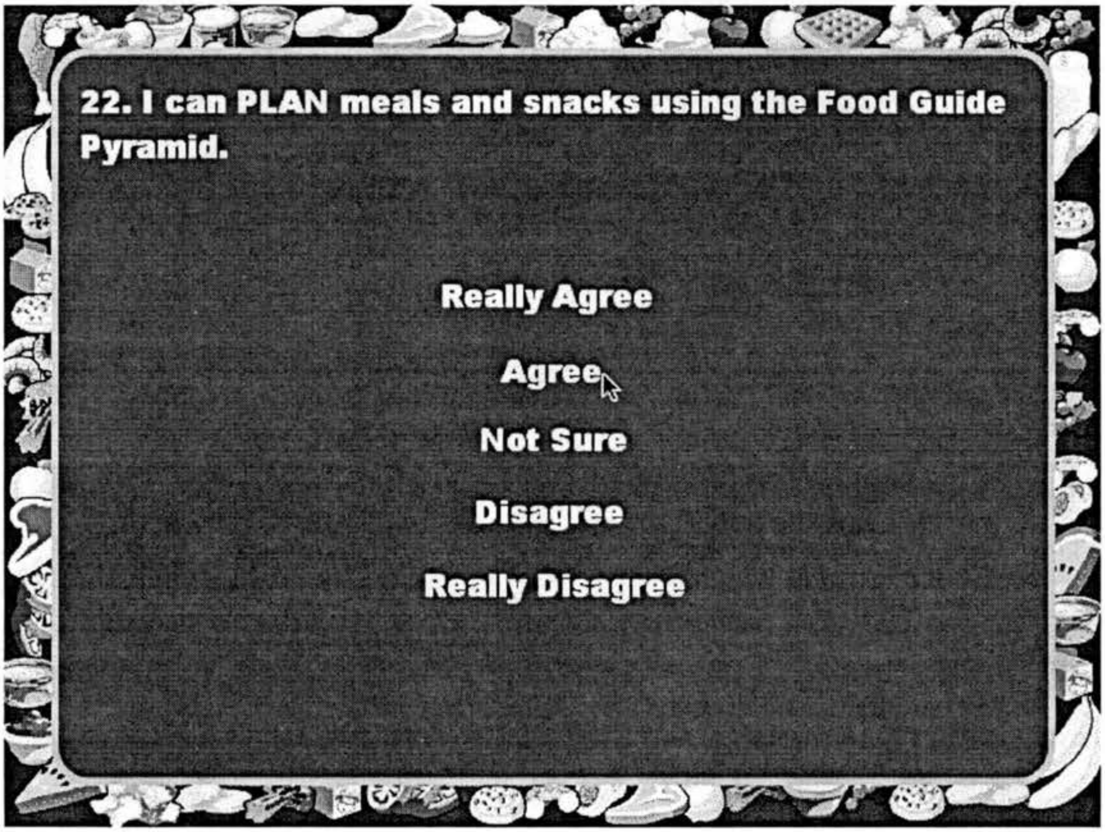

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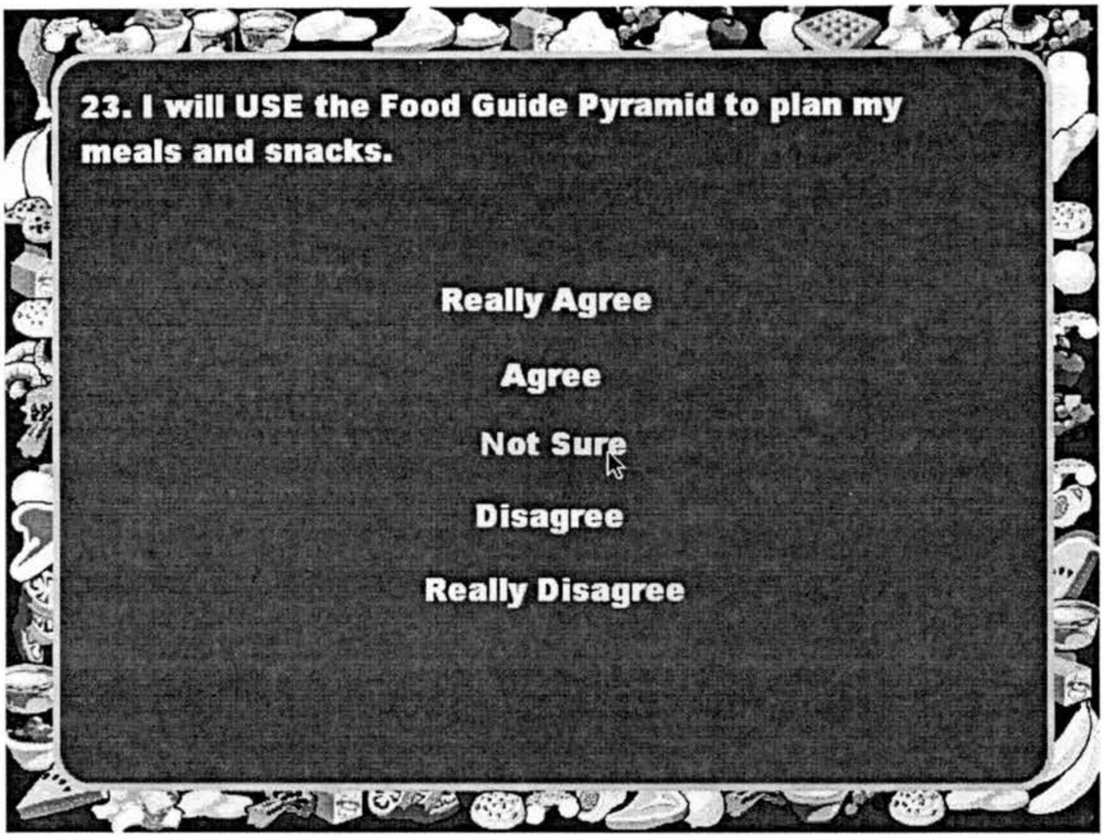

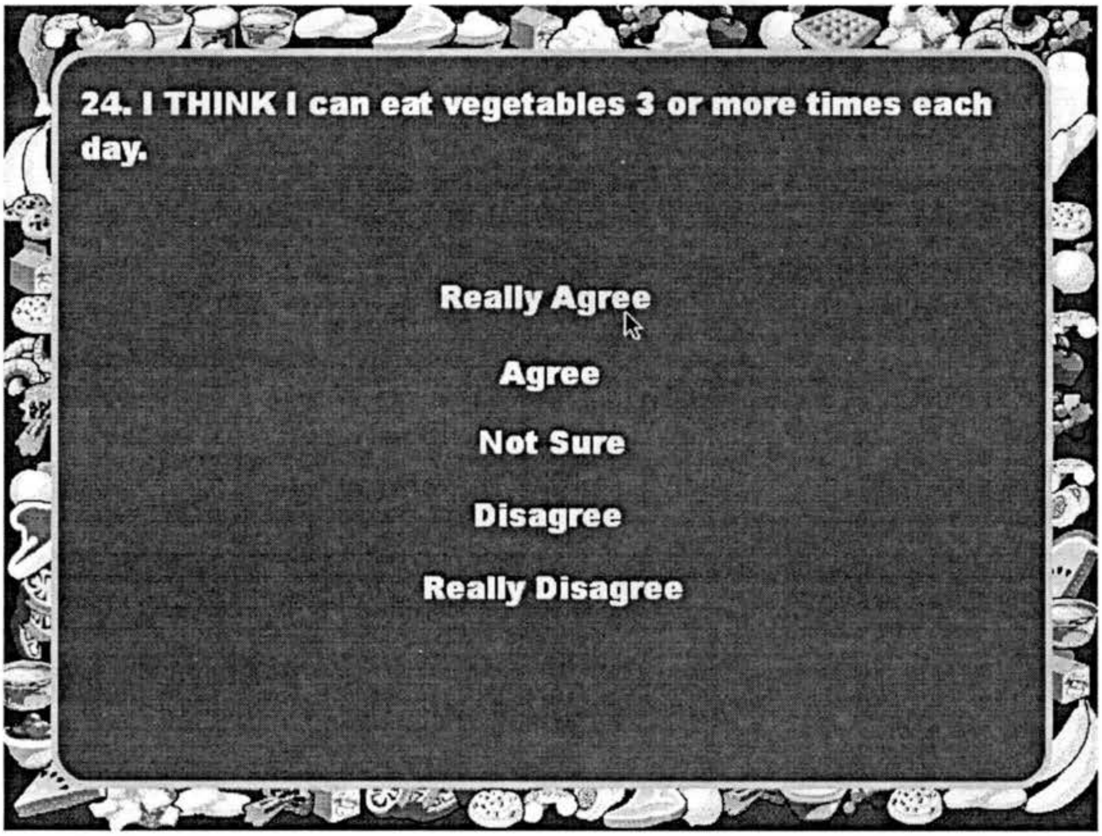

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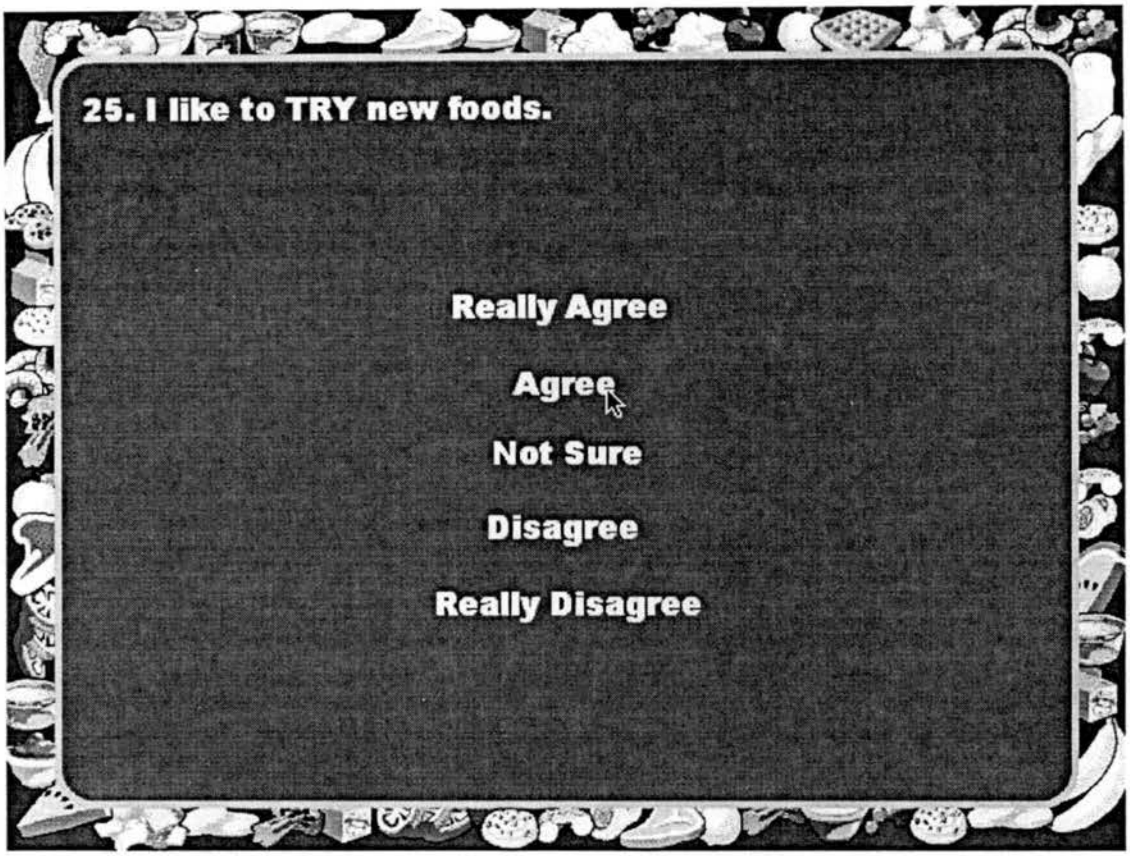

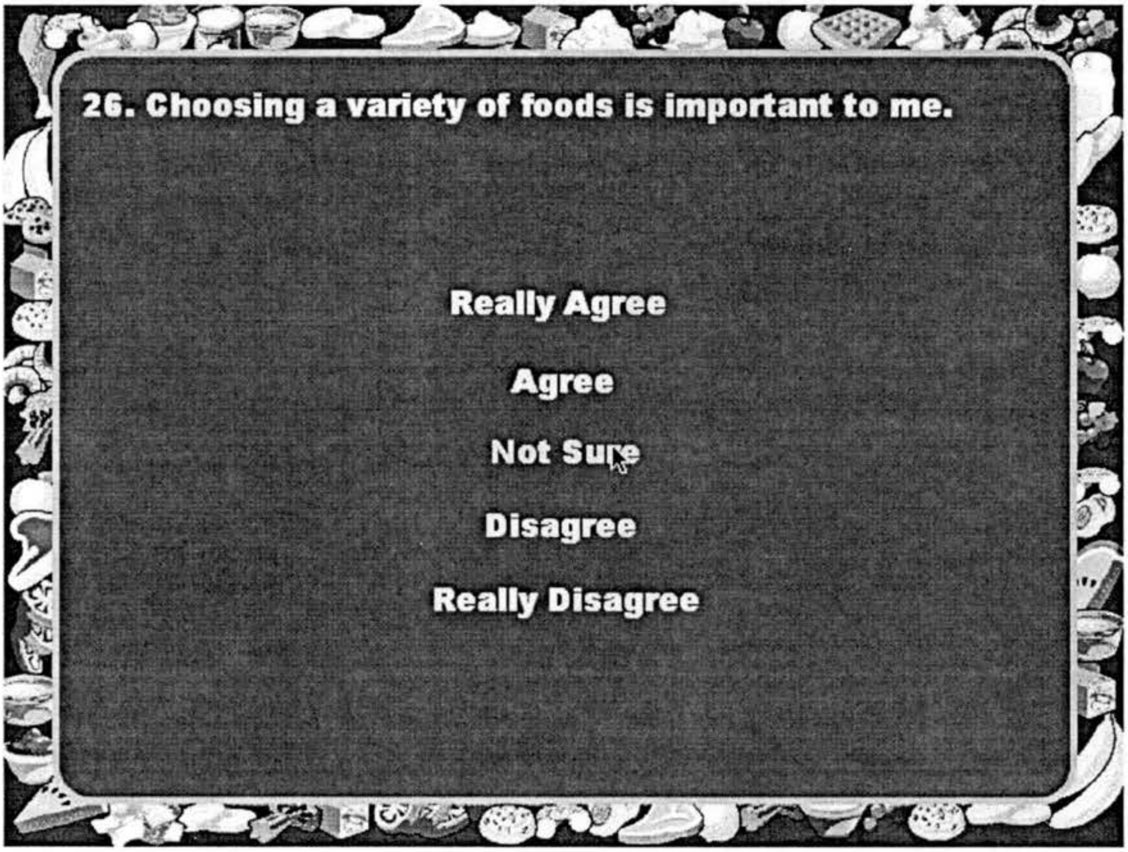

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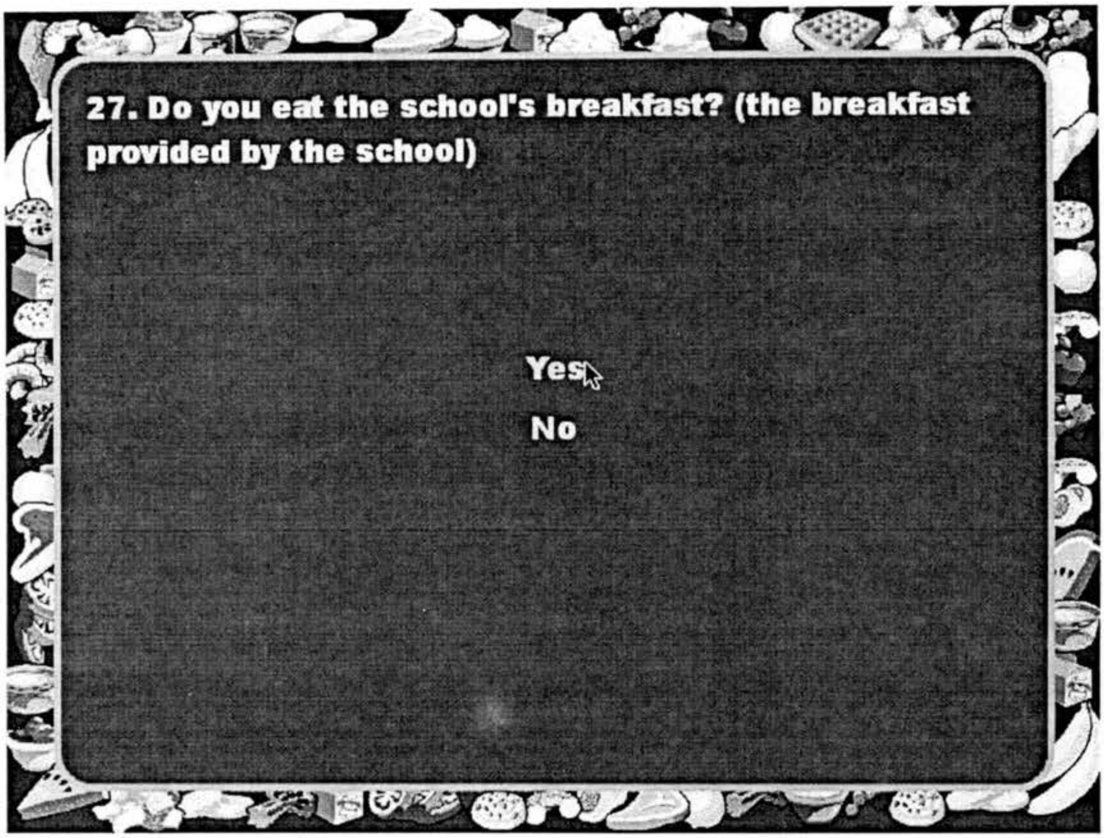

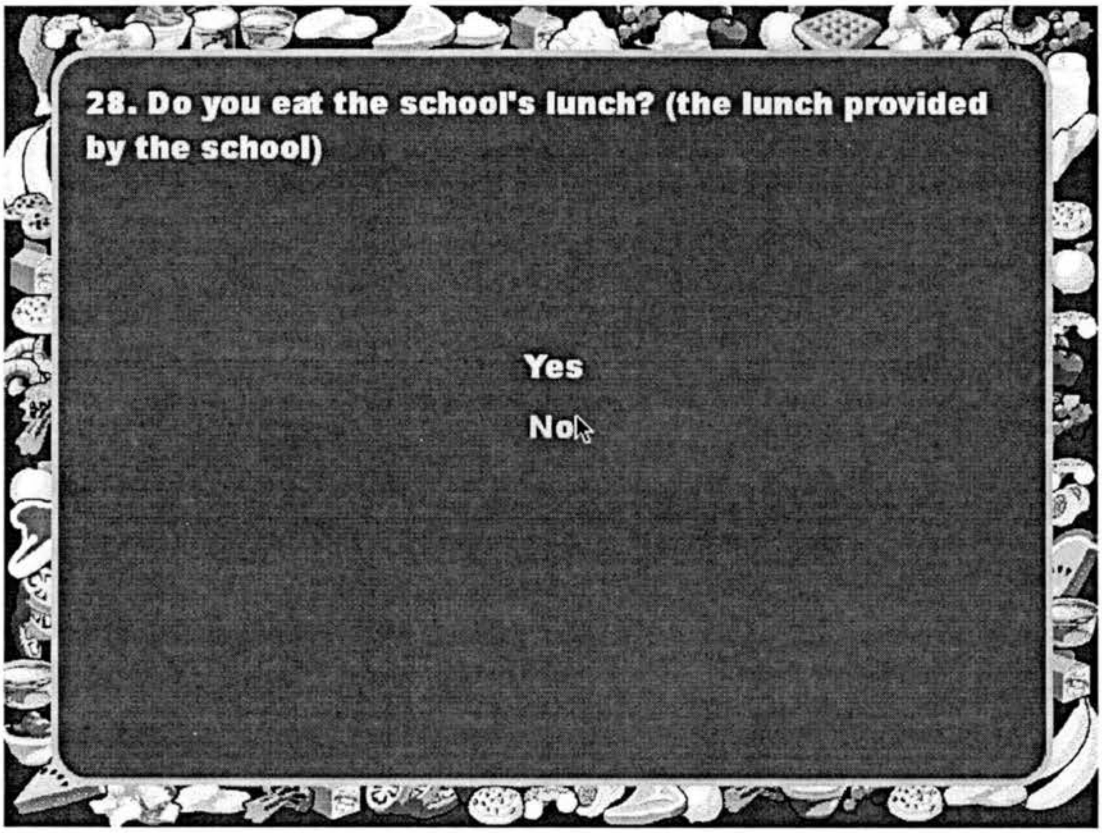

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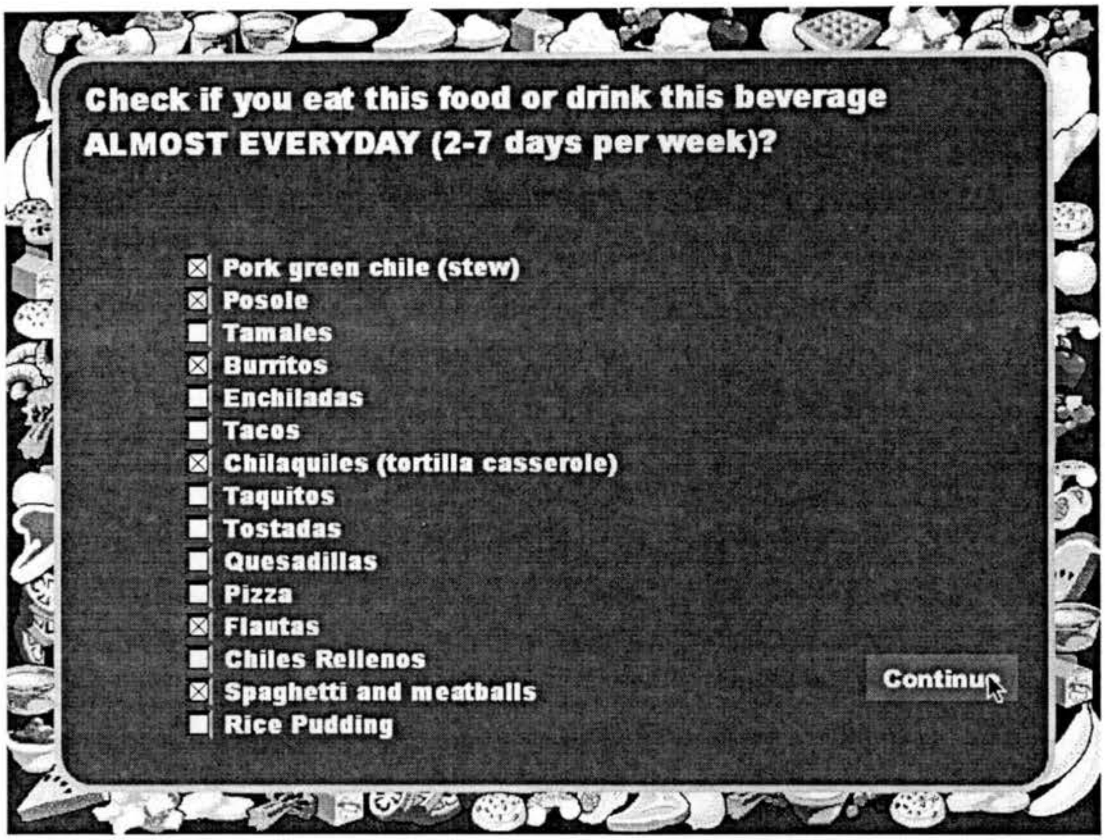

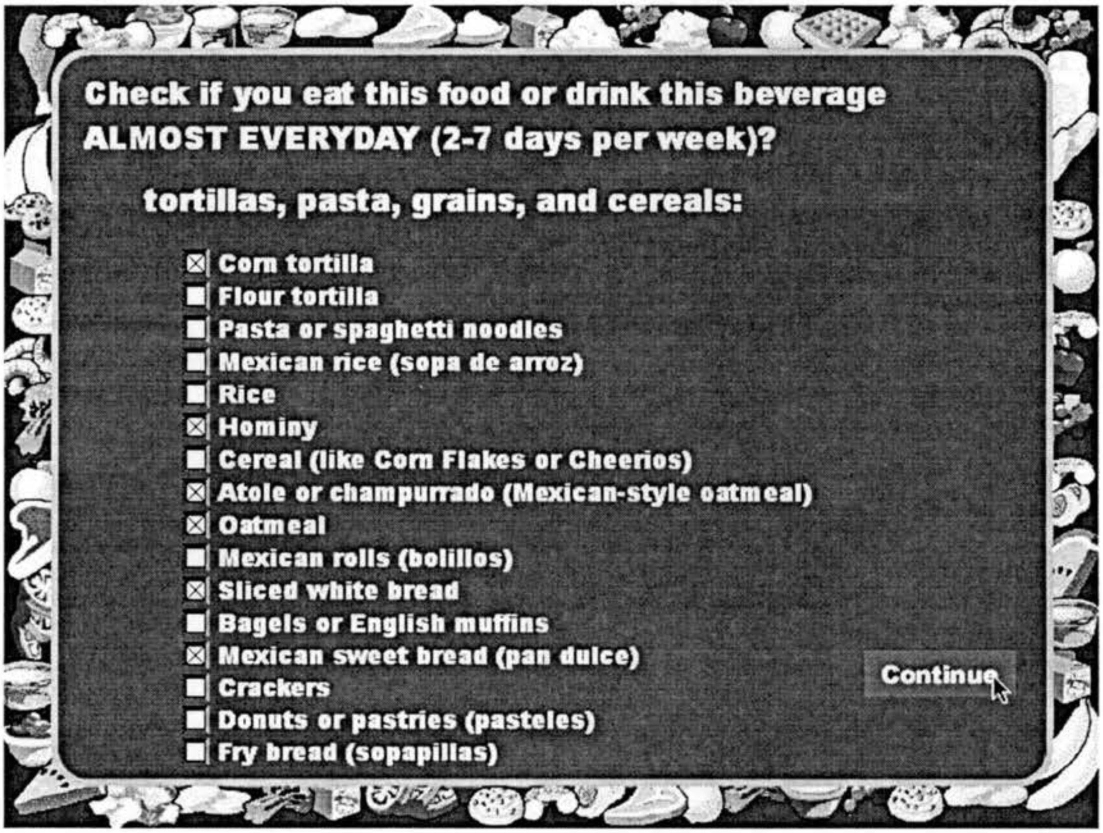

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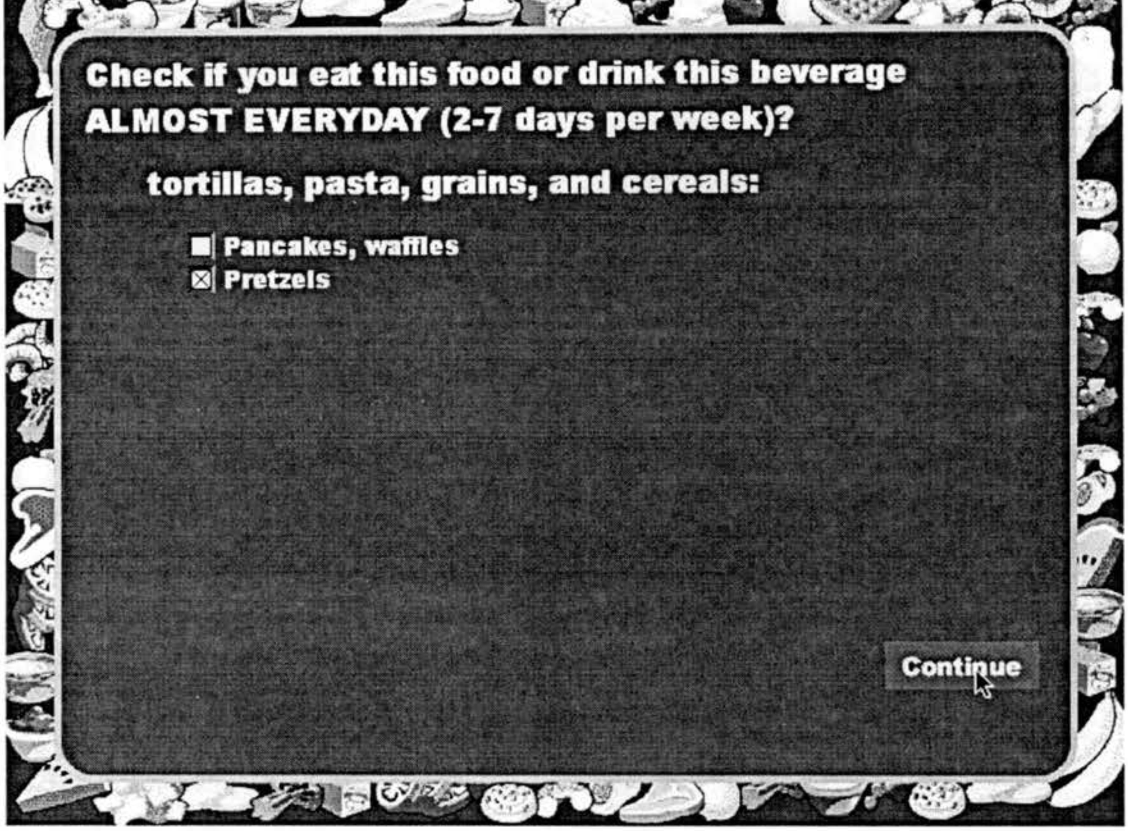

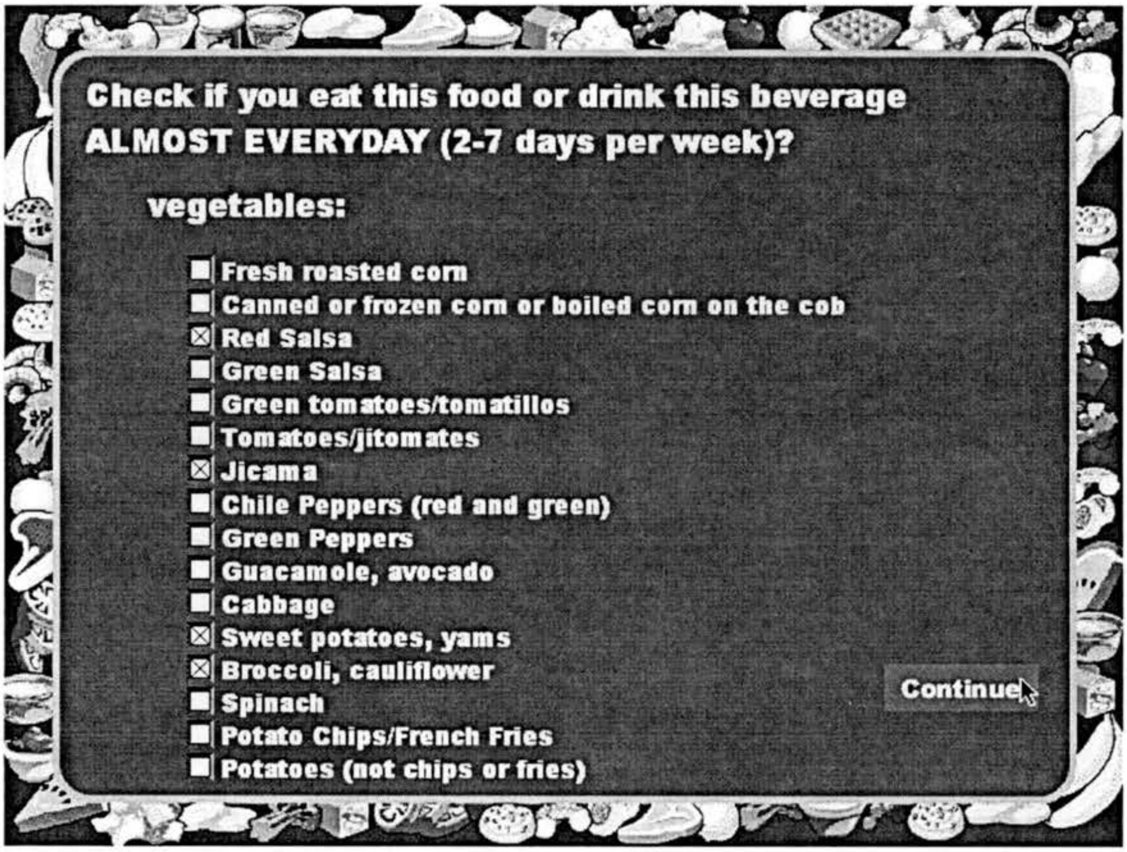

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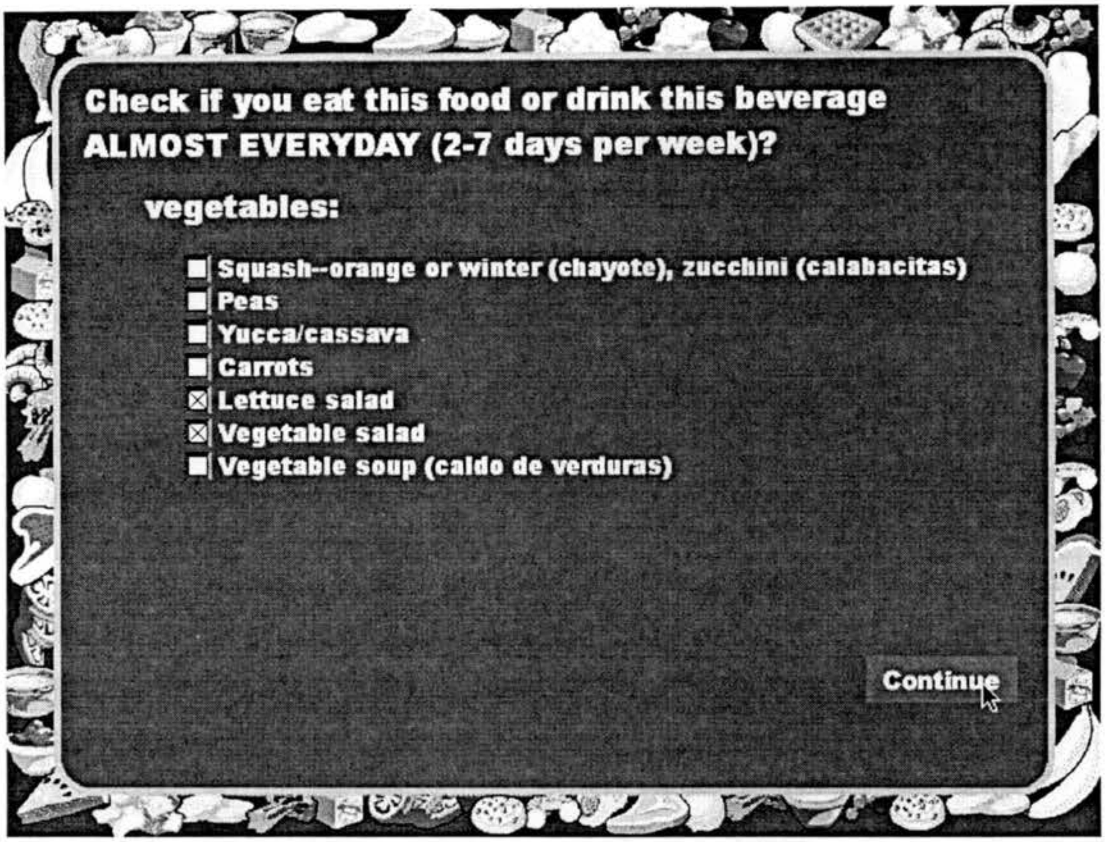

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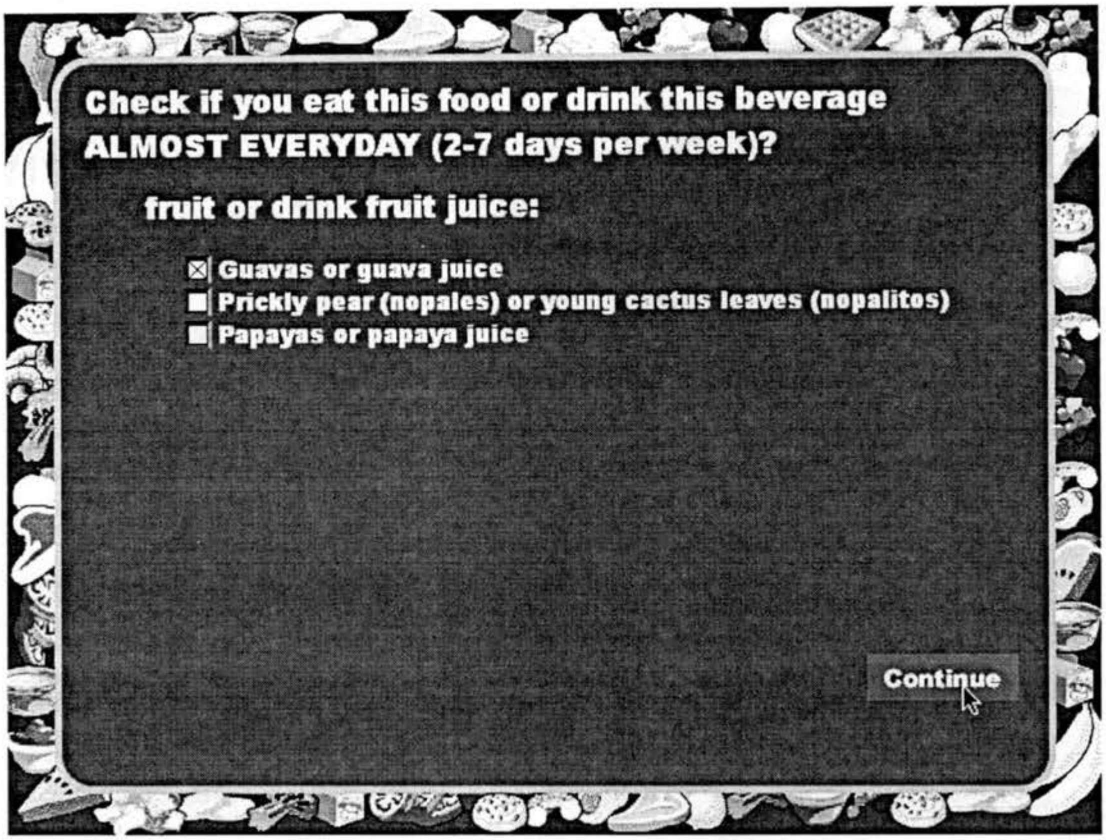

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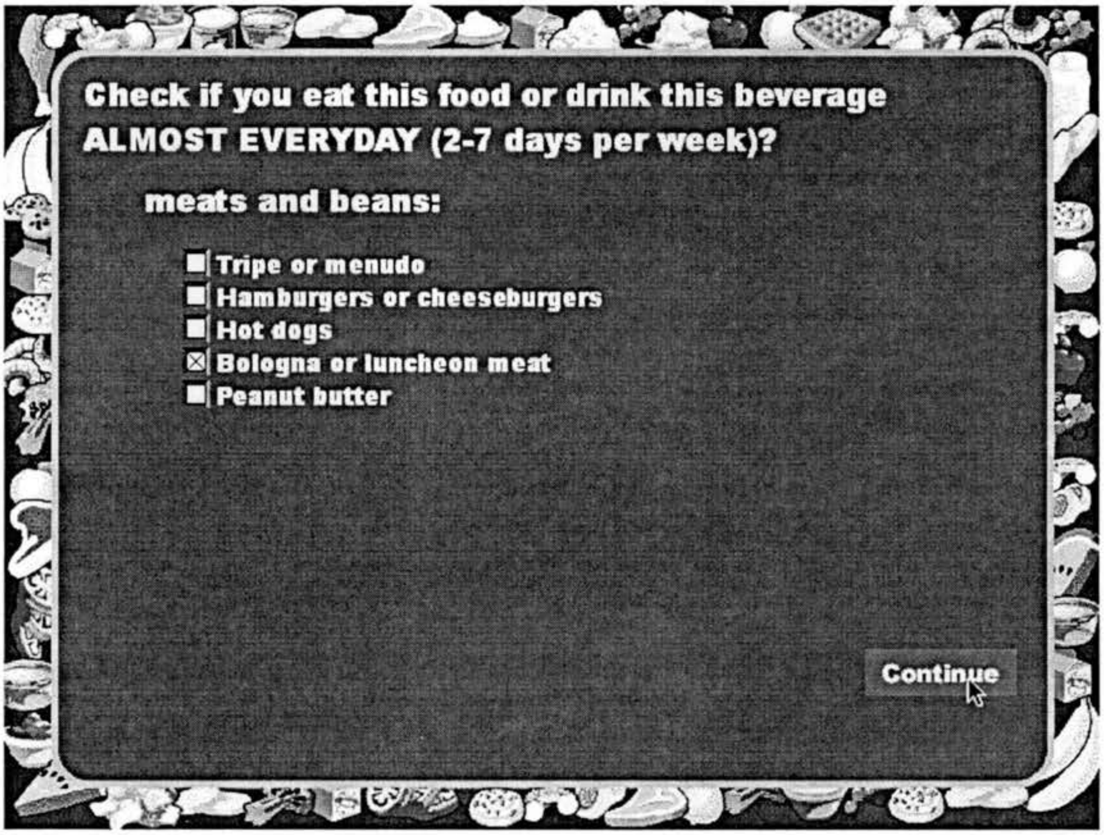

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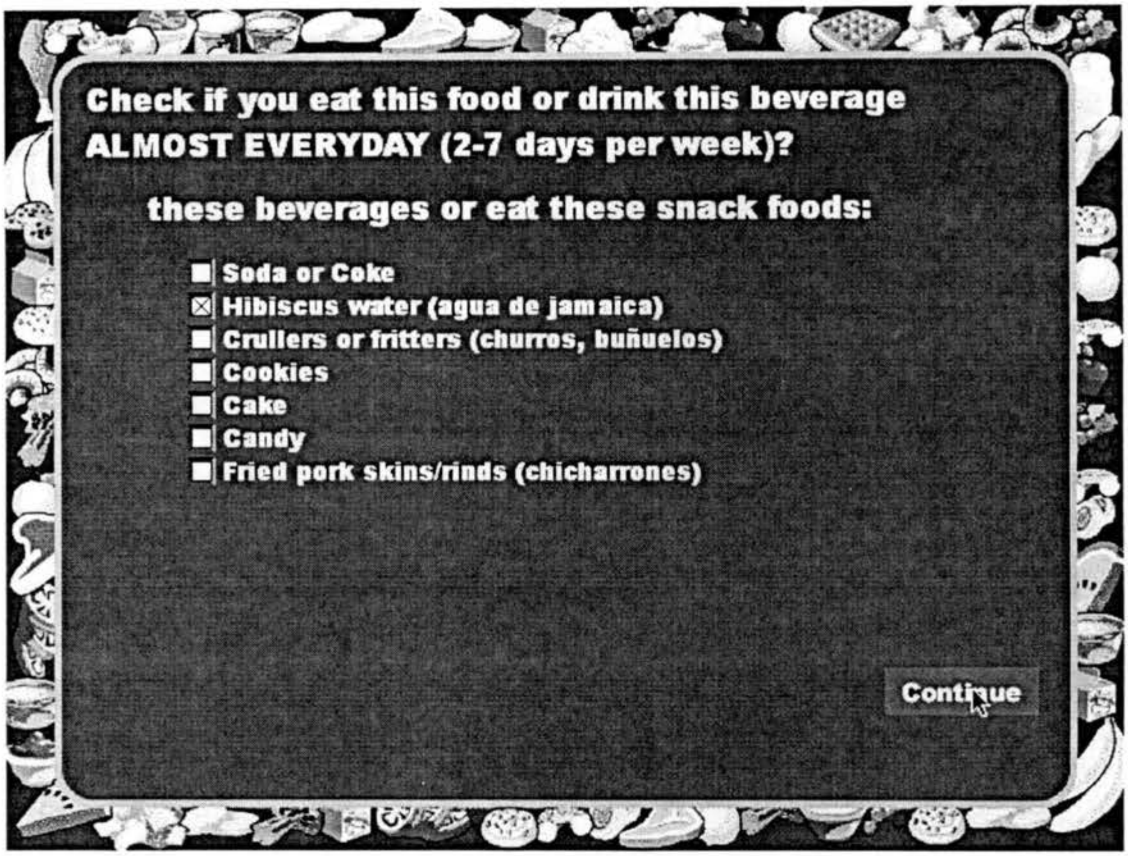

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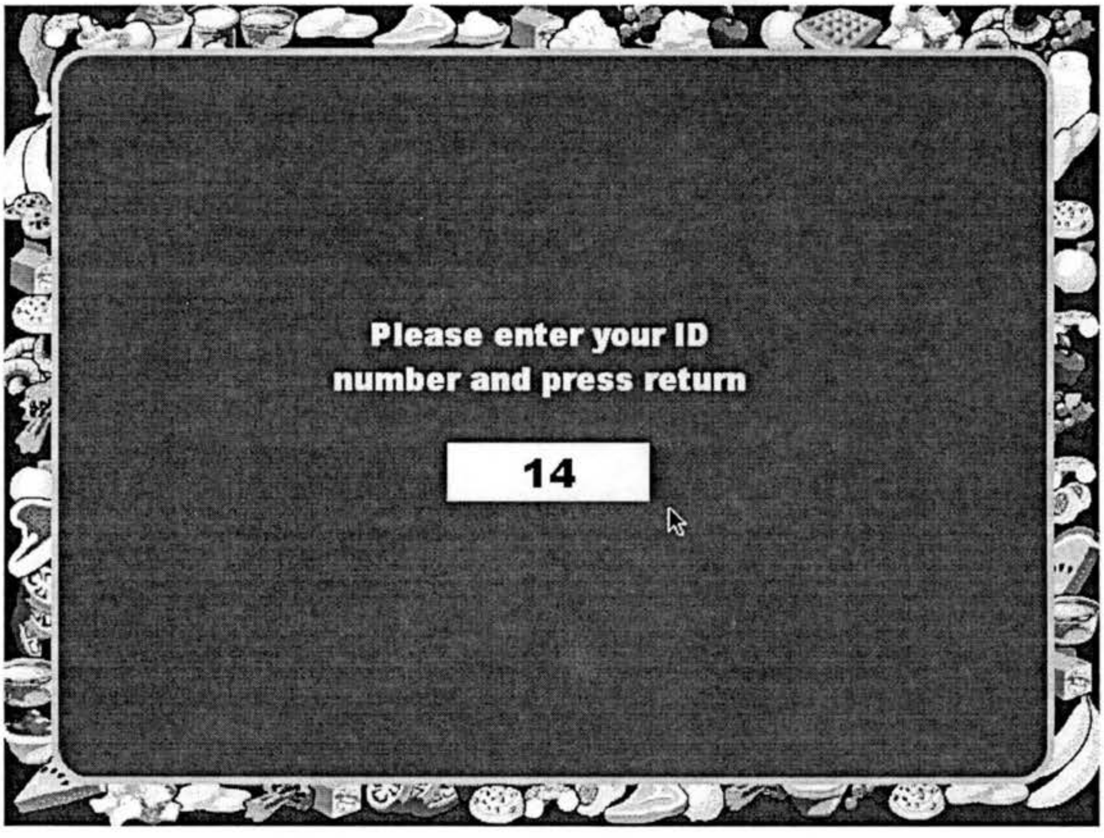
Online Evaluation Screens for Post-Test



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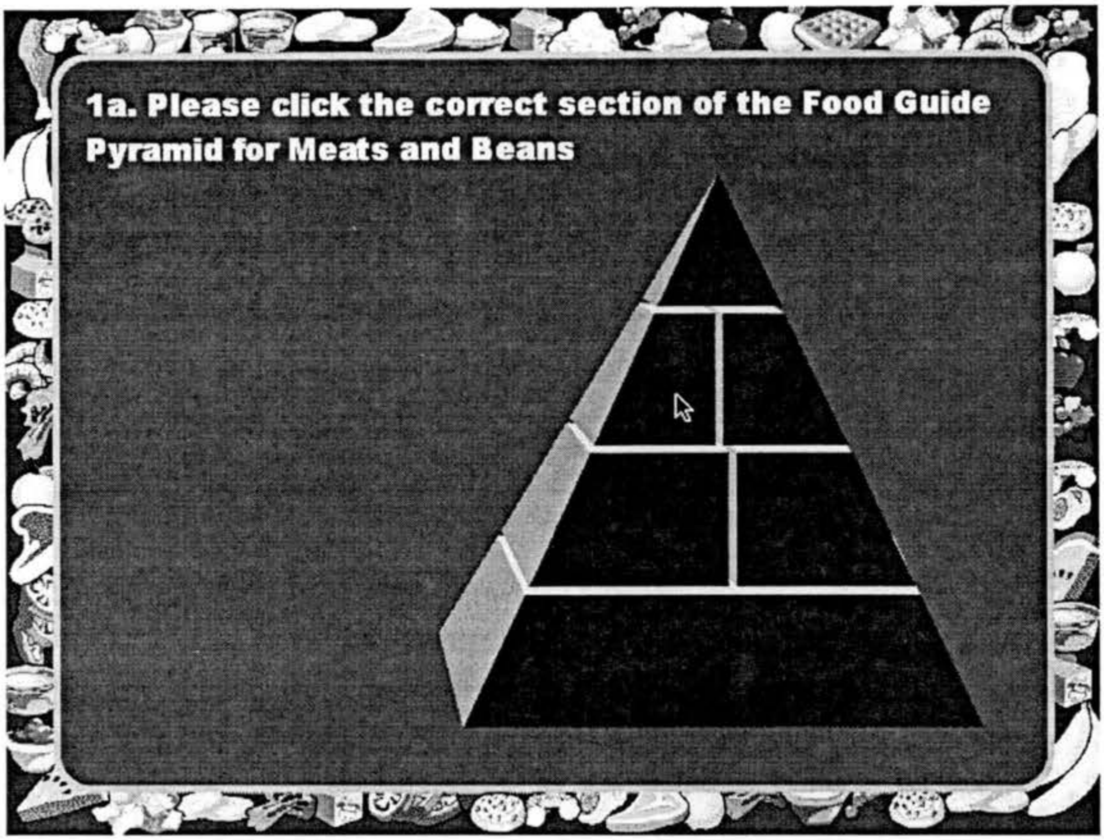

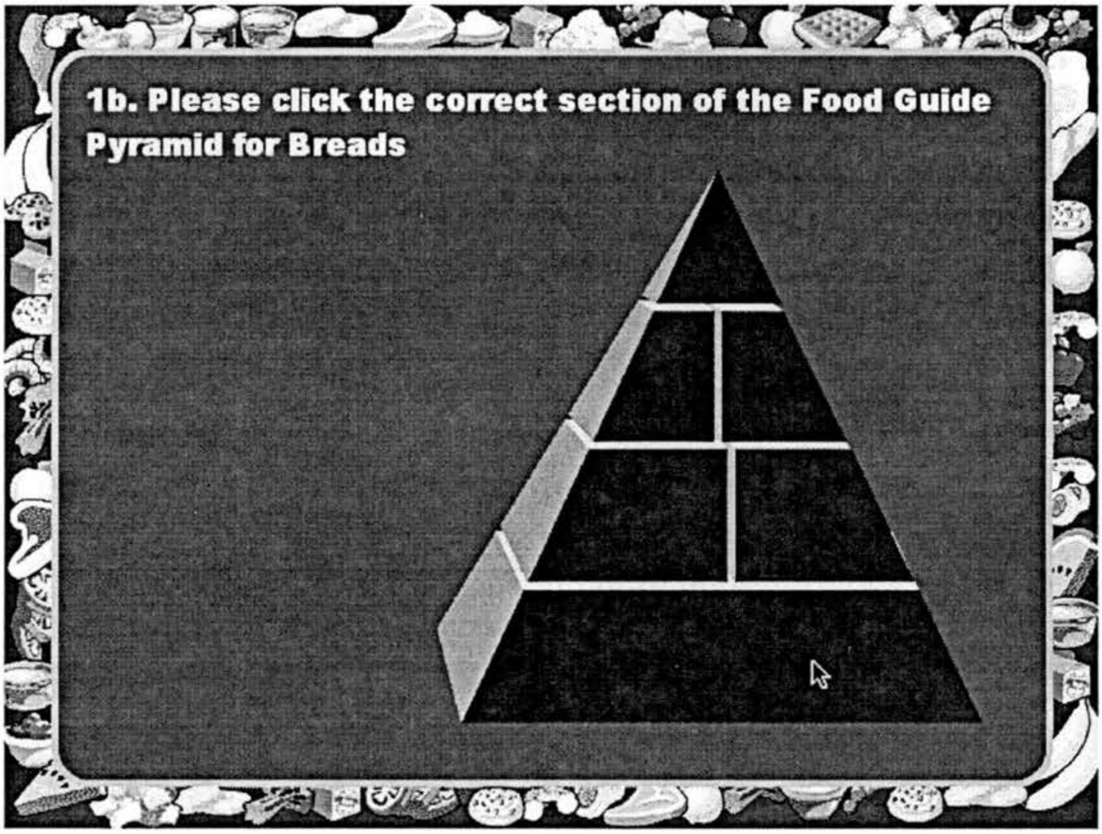

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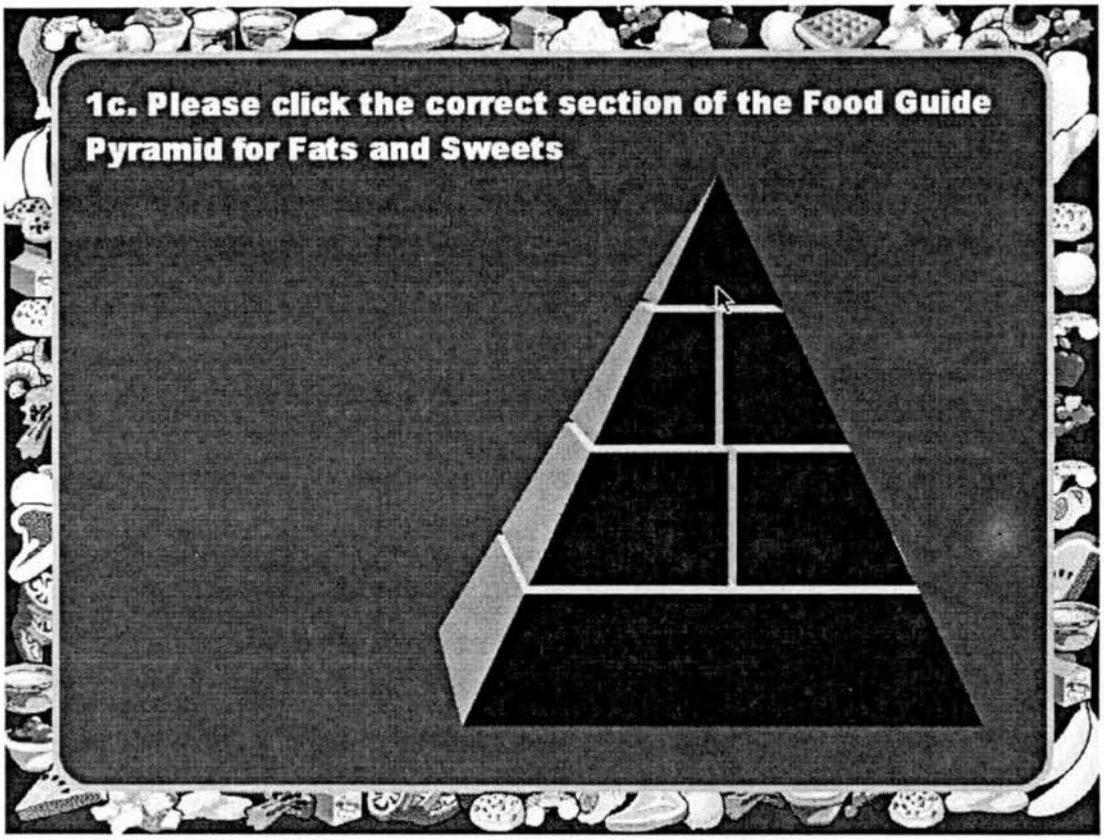

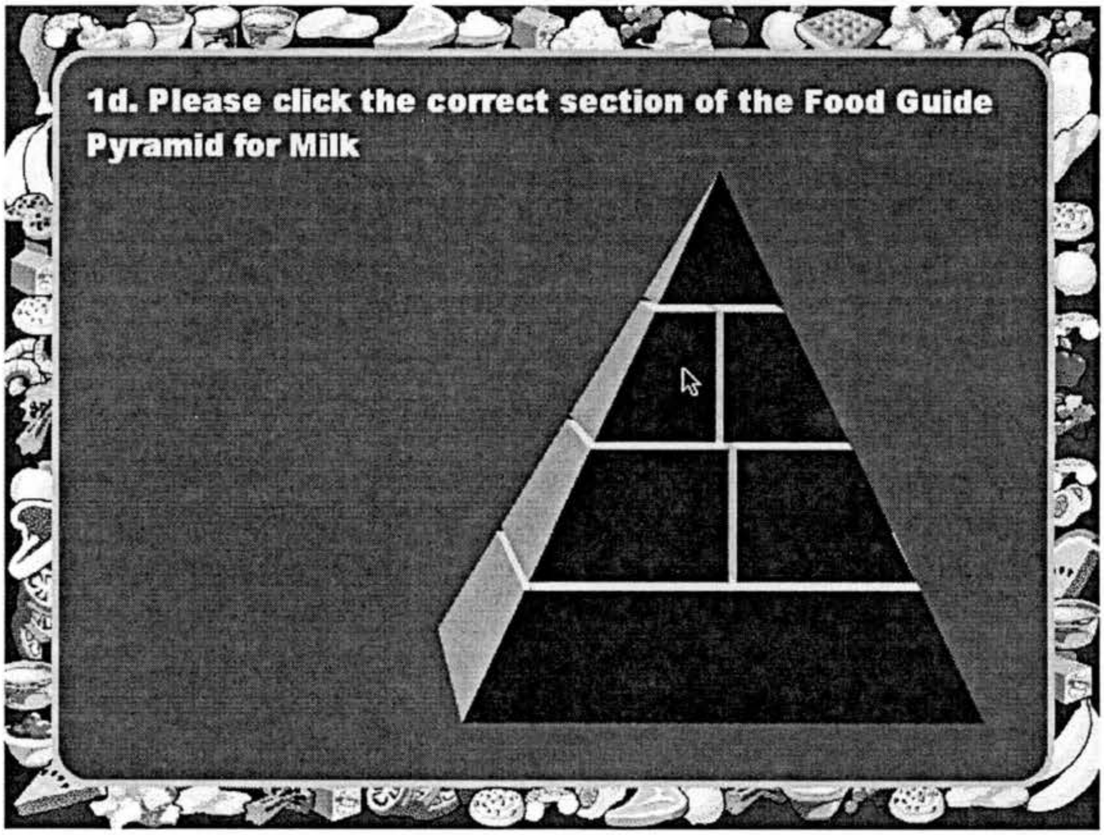

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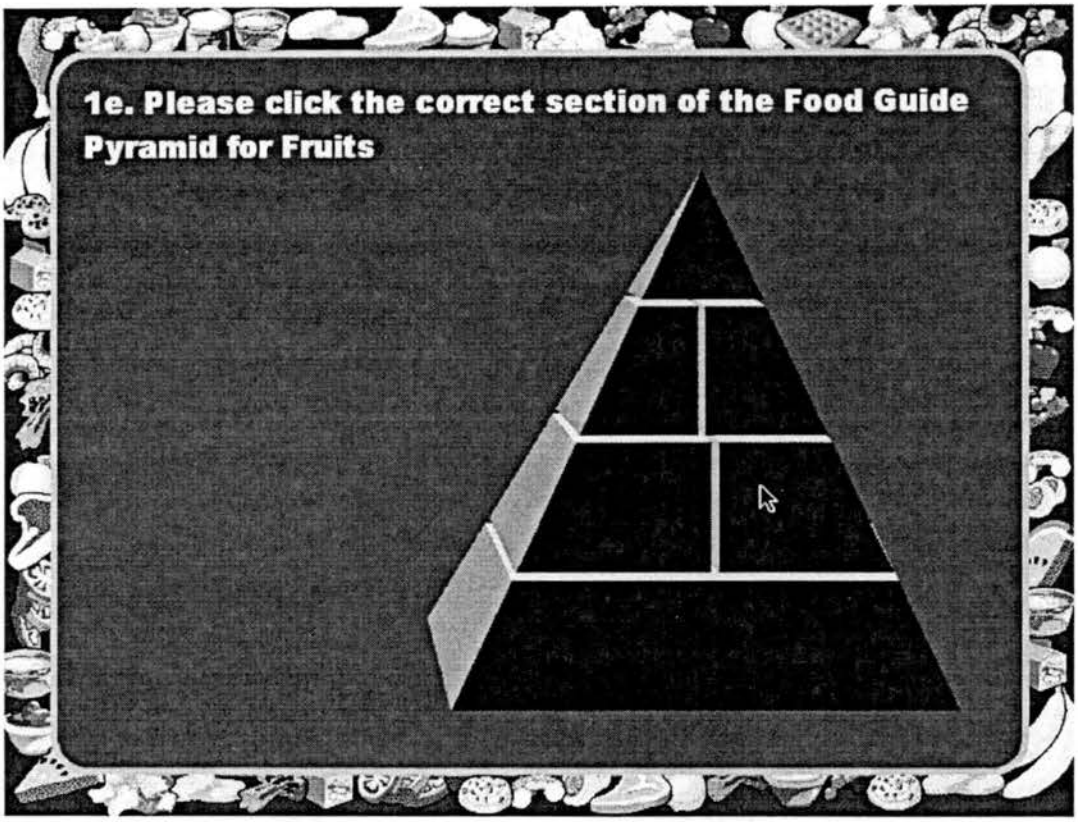

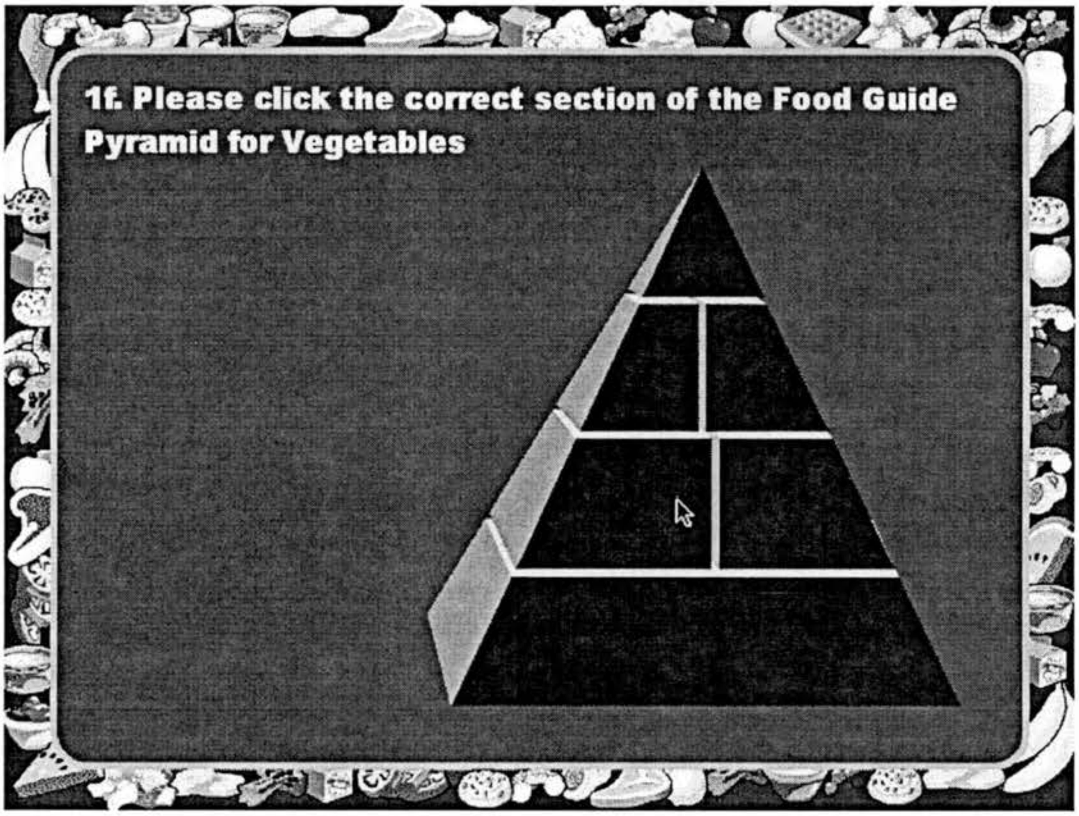

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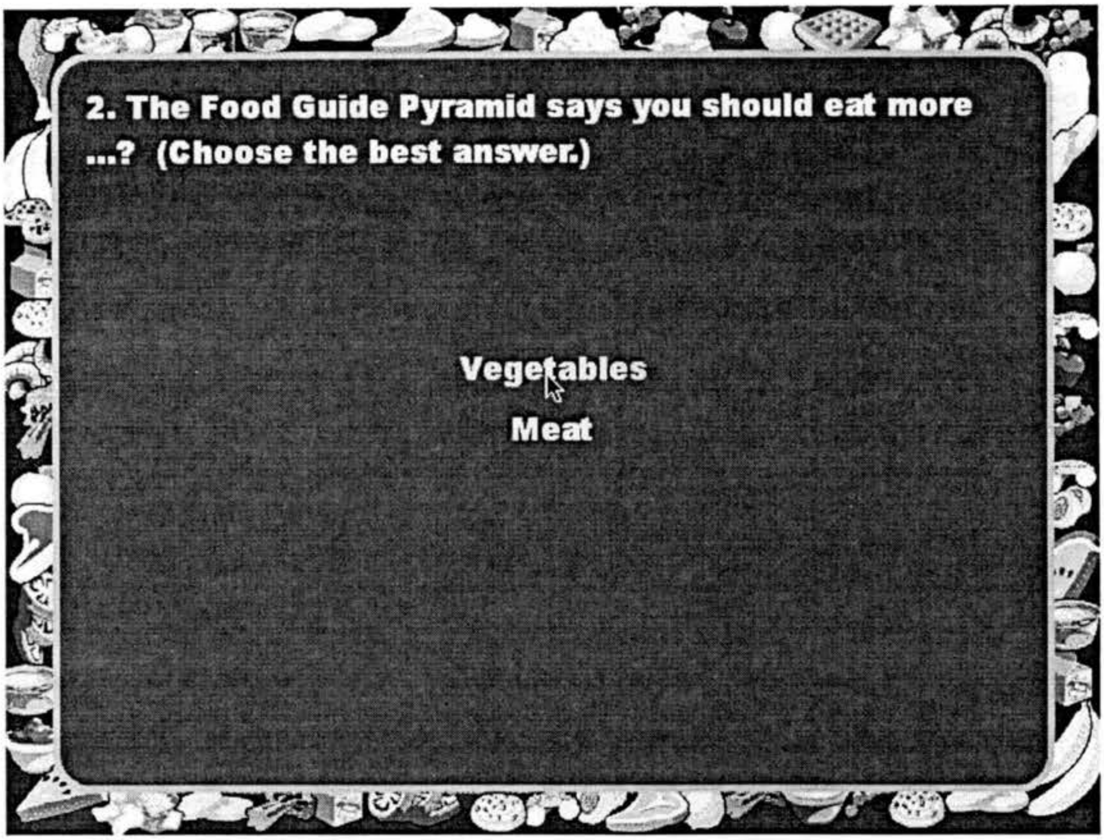

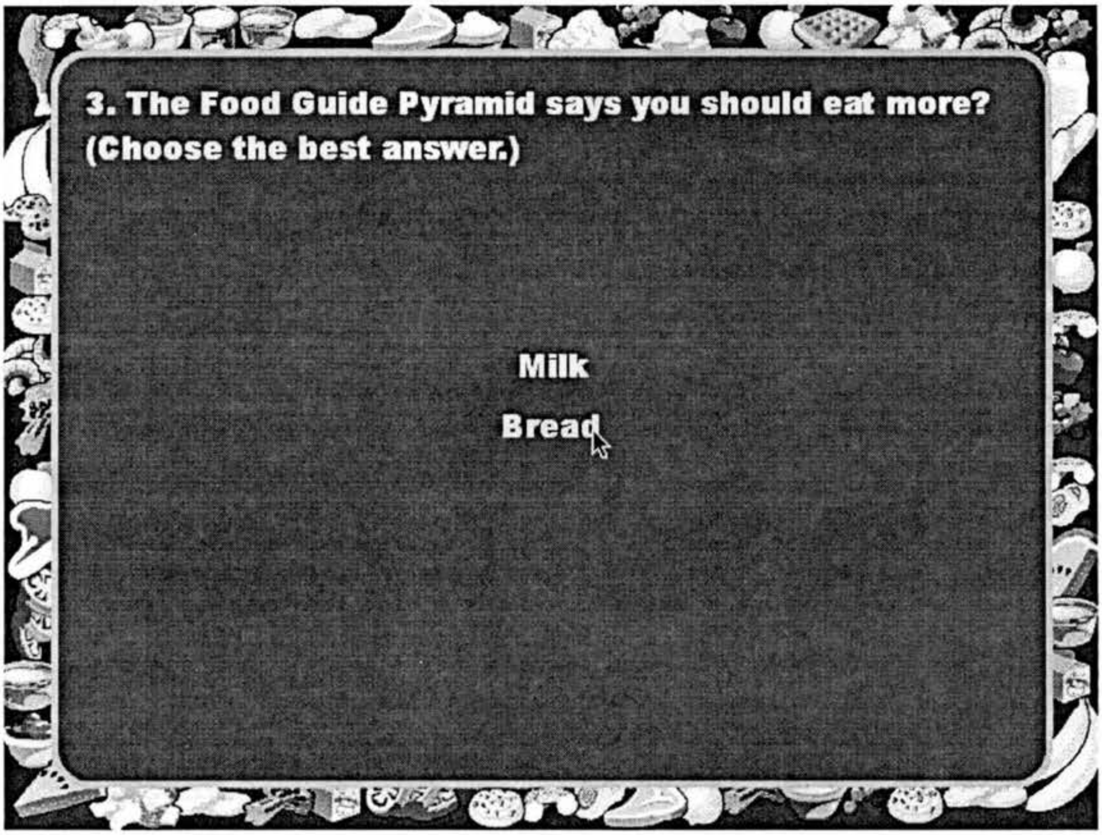

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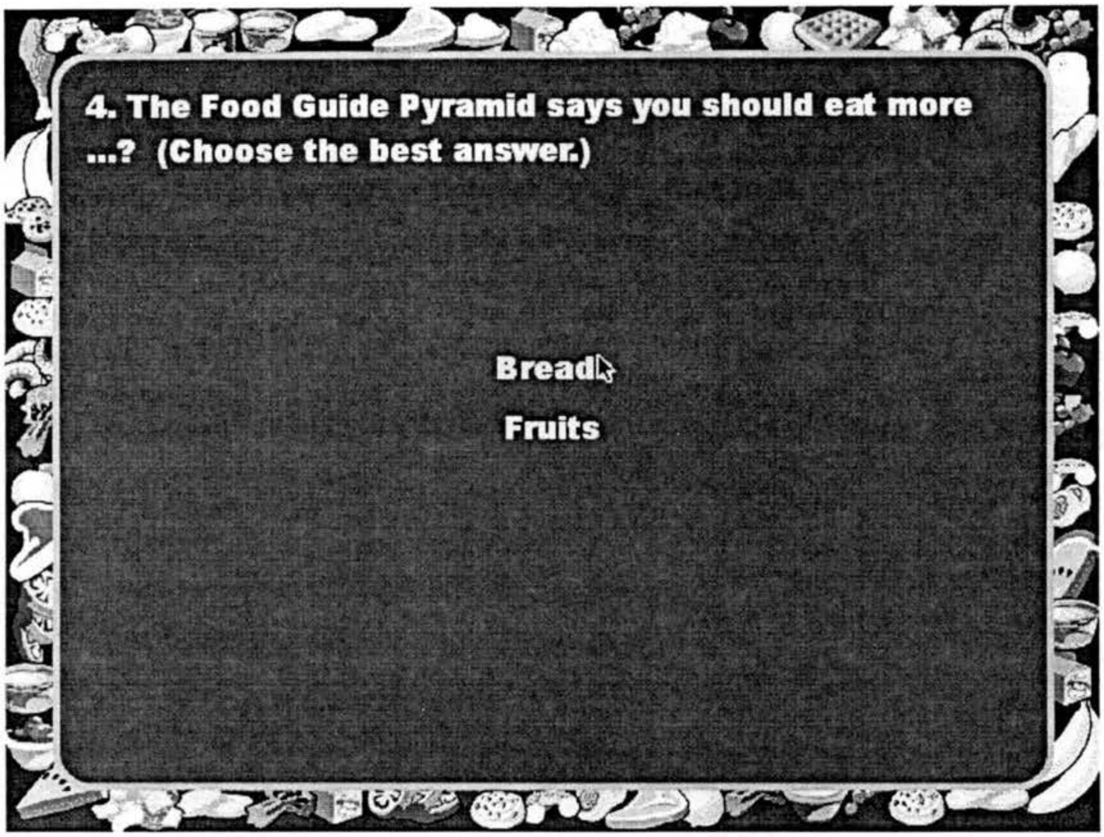

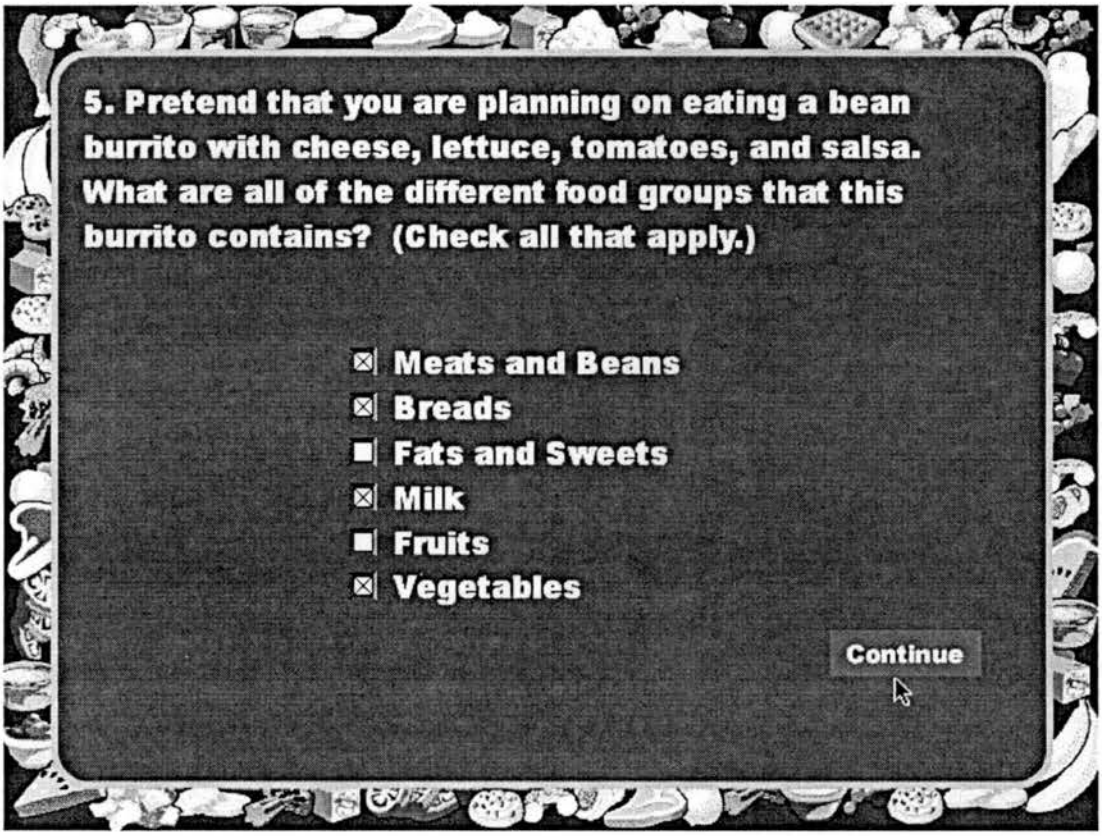

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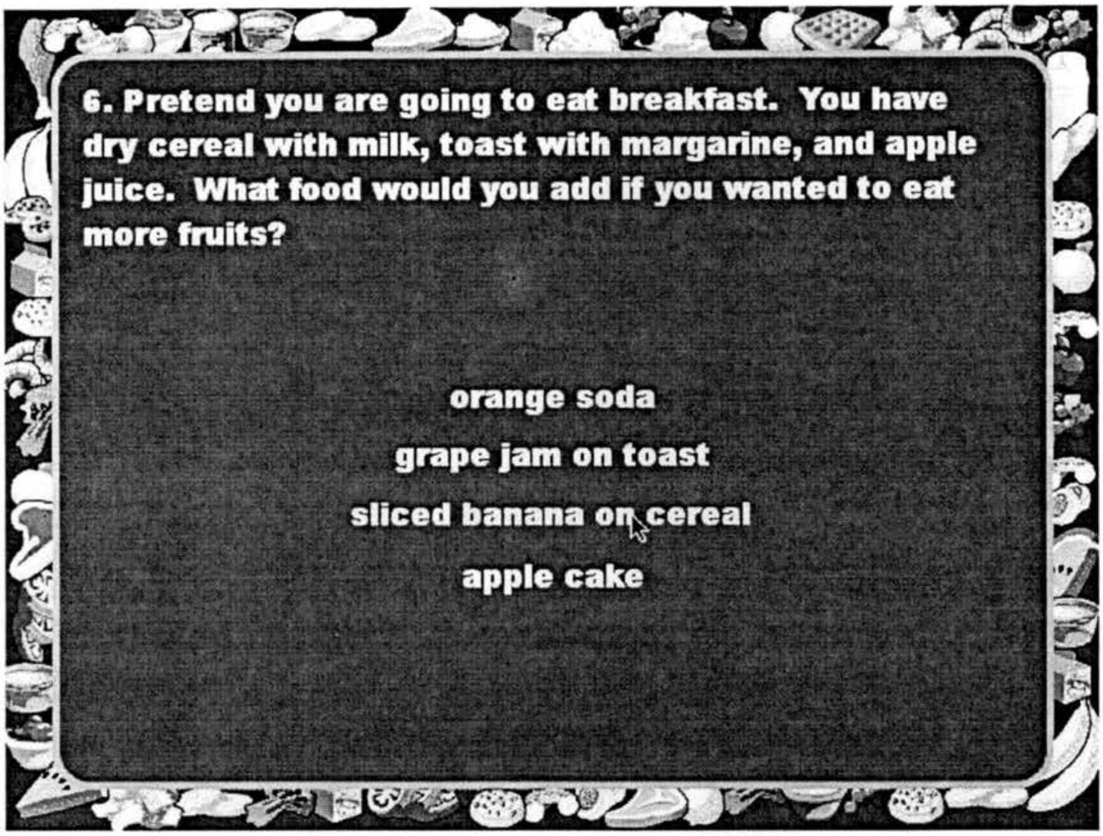

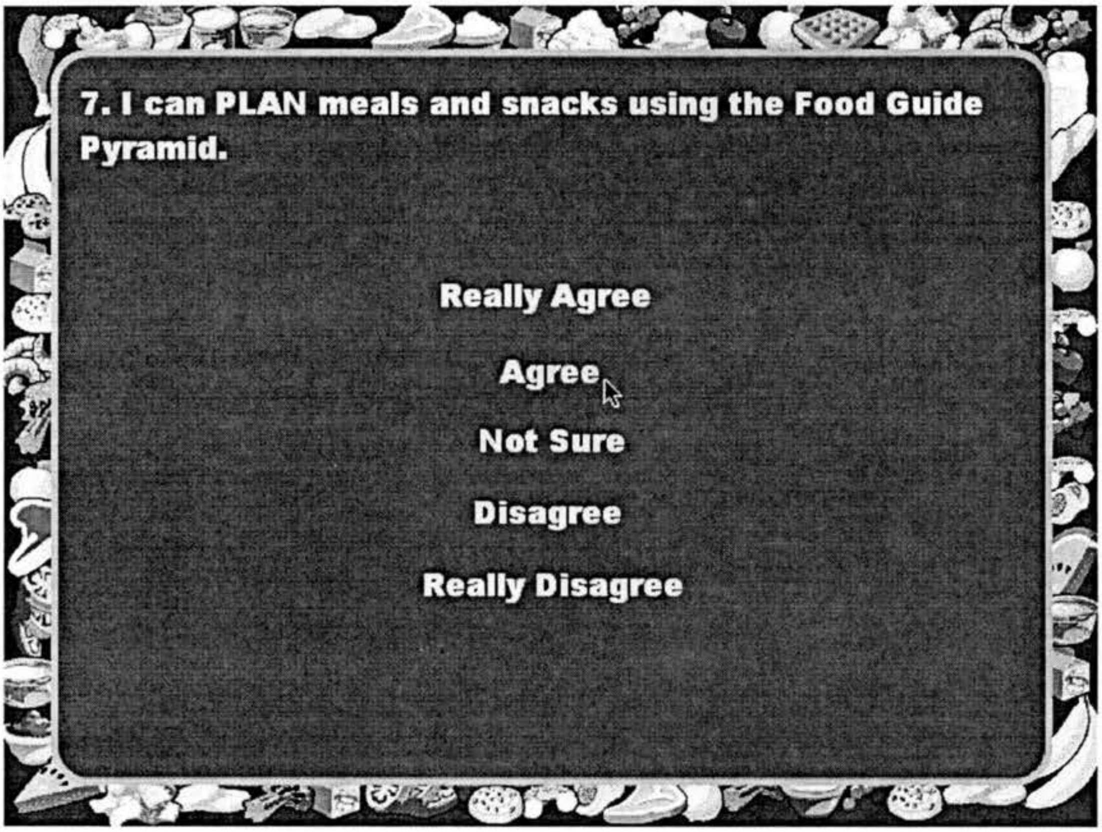

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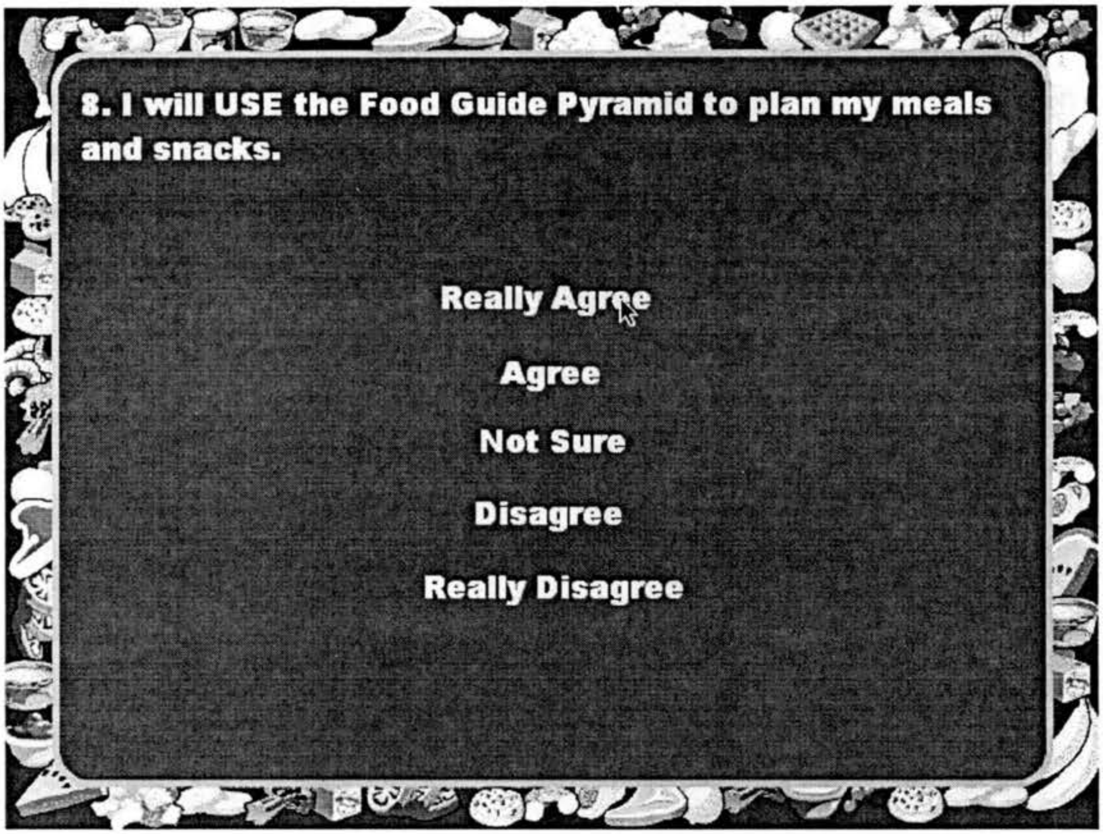

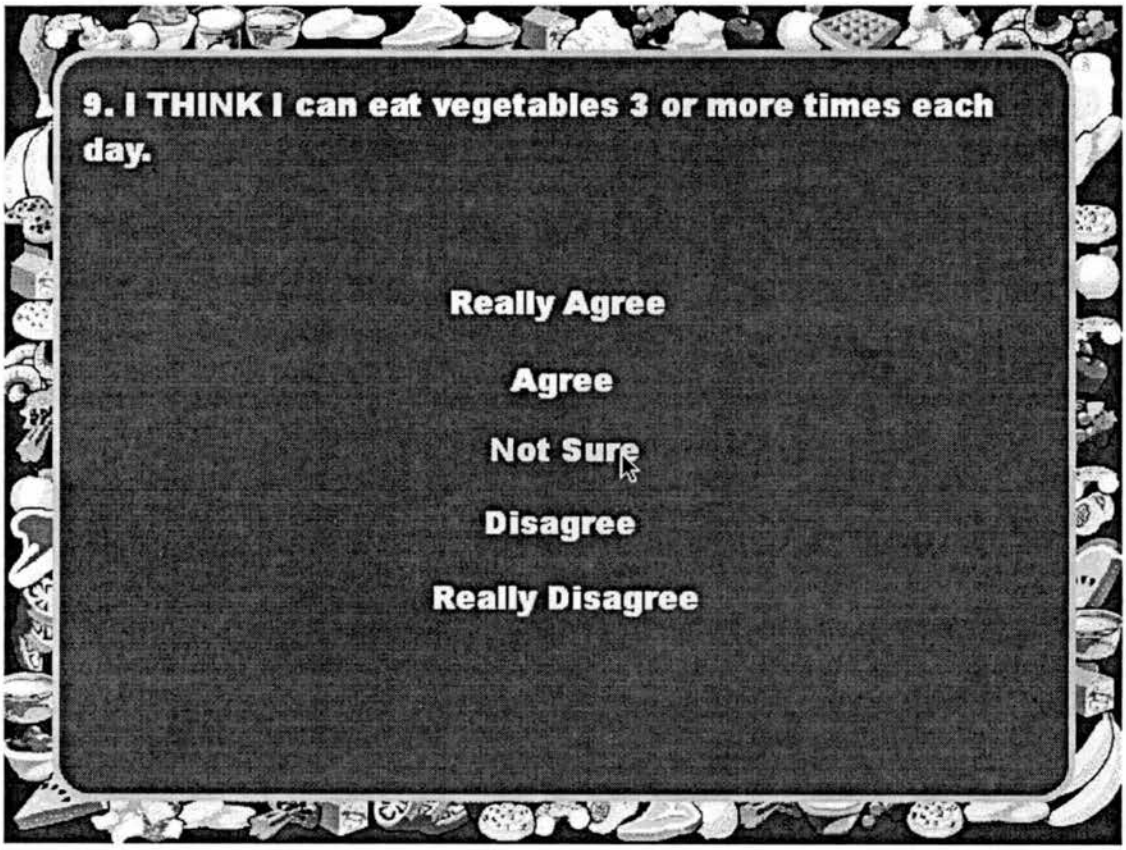

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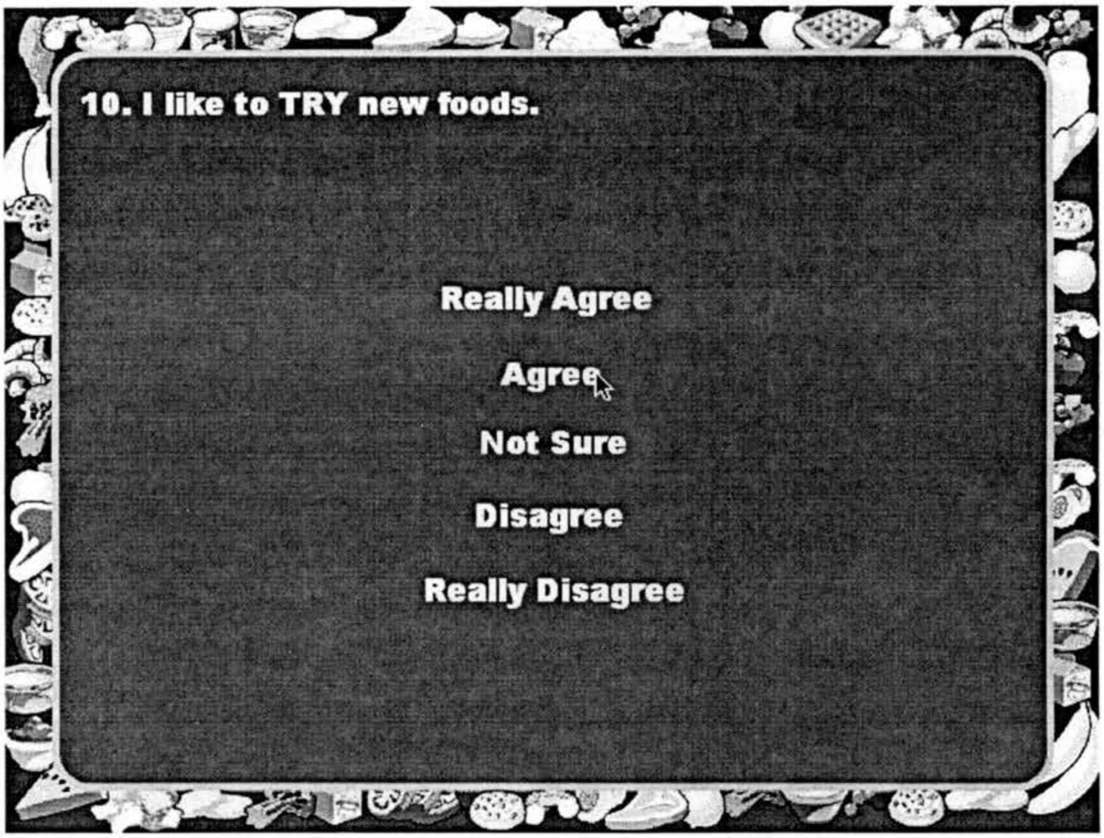

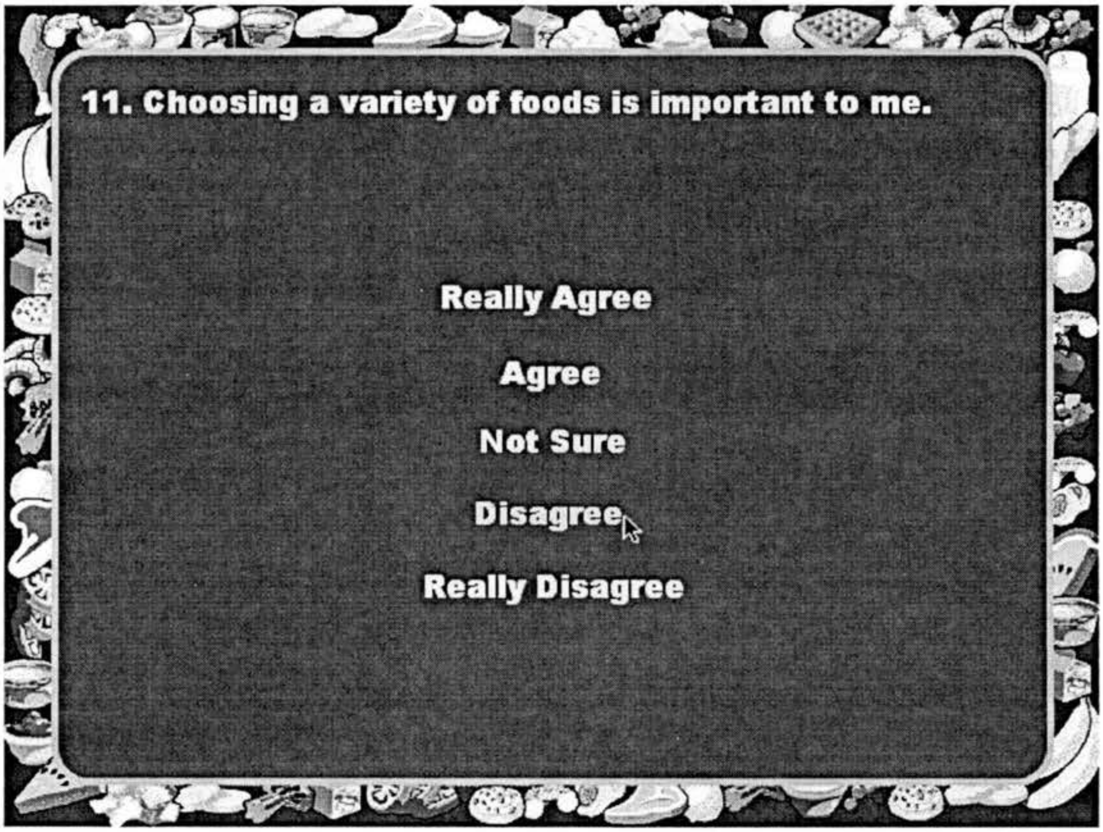

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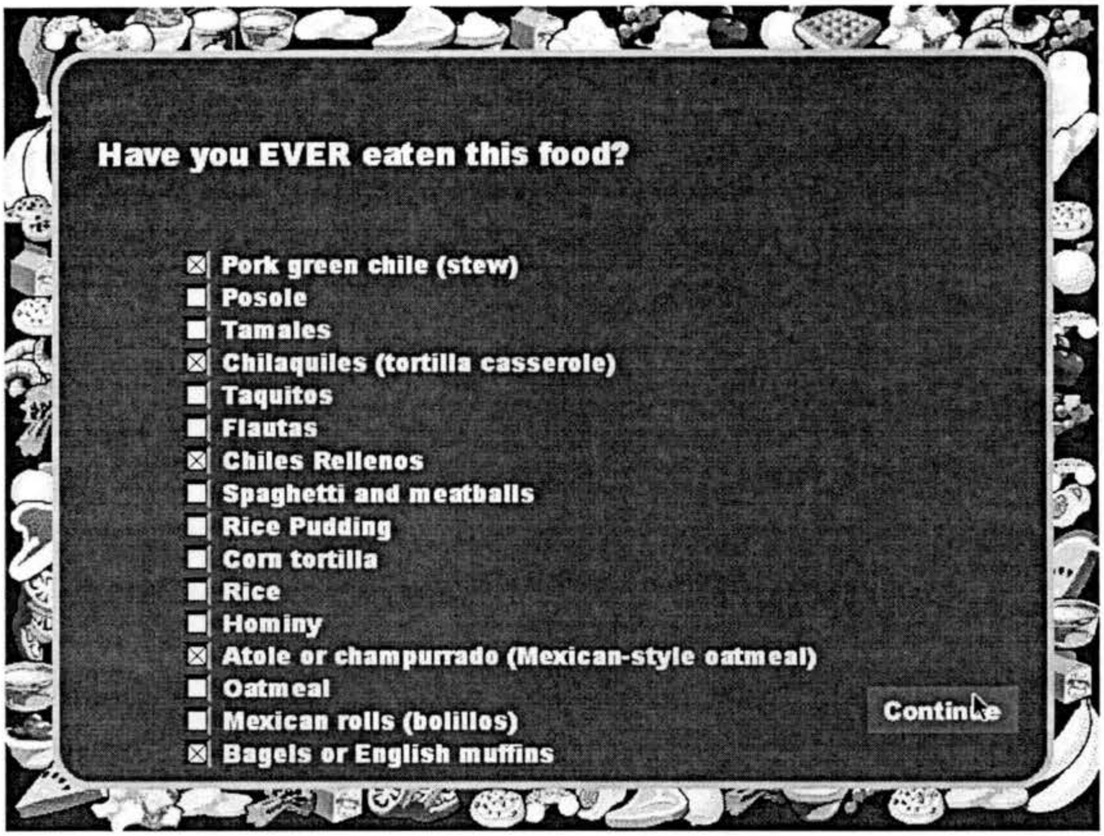

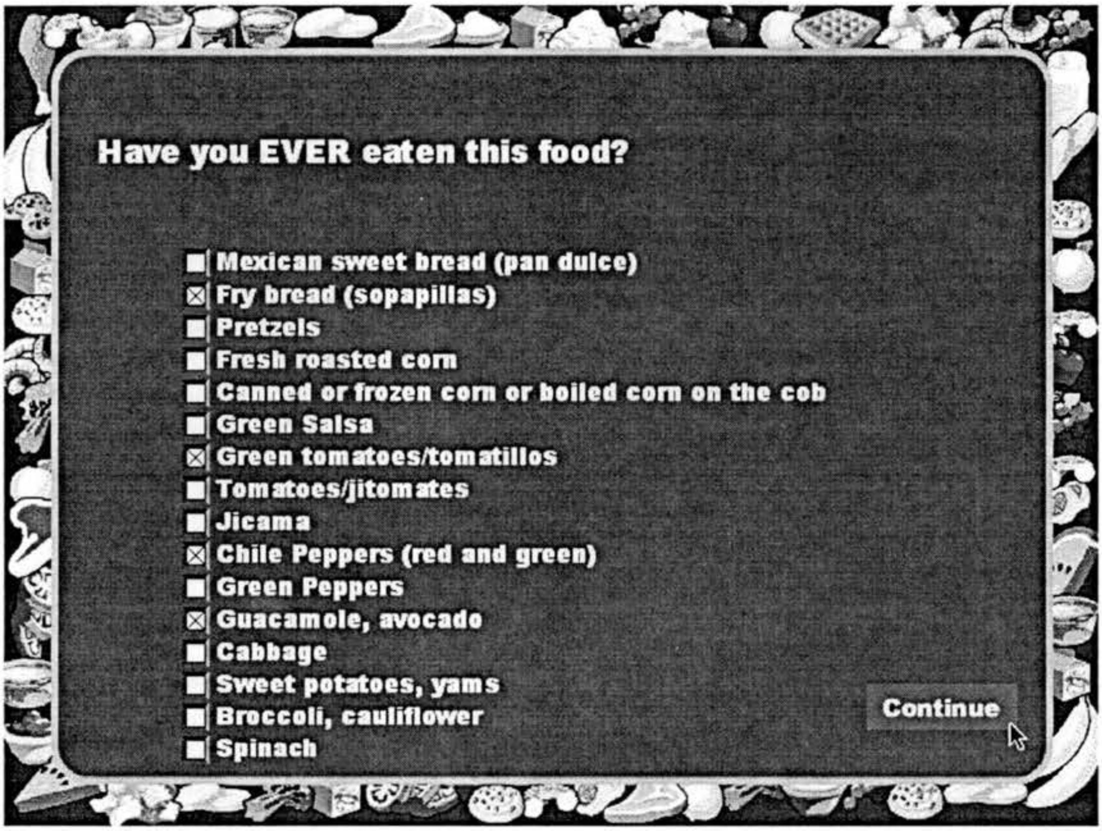

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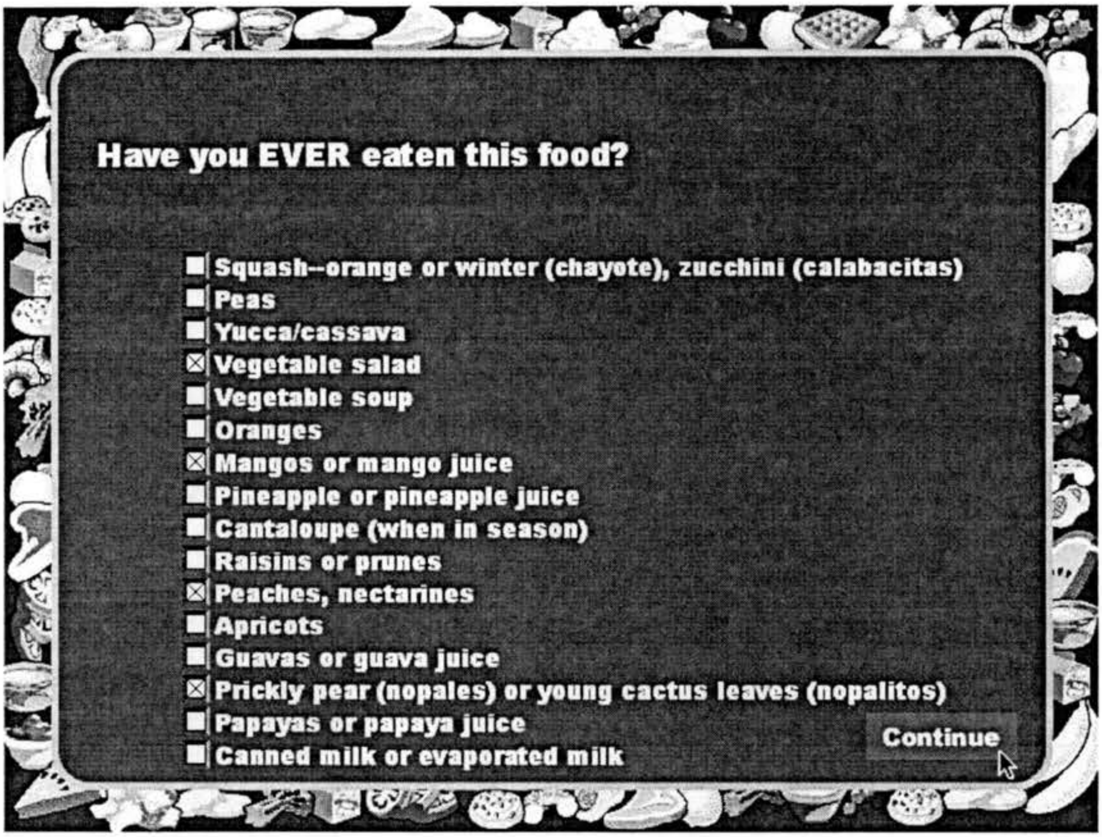

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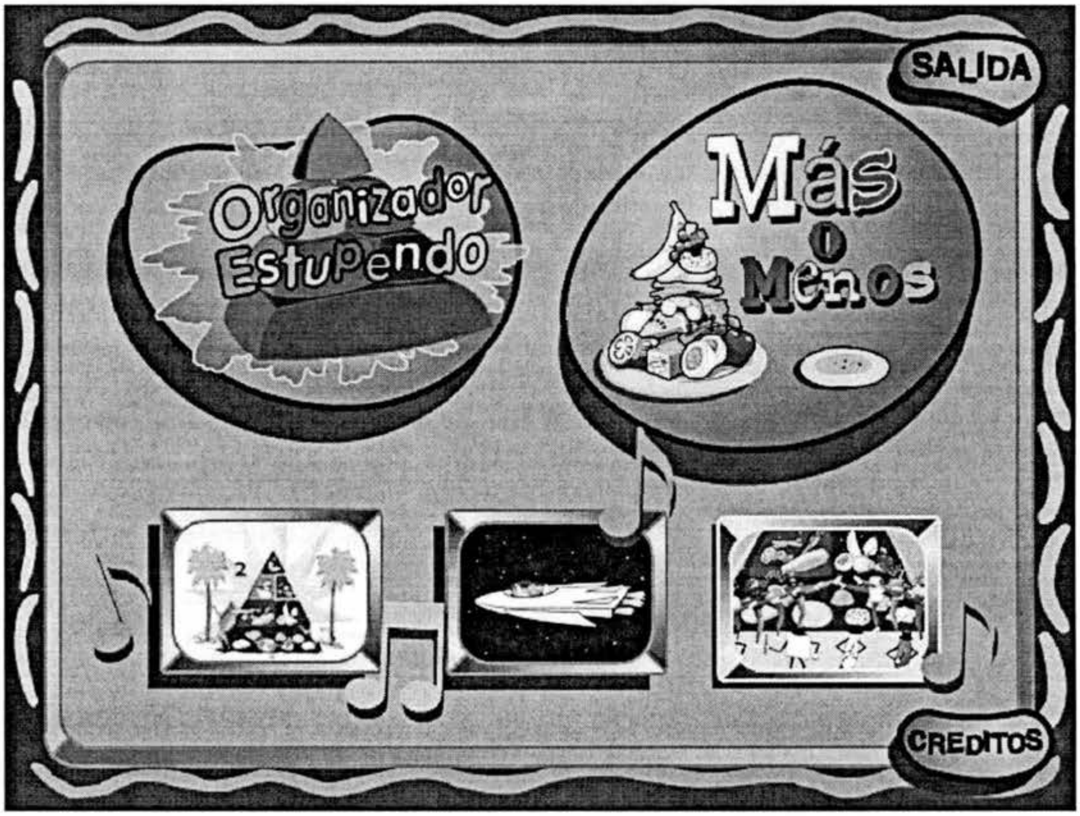
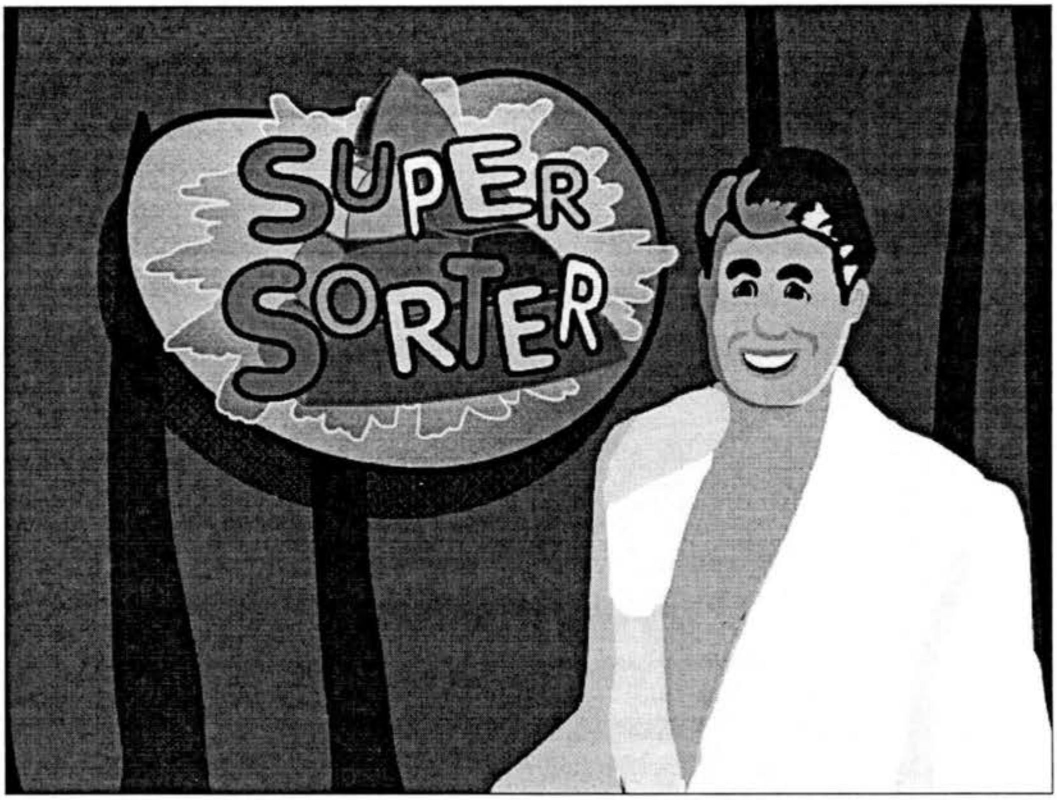
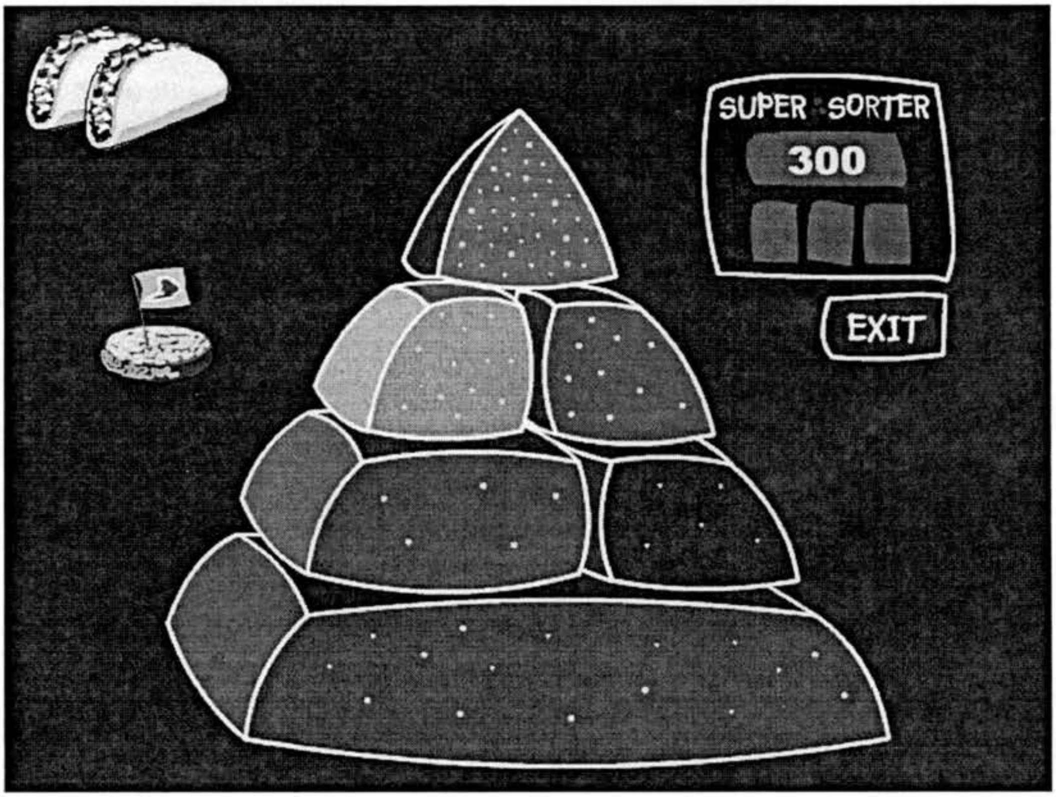
Main Menu Screens

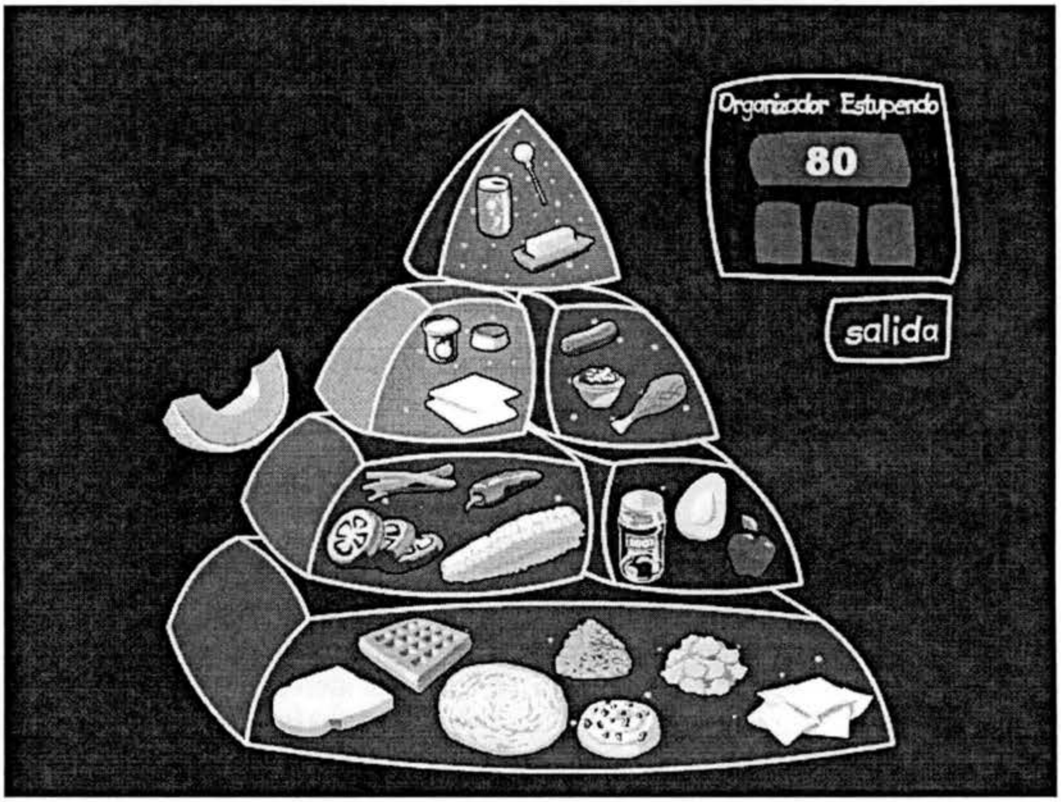


Super Sorter Sample Screens






Organizador
Estupendo


Organizador Estupendo
80
salida

Super Sorter Script

[Super Sorter] [Organizador Estupendo] [Breads & Tortillas][Panes y Tortillas] [Vegetables][Verduras] [Fruits][Frutas] [Milk][Leche] [Meats][Carnes] [Fats & Sweets][Grasas y Dulces]
OK you crazy pyramid schemers... the food guide pyramid has all the foods you and I eat... and they're divided into groups... how ? Vale, tus jugadores de la píramide ... Bueno, empezamos el juego...la Guía Píramide de Comidas tiene todas los alimentos que tú y yo comemos y está dividido en varios grupos...¿como? Foods are grouped in the Food Guide Pyramid based on NUTRIENTS. The size of each section shows how much of each type of food you should eat. Las comidas en La Guía Pirámide de Comidas están formadas en grupos basados en LOS NUTRIENTES. El tamaño de cada sección muestra cuanto de cada tipo de comida tú debes de comer. The base and the biggest portion of the Food Guide Pyramid is made of the Breads group, foods like bread, tortillas, cereal, crackers, and pasta. These foods will give you the energy to keep going all day. Base your meals and snacks on these foods. El base y la sección más grande de la Guía Pirámide de Comidas es el Grupo de Panes, como los granos, tortillas, cereáles, galletas, fideos, y pasta. El consumo de estos alimentos te da la energía que tu cuerpo necesita para todo el día. Planea tus comidas, entremeses, y bocadillos con estos alimentos. On the next row you find fruits and vegetables which are packed with vitamins and minerals to keep you healthy. Notice how much space the breads, fruits, and vegetables take up of the pyramid! Build your meals using these foods first. En la siguiente fila encontrarás frutas y verduras, las cuales contienen vitaminas y minerales para mantener tu salud. Mira a cuanto espacio ocupan los panes, frutas y verduras en la pirámide! Construye tu dieta y tus comidas usando estos alimentos principalmente. On the third row you have the milk and calcium foods -- like cheese and yogurt -- that will build strong bones....and then next to that group the Meat, Beans, and Eggs foods -- the high protein foods that will help you grow and form strong muscles. La tercera fila contiene leche y alimentos con calcio -- como queso y yogúr—que mantienen fuertes a los huesos ... y al lado de este grupo están carnes, frijoles, y huevos, tambien llamados blanquillos –las comidas altas en proteína que ayudan a crecer y a formar músculos fuertes.

English and Spanish are included together here, however the user chooses either English or Spanish before entering the main menu. [brackets denote onscreen text or button text] *(words in parenthesis are on-screen actions)*

Oh yeah....do you see that smaaaaall triangle at the top? That's for fats and sweets ...like soda. It is Soooooooo small because you should choose these only soooooooometimes. Oh claro...¿vees el triángulo pequeño a la arriba? Es para grasas y dulces ... como soda, también lammada bebida gaseosa. Es tan pequeño porque debes escojer estos alimentos y bebidas solamente de vez en cuando. To play this game, a food will appear, and all you have to do is click on the group of the pyramid where it belongs. It's going to go a little faster and get a little harder in each round and, watch out...three wrong answers and you'll have to start again. Para jugar este juego, un alimento va a aparecer y lo único que debes de hacer es empujar el grupo de la pirámide al cual pertenece. El juego será un poco más rápido y difícil en cada ronda y, fíjate...tres respuestas malas y tendrás que empezar otra vez. Let's play the game. Vamos a jugar.
You missed the categories for three foods. Would you like to play again? Clasificaste tres comidas incorrectamente. ¿Quieres jugar otra vez?
[skip intro][[exit game][salida]
Bread: 6-11 servings a day Panes: 6 – 11 servidas por día
Veggies: 3-5 Verduras: 3 - 5
Fruit: 2-4 daily Frutas: 2-4 por día
Milk: 2-3 servings Leche: 2-3 porciones
Meat: 2-3 a day Carnes: 2-3 cada día
Fats and sweets: just a very little bit Grasas y dulces: solamente un poquito
[would you like to play again?] [¿quieres jugar otra vez?] [yes] [si] [no thanks] [no gracias]
The following foods are presented randomly -- not necessarily in this order:
Hamburger Hamburquesa
hamburger bun top Panecillo arriba
hamburger bun bottom Panecillo abajo
Cheese Queso
lettuce & tomatoes Lechuga y tomate

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Pizza Pizza
Crust Corteza
Tomatoes Tomtes
Pineapple Piña
Ham Jamón
Tacos Tacos
corn tortillas Tortillas de maíz
Ground beef Carne molida
Turkey sandwich Sandwich de pavo
Bread Pan
Turkey Pavo
Hot dog Perro caliente
Hot dog Perro caliente
Bun top Panecillo arriba
Bun bottom Panecillo abajo
Chile relleno Chile relleno
green chile Chile verde
Oatmeal Avena
Corn bread Pan de maíz
Bagel Bagel
Pretzels Pretzels
Waffle Waffle o Barquillo
Tortilla chips Tortillas fritas
Cookies Bizcochos
Rice Arroz

Pasta Fideos
Flour tortilla Tortilla de harina
Cereal Cereal
Pan dulce Pan dulce
Donut Dona
Potatoes Papas
Jicama Jícama
Cassava Yucca
Corn on the cob Elote
Broccoli Brecól
Peas Guisantes
Cucumbers Pepinos
Mushrooms Hongos
Salsa Salsa
grape juice Jugo de uva
Bananas Plátanos
Cantaloupe Melón
Raisins Pasas de uva
Strawberries Fresas
prickly pear Nopalitos
Papaya Papaya
Cottage cheese Requesón
Flan Flan
Pudding Pudín
Yogurt Yogúr

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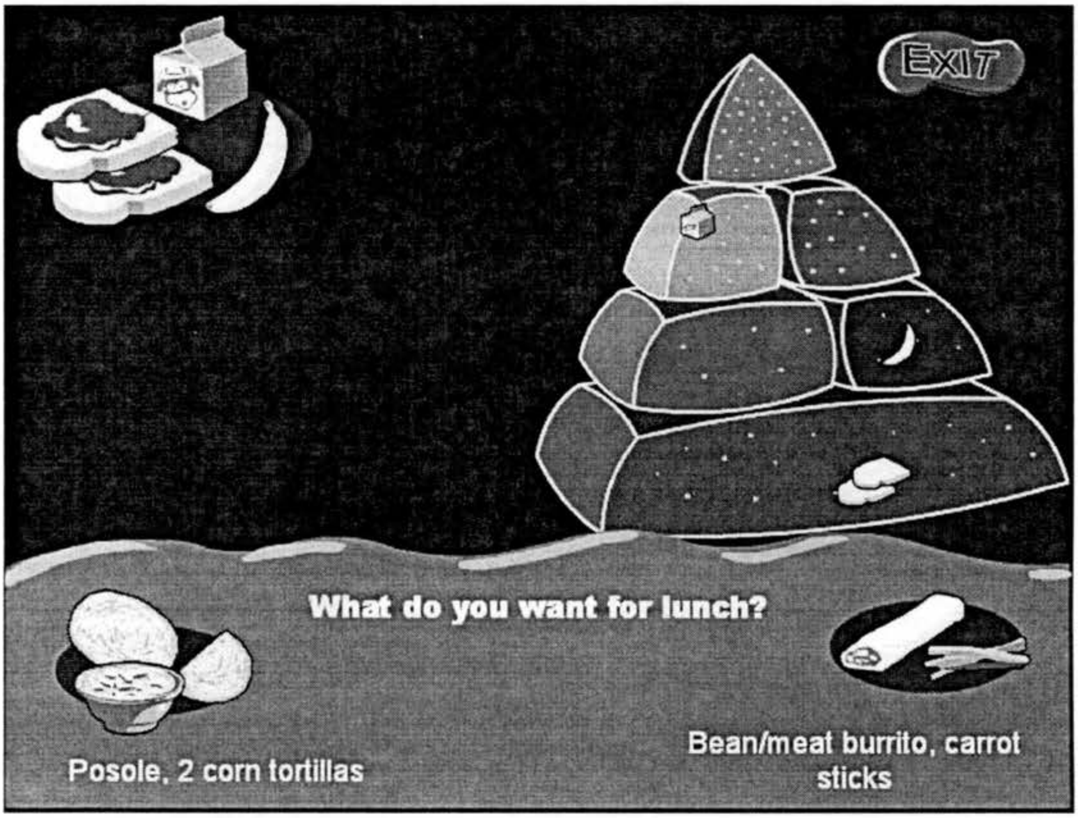
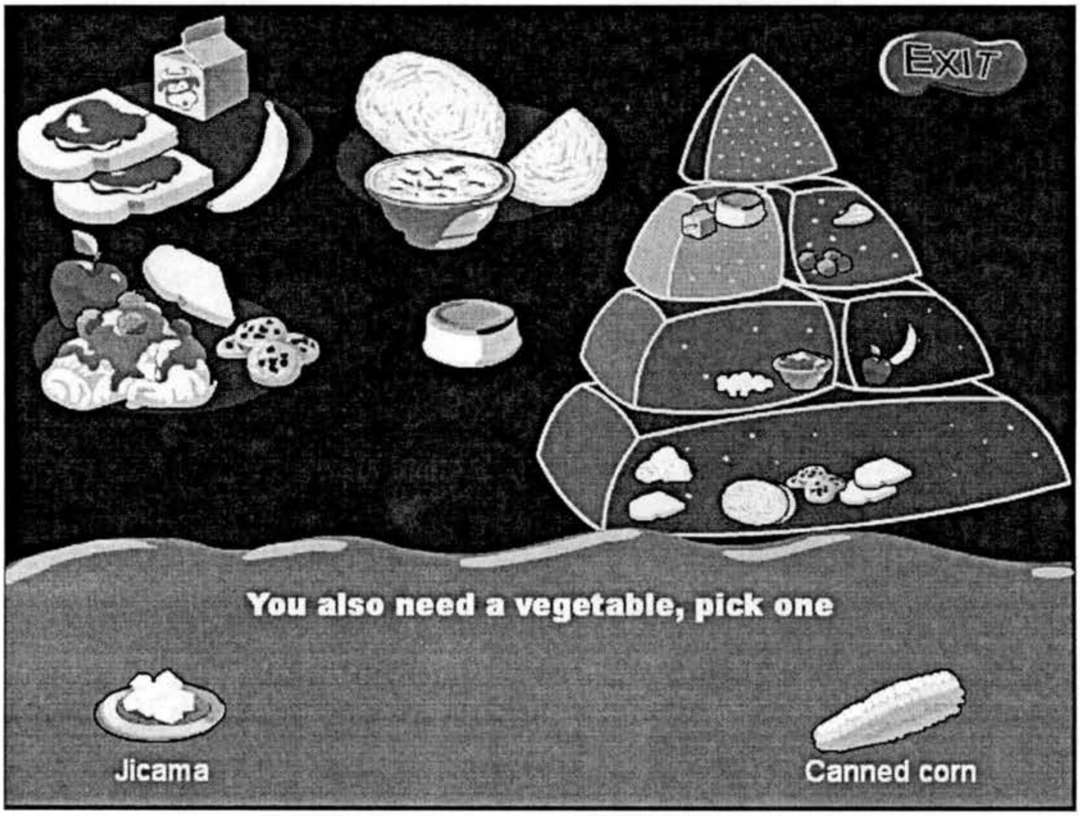
string cheese queso tipo "string"
chocolate milk Leche con chocolate
Chorizo Chorizo
pork chops Chuletas
Tuna Atún
peanut butter Crema de maní o cacahuate
carne asada Carne Asada
Steak Bistek
Shrimp Camarón
Nuts Nueces
Soda Soda o bebida gaseosa
fruit drinks Bebidas de fruta
Candy Dulce
Butter Mantequilla
sour cream Crema
Jelly Jalea
Honey Miel
Fried pork rinds Chicharrones

More or Less Sample Screens






SALIDA
Panes
4
100
Más
o
Menos
Más
Panes: ¿necesitas más o menos ?
Menos


Rosa's Menu
Almuerzo (Desayuno):
cereal con leche; banana o plátano
Lonche:
dos enchiladas de pollo; durazno
Bocadillo o Entre Comida:
pedazos de zanahorias
Cena:
pizza con queso, salsa de tomate y jamón, helado
SALIDA

More or Less Script

More or Less Más o Menos
Welcome to everyone's favorite game... More or Less. Let's get started right away... Bienvenidos al juego que les gusta a todos...Más o Menos. Vamos a empezar ahorita ...
First things first. What do you think about me? Do you like me MORE or LESS than other game show hosts? Al primero ¿Qué piensas de mí? ¿Me gusto yo más o menos que los otros presentadores? [more] más] [less] [menos]
More: Well, I sure like your answer. Here's (one) hundred points, just for agreeing with me. Let's play the game. Más: Bueno, seguro que me gusta tu respuesta. Aquí hay cien puntos, simplemente porque estás de acuerdo conmigo. Vamos a jugar.
Less: Hmmm... ok, so I'm not your favorite ... yet! Here's (one) hundred points to help you change your mind. Let's play the game. Menos: Hmmm, está bién, no soy tu favorito ... todavía! Aquí hay cien puntos para ayudarte a cambiar de opinión. Vamos a jugar.
The base and the biggest portion of the Food Guide Pyramid is made of the Breads group, foods like bread, tortillas, cereal, crackers, and pasta. These foods will give you the energy to keep going all day. Eat between 6 - 11 servings from the Breads group each day. Sound like a lot? Don't worry. One serving is one slice of bread or one flour tortilla. It adds up quickly after a day. El base y la mayor porción de la Guía Pirámide de Comidas está formada por el grupo de Panes, alimentos como granos, tortillas, cereal, galletas, y fideos. Estos alimentos te darán la energía para continuar con el día. Come entre 6-11 servidas del grupo de Panes cada día. ¿Se escucha demasiado? No te preocupes. Una porción es una tajada de pan o una tortilla de harina. Es muy fácil comer el mínimo -- lo que necesitas -- en el día. If you've eaten everything you're going to eat today, and you have a total of 4 servings from the Breads group... do you need to eat more or less from the bread group? Si has comido todo lo que comerás ahora, y tiene un total de 4 porciones del grupo de Panes...Necesitas que comer más o menos del grupo de Panes?
[Bread: do you need more or less?] [Panes: ¿necesitas más o menos ?]

More: (great) exactly... more breads... How about a few flour tortillas – two tortillas would tally up to two more servings, making a total of six? Or a bowl of cereal, again two servings? Más: (fabuloso) exactamente...más panes...¿Qué tal unas tortillas de harina? Dos tortillas harán dos servidas más, haciendo un total de seis. ¿O un tazón de cereal? Otra vez dos porciones.	
	Less: You've only eaten 4... but need at least 6... try again. Menos: Has comido solamente 4 ... pero necesitas 6 .... Trata otra vez.
	Moving on to vegetables, which are full of vitamins. You need at least 3 to 5 per day .... you've eaten 1. Should you have more or less? Ahora verdures o vegetales, las cuales están repletas de vitaminas. Necesitas por lo menos de 3 a 5 porciones por día...has comido 1. ¿Debes tener más o menos?
	[Vegetables: Should you have more or less?] [Verduras: ¿Debes comer más o menos?]
	More: Exactly...veggies are great for you. You need at least another two. Think of some yummy veggies that you like – what about some corn? Or carrots and cucumbers? Add a dip to make them even more fun. Más: exactamente...verduras son muy saludable para tí. Necesitas por lo menos otras dos. Piensa en algunas deliciosas verduras que te gustan. ¿Que tal elote? ¿O zanahoría y pepinos? Untalos en algo para hacerlo más divertido.
	Less: Not quite. You still need at least two more veggies. Try again. Menos: No totalmente. Todavía necesitas por lo menos otras dos verduras. Trata otra vez.
	Fruits are right next to vegetables on the second level of the Food Guide Pyramid. The box is a little smaller for fruit than vegetables because you don't need as many fruits as veggies. You should eat at least two fruits a day and three veggies a day. That makes 5. Have you heard about 5-a-day? So, compare fruits to Bread groups... do you need more Fruits than Breads? Or less Fruits than Breads? Frutas están al lado de las verduras en el segundo nivel de la Guía Pirámide de Comidas. La caja de las frutas es más pequeña que la de las verduras porque no necesitas tantas frutas como verduras. Debes comer por lo menos dos frutas y tres verduras al día. Que harán cinco. ¿Has escuchado de "5 al día"? Entonces compara el grupo de frutas al grupo de Panes...¿necesitas más frutas qué panes? ¿O menos frutas qué los alimentos del grupo de panes?
	[Fruits: do you need more than bread or less than bread?] [Frutas: necesitas más servidas de frutas que panes o menos?]
	More: The Food Guide Pyramid says you should eat more Breads than Fruits Más: La Guía Píramide de Comidas muestra que debes comer más de los alimentos del grupo de panes que del grupo de frutas.
	Less: Good job! You are learning the Food Guide Pyramid. The Food Guide Pyramid says you should eat more Breads than Fruits. Menos: Buen trabajo! Estás aprendiendo la Guía Píramide de Comidas. La Píramide dice que debes comer más del grupo de Panes que del grupo de las Frutas.

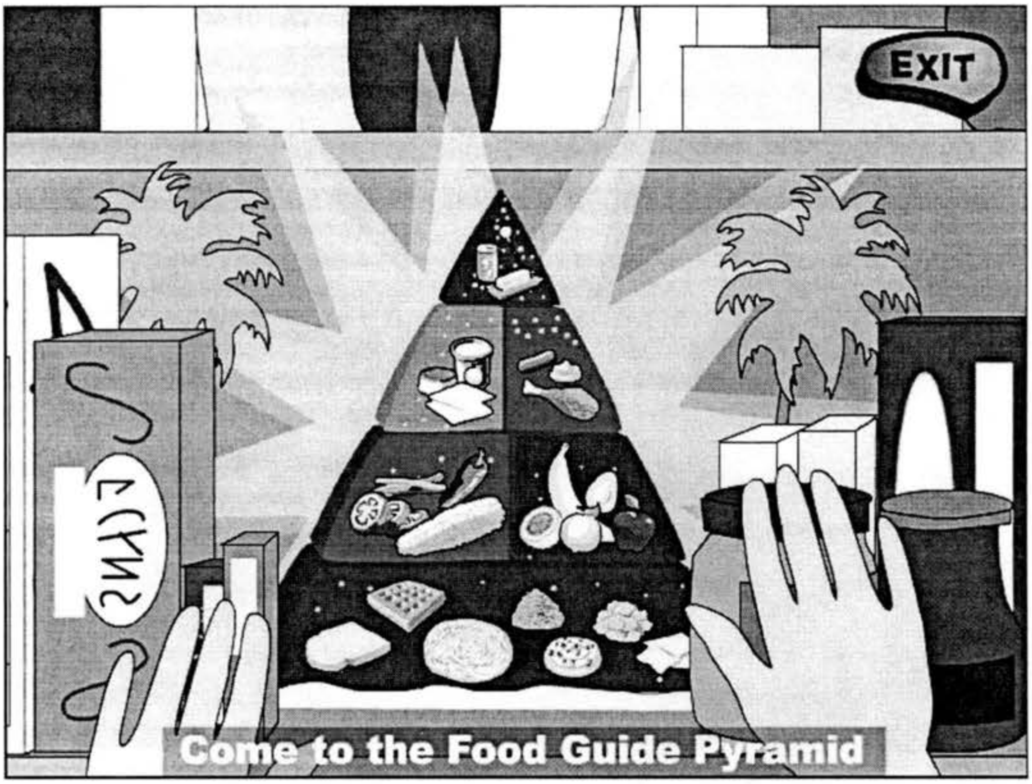
	Next, on the third row, you have the Milk and Calcium foods -- like cheese and yogurt -- that will build strong bones....And then next to that group the Meat, Beans, and Eggs foods --the high protein foods that will help you grow and form strong muscles. So, compare the Milk group to the Meat group ... Do you think you need more Milk and Calcium Foods than foods from the Meat Group? or less items from the Milk group than the Meat group? Siguiente, en la tercera fila, hay el grupo de leche y comidas con calcio -- como queso y yogúr -- qué te ayudan a formar huesos fuertes...Y luego, al lado, está el grupo de carne, frijoles, huevos, y blanquillos -- los alimentos altos en proteínas que te ayudan a crecer y formar músculos fuertes. Entonces, compara el grupo de la leche al grupo de la carne...¿Crees que necesitas más leche y alimentos con calcio qué alimentos del grupo de la carne? O menos de la leche qué de la carne?
	[Milk: do you need more than meat or less than meat?] [Leche: ¿Necesitas más porciones del grupo de la leche qué del grupo de carne o menos?
	ha! Trick question... don't worry, I'll still give you 100 points... Both of these groups have the same requirements -- at least 2 servings a day. ha! Qué pregunta de pega ...no te preocupes, yo todavía te daré los 100 puntos...Los dos grupos tienen los mismos requisitos -- por lo menos dos servidas al día.
	(same answer regardless of selection)
	Ok, the tippy top is tricky... it is for fats and sweets, like soda pop and butter. But...fats and sweets are found in many food items too like donuts, potato chips, and ice cream. These foods belong in food groups, but have a lot more fat than other choices in those groups. Oh yeah, there aren't any serving numbers for this group – just choose these items sometimes. Ask your parents to help you watch your fat and sugar. Está bien, la punta o el triángulo en la cumbre de la Píramide es diferente que los otros grupos ...esta sección es para las grasas y dulces, como soda y mantequilla. Grasas y dulces son encontradas también en varios alimentos como donas, papitas y helado. Estos alimentos pertenecen a grupos de comida, pero tienen más grasa que otros alimentos en estos grupos. Oye, no hay algun número de porciones para grasas y dulces -- solo escoje estos escasamente. Píde a tus padres que te ayudan a tener cuidado con tu consumo de grasas y dulces. So...you "more or less" master... let's put this into practice. Take a look at everything Rosa has eaten today... let's take it to the pyramid. Entonces...tu maestro de "más o menos" ... pongamos esto en práctica. Observa a todo lo que Rosa ha comido hoy...vamos a poner los alimentos en la pirámide.

[Breakfast: cereal with milk] [Almuerzo (Desayuno): cereal con leche] [Lunch: cheese pizza with sauce and pepperoni, peach] [Lonche: pizza con queso, salsa de tomate, y pepperoni, durazno] [Snack: French fries, grapes] [Bocadillo o entre comida: papas fritas y uvas] [Dinner: 2 chicken enchiladas, ice cream] [Cena: 2 enchiladas de pollo, helado]
Hmm.... It appears Rosa has met the minimum requirements for all of the pyramid pieces but one. Which one? Hmm...Parece que Rosa ha juntado lo mínimo de los requisitos de todas las partes de la pirámide menos una. ¿Cuál es? Bread Panes Veggies Verduras Fruits Frutas Meat Carnes Milk Leche
[Which piece does not have the minimum requirements?] [¿Cuál sección no tiene el mínimo de los requisitos?] [Bread][Panes] [Veggies][Verduras] [Fruits][Frutas] [Meat][Carnes] [Milk][Leche]
Bread: exactly, she needs at least 6, but has only eaten 5. Panes: exactamente, ella debe comer por lo menos 6, pero ha comido solamente 5.
Veggies: No... she has at least 3, try again Verduras: No ...ella comío por lo menos 3, trata otra vez.
Fruits: No, she has at least 2, try again. Frutas: No, ella ha comido por lo menos 2, trata otra vez.
Meat: No... she has at least 2, try again. Carnes: No...ella tiene por lo menos 2, trata otra vez.
Milk: No... she has at least 2, try again. Leche: No ... ella comío por lo menos 2, trata otra vez.
And... it looks like she may have too much of one category. Which one should she have eaten less of? Y ... parece que ella ha comido demasiado de una categoría. ¿Cuál es la que ella debería haber comido menos?
[Which category has too much?][¿De cuál categoría comió ella demasiado?] [Bread][Panes] [Meat][Carnes] [Milk][Leche]
Bread: No, sorry... She didn't meet the minimum of 6... she should eat more bread. Try again. Panes: No, ella no ha hecho el mínimo de 6 porciones, necesita comer más de los Panes. Trata otra vez.

Meat: No, if she ate less meat, she wouldn't have the minimum 2. Carnes: No, si ella comió menos carne, ella no tendría el mínimo de 2.
Milk: Super! She ate 4 and she needs other foods. Instead of the ice cream, maybe she could pick a food from the Bread group Leche: Super! Ella comió 4 y ella ya necesita otros alimentos. En vez de helado, posiblemente ella puede escojer un alimento del grupo de Panes.
If Rosa were still hungry, she could eat another meat, veggie, fruit, and lots of bread. Which of these are your favorites? Si Rosa todavía tenga hambre, ella podría comer otra comida de los grupos de Carnes, Vegetales, Frutas, y mucho de los Panes. ¿Cuál de estos alimentos es tu favorito?
[Pick one bread][Escoje uno del Pan] [Mexican Rice][Arroz Mexicano] [English Muffin][Molletes de Inglaterra]
Pick a vegetable. [Escoje una verdura]
[Pick one veggie][Escoje una verdura] [Green Salsa][Salsa Verde] [tomatoes][tomates]
Select a fruit.[Escoje una fruta]
[Pick one fruit][Escoje una fruta] [mango][mango] [strawberries][fresas]
Choose a meat[Escoje uno de la carne]
[Pick one meat][Escoje uno de la carne] [peanut butter][crema de cacahuate o maní] [eggs][huevos o blanquillos]
Let's plan a meal for today. What do you want for breakfast? Planeemos una comida para hoy. ¿Qué quieres comer para el almuerzo (desayuno)?
[What do you want for breakfast?] [¿Qué quieres comer para el almuerzo? [Atole, 2 pan dulce, apple][Atole, 2 pan dulce, manzana] [2 pieces of toast, 1 banana, 1 chocolate milk] [2 panes tostados, 1 banana (plátano), leche con chocolate (ovalmaltina)
What do you want for lunch? ¿Qué deseas comer para el lonche?
[What do you want for lunch?] [¿Qué quieres comer para el lonche?] [Posole, 2 corn tortillas][Posole, 2 tortillas de maíz] [Bean/meat burrito, carrot sticks][Burrito con carne y frijoles, zanahoria en pedazos]
What do you want for dinner? ¿Qué quieres comer para la cena?
[What do you want for dinner?] [¿Qué quieres comer para la cena?] [Spaghetti and meat balls, bread, cookies, apple][Espagueti y albondigas, pan, bizcochitos, manzana] [Rice, beans, carne asada, bolillo, cookies, guava][Arroz, frijoles, carne asada, bolillo, bizochitos, guava]
What do you want for a snack? ¿Cuales de estos alimentos quieres para el bocadillo?

	[What do you want for a snack?][¿Qué quieres comer para el bocadillo?] [flan][flan] [cheddar cheese][queso tipo "cheddar"] [fish][pescado] [steak][bistek] [pineapple][piña] [watermelon][sandia] [jicama][jícama] [canned corn][elote en lata] [bread rolls][panecillos] [crackers][galletas saladas]
	This is a great looking pyramid... you've met all the minimums. You've won...because you can make a menu. Now try to make a menu everyday. Use the Food Guide Pyramid as a guide.....To remember how many servings you need from each food group – at least -- per day think 6 Bread. 3 Veggies. 2 Fruit. 2 Milk. 2 Meats. That's 6 - 3 - 2 - 2 - 2. Esto es una pirámide perfecta...has juntado lo mínimo. Has ganado... porque puedes hacer un menú. Ahora trata de hacer un menú así cada día. Usa la Guía Pirámide de Comidas como una guía...Para recordar cuantas servidas necesitas de cada grupo -- por lo menos -- cada día, piensa 6 del grupo de panes. 3 de verduras. 2 de frutas. 2 de leche. 2 de carnes. Eso hace 6-3-2-2-2.

The Food Guide Pyramid (La Pirámide Guía de las Comidas)
Sample Screens



English and Spanish are included together here, however the user chooses either English or Spanish before entering the main menu.

The Food Guide Pyramid (La Pirámide Guía de las Comidas)
Song Script

Chorus/Intro:

When you get hungry, where do you go
¿Cuándo te da hambre, ¿a dónde vas?

what do you eat
¿qué comes?

how do you know
¿cómo sabes?

what your body needs to help it grow?
¿qué requiere tu cuerpo para crecer?

Come to the food guide pyramid
Ven a la Pirámide Guía de las Comidas

and it will show
y te dirá

Verses:

You need bread-six servings a day
Requieres pan-seis porciones por día

cereal, tortillas, they're all okay.
trabajan bien cereal y tortillas.

You need vegetables-three times or more
Requieres vegetales-tres veces o más

carrots, cassava, potatoes or corn.
zanahoria, cazabe, maíz o papas.

Fruits are good, juicy and sweet
Son buenas y dulces las frutas

every day, two times at least.
cada día-dos veces o más

Milk and food with calcium
Leche y la comida con calcio

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two times a day is the minimum.
dos veces al día es el minimo.

Then there's meat, beans and eggs
También hay carne, frijoles y huevos,

put them on your plate two times a day.
dos veces al día-sírvelos.

Last and least is fats and sweets
No debes comer mucho de

only a little is all you need
la grasa o los dulces.

<u>Chorus/Conclusion:</u>

Next time you're hungry
Cuando tienes hambre

now you will know
ahora sabes

what you should eat
lo que debes comer

where you should go
donde buscar

to see what helps your body to grow
lo que ayuda a tu cuerpo crecer

Come to the food guide pyramid
Ven a la Pirámide Guía de las Comidas

come on lets go!
vámonos, ya!

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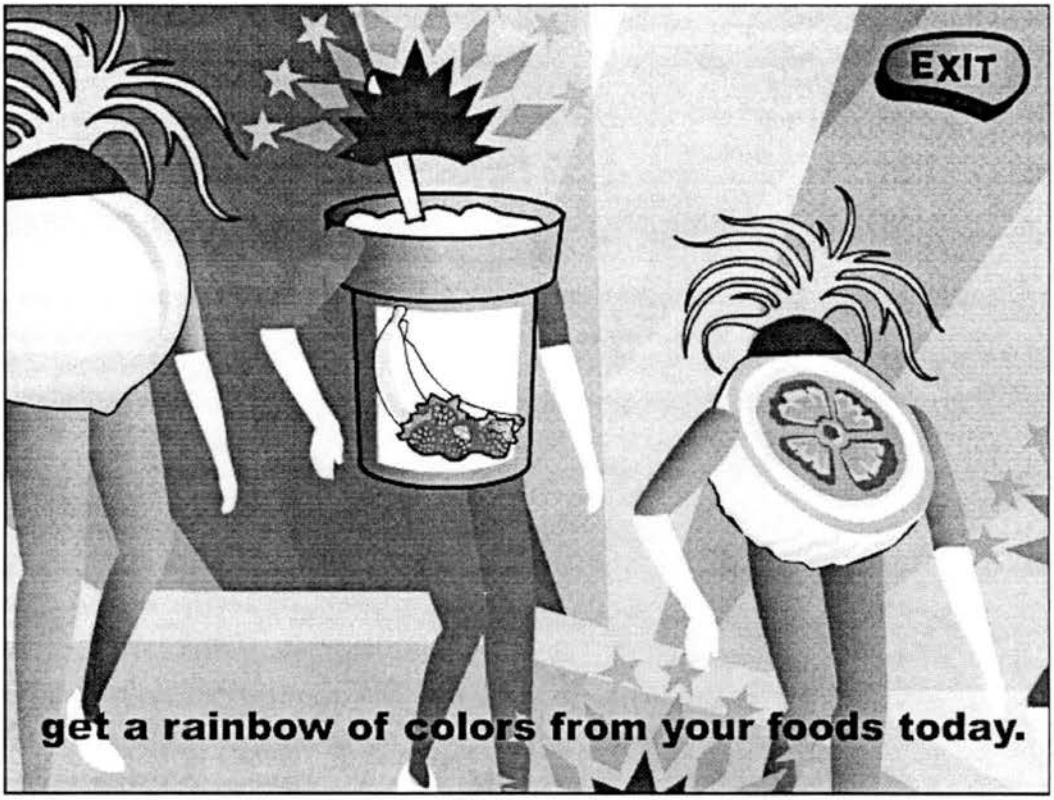
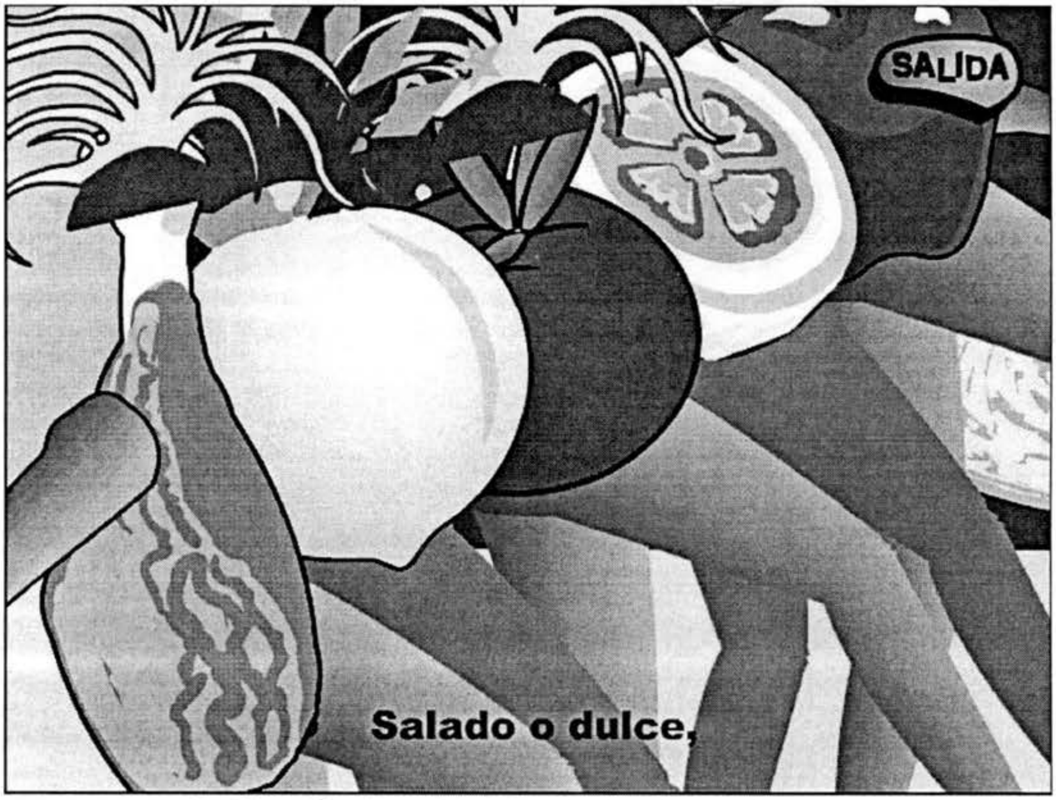
Variety (Variedad) Song Sample Screens





English and Spanish are included together here, however the user chooses either English or Spanish before entering the main menu.

Variety (Variedad) Song Script

Chorus:

Variety, variety
Variedad, variedad

get a rainbow of colors from your foods today
tu comida debe estar, llena de color

Variety, variety
Variedad, variedad

choose a different delight, at the table tonight
debes escoger, algo nuevo de cenar

eat a variety
comas una variedad

(add to chorus last time)
Crunchy or chewy, creamy or gooey, eat a variety
Salado o dulce, cocido o fresco, comas una variedad

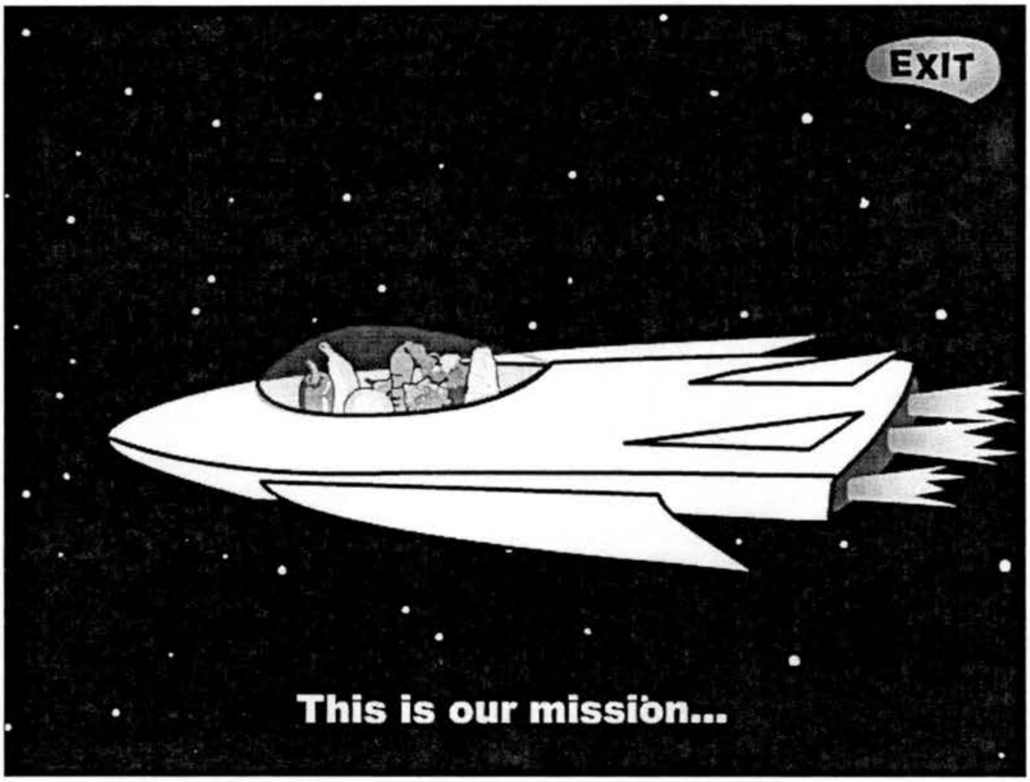
Verses:

There's no need to be boring / do some culinary exploring
no tiene que ser aburrido / puedes ser explorador culinario

fruits and vegetables, dairy, grains and meats / there's a rainbow of choices in each of these.
frutas, vegetales, granos y carnes / de estos, hay muchas opciones distintas.

English and Spanish are included together here, however the user chooses either English or Spanish before entering the main menu.

The Food Adventurers (Los Aventureros de la Comida)
Song Sample Screens



English and Spanish are included together here, however the user chooses either English or Spanish before entering the main menu.

The Food Adventurers (Los Aventureros de la Comida) Song Script

Spoken Introduction:

This is our mission / to search out new foods
Esta es nuestra misión / buscar nueva comida

to explore new tastes / to eat what we've never eaten before
explorar nuevos sabores / comer lo que nunca hemos comido.

Chorus:

We're the food adventurers
Somos los aventureros de la comida

trying foods we've never had before
probando comida nueva

and we pledge that we won't let our mouths be bored
y prometimos que la comida nunca nos va aburrir

We're the food adventureres
Somos los aventureros de la comida

Verses:

With our forks in our hands
con tenedores en las manos

we will take our seats at the table
nos sentamos a la mesa

we consult the food guide pyramid
consultamos La Pirámide Guía de las Comidas

and follow it as best as we are able
lo seguimos lo mejor que podemos.

English and Spanish are included together here, however the user chooses either English or Spanish before entering the main menu.

Infomercial Scripts

Now, this headline: Fruit drinks aren't fruit! Fruit drinks often have as much sugar as a soda pop ... 10 teaspoons! Consider drinking fruit juice instead ... it counts as a fruit serving in the pyramid!

Ahora, este titular: Refrescos o bebidas de frutas no están hechos de frutas naturales. Casí siempre tienen igual o hasta más azúcar que las sodas...10 cucharaditas! Considera tomar jugos de frutas en vez...eso cuenta como una porción de frutas en la pirámide!

What's wrong with this picture? It's awfully difficult to fill the food guide pyramid if you don't start with breakfast! How 'bout some cereal for 2 bread servings? A tortilla with peanut butter and jelly? Fruit? Don't start the day with an empty plate staring back at you.

¿Qué está mál con la foto? Es terriblemente difícil llenar La Gúia Piramide de Comidas sin empezar con el desayuno. ¿Qué tal algo de cereal por dos servidas del grupo de Panes? ¿Una tortilla con mantequilla de maní y mermelada (jalea)? ¿Fruta? No empieza el día sin un plato de comida.

This game is sponsored by the Candy Bar: the not-good-all-the-time-and-probably-not-even-every-day-but-ok-as-a-treat-every-once-in-a-while-snack.

Este juego está patrocinado por Chocolate y Dulces: no es bueno comerlos todo el tiempo, pero bién como una golosina de vez en cuando.

Salsa: Fun to say and fun to eat ... AND ... one serving counts as a veggie! So, put it on EVERYTHING ... OK...maybe not pancakes (eeew!) What?

Salsa: Divertido para decir y comer...Y...una servida cuenta como una verdura en la pirámide! Entonces, póngala en TODO ...OK...a lo mejor no panqueques, (eeew) ¿Qué?

This game has been brought to you by WATER: the drink that goes with everything!

Este juego ha sido traido por AGUA: la bebida que va con todo!

What are these french fries and chips hiding? These potatoes count as a vegetable in the pyramid, but are high in fat... try carrots, peppers or celery sticks instead and eat fries or chips only sometimes."

¿Qué cubren las papas fritas y las papitas? En la píramide son vegetales, pero son altas en grasa ... trata zanahoria, chile o apio en pedazos y come papas fritas o papitas solamente de vez en cuando.

English and Spanish are included together here, however the user chooses either English or Spanish before entering the main menu.

Description of Foods

Atole. A gruel thickened with masa and sweetened with sugar. It can be made with water or milk, or a mixture of both -- in our case we can have it look like milk.

Burritos. A flour tortilla wrapped around refried beans or meat filling. Chile may be added and depending on region may be served on the top or on the side and can be red or green. I think for our purposes we should leave the chile on the side.

Chilaquiles. A type of corn tortilla casserole. Corn tortillas are cut in small pieces (the same way pizza is cut) and cooked in oil. Scrambled eggs, cheese, and red salsa are added and all cooked together.

Chile. A sauce used for enchiladas or smothered over burritos. In southern Colorado, the chile looks like gravy. It is a light brown with green or red chile added and usually made with meat (pork).

Chile Rellenos. Large mild green chile stuffed with cheese or meat. These are then dipped in a batter of milk, flour, and egg, then fried.

Crullers or fritters (buñuelos). Fried flour tortillas garnished with honey or brown sugar syrup.

Enchiladas. Corn tortillas stuffed with cheese or chicken. Served with choice of green or red chile on top.

Flautas. Fried flour tortillas filled with meat.

Menudo. A soup similar to posole with tripe.

Mexican rice (sopa de arroz). Rice made with tomato sauce/juice and cumin spice.

Mexican rolls (bolillos). These rolls are typically small and made with refined white flour. They are very crisp on the outside and overall dry.

Mole. This is a sauce. In Colorado the most common form is cafecito -- brown colored.

Pork green chile (stew). This is a soup version of the green chile with chunks of pork in it.

Posole. A hearty soup composed of hominy and pork. In Colorado it is typically a "white" posole. Lime wedges are often garnishes.

Quesadillas. Flour corn tortillas folded heated with cheese. Red salsa may be served on the side. Meat is an option for quesadillas.

Rice pudding (arroz con leche). Rice cooked with milk and a little sugar and sprinkled with cinnamon.

Tacos. Corn tortillas filled with meat with garnishes of lettuce, tomatoes, and red salsa.

Tamales. Spicy meat (usually pork) wrapped in cornmeal or masa, then wrapped in softened corn husks and steamed.

Taquitos. Fried corn tortillas filled with meat.

Tostadas. Flat, fried corn tortilla spread with a thin layer of refried beans, selected meat, topped with shredded lettuce, chopped tomato, onion, and grated cheese (often guacamole too)

Foods by Percent Agreement between Tests and Re-Tests (n=12)

Food Group	Test/Re-test Percent Agreement	Criterion Validity Percent Agreement
Custard/flan	92.3	100.0
Flautas	92.3	100.0
Spinach	92.3	90.0
Tripe, menudo	92.3	100.0
Atole	84.6	100.0
Beans	84.6	100.0
Cabbage	84.6	90.0
Canned corn	84.6	70.0
Chilaquiles	84.6	90.0
Crackers	84.6	70.0
Goat	84.6	100.0
Lettuce	84.6	80.0
Mexican crema	84.6	100.0
Mole	84.6	100.0
Papayas	84.6	100.0
Pork green chile	84.6	100.0
Prickly pear	84.6	100.0
Taquitos	84.6	100.0
Tomatillos	84.6	100.0
Vegetable Soup	84.6	80.0
American cheese	76.9	80.0
Bagels	76.9	80.0
Cantaloupe	76.9	50.0
Chile peppers	76.9	90.0
Chile rellenos	76.9	100.0
Cottage cheese	76.9	90.0
Crullers or fritters	76.9	100.0
Grapes	76.9	90.0
Green peppers	76.9	90.0
Green salsa	76.9	100.0
Guavas or guava juice	76.9	100.0
Ice cream	76.9	60.0
Jicama	76.9	100.0
Mangoes or mango juice	76.9	70.0
Mexican-style grilled and barbecued beef	76.9	100.0
Milk	76.9	80.0
Oatmeal	76.9	80.0
Peanut butter	76.9	80.0
Peas	76.9	70.0
Rice pudding	76.9	100.0
Sliced beef strips	76.9	100.0
Spaghetti sauce	76.9	90.0
Squash	76.9	90.0
Steak	76.9	70.0
Yucca	76.9	100.0

Apple, grape or grapefruit juice	69.2	70.0
Apples	69.2	80.0
Atole (listed in Milk group)	69.2	100.0
Barbecued beef	69.2	60.0
Bread rolls	69.2	100.0
Burritos	69.2	60.0
Candy	69.2	60.0
Canned milk	69.2	90.0
Carrots	69.2	60.0
Eggs with chicken livers	69.2	90.0
Fish and seafood	69.2	90.0
Fresh corn	69.2	90.0
Fry bread	69.2	100.0
Ham	69.2	80.0
Meat soup with vegetables	69.2	80.0
Mexican cheese	69.2	100.0
Mexican-style drinks	69.2	100.0
Mexican sweet bread (pan dulce)	69.2	100.0
Orange juice	69.2	90.0
Oranges	69.2	80.0
Posole	69.2	100.0
Potato chips	69.2	90.0
Raisins or prunes	69.2	70.0
Smoothie with milk	69.2	90.0
Soda or coke	69.2	80.0
Strawberries	69.2	90.0
Sweet potatoes	69.2	70.0
Tamales	69.2	90.0
Thin Mexican-style steak	69.2	100.0
Tomatoes	69.2	80.0
Watermelon	69.2	70.0
White bread	69.2	70.0
Apricots	61.5	60.0
Broccoli	61.5	60.0
Chicken	61.5	80.0
Eggs	61.5	60.0
Flour tortilla	61.5	80.0
Guacamole	61.5	90.0
Hamburgers	61.5	60.0
Hot dogs	61.5	50.0
Monterey Jack cheese	61.5	80.0
Mozzarella cheese	61.5	90.0
Peaches, nectarines	61.5	90.0
Potatoes	61.5	70.0
Quesadillas	61.5	60.0
Rice	61.5	90.0
Tostadas	61.5	100.0
Vegetable Salad	61.5	70.0

Cake	53.9	70.0
Chocolate milk	53.9	60.0
Cookies	53.9	70.0
Corn tortilla	53.9	90.0
Donuts	53.9	40.0
Fried pork skins/rinds	53.9	100.0
Fruit drinks	53.9	80.0
Pancakes	53.9	80.0
Pasta soup	53.9	80.0
Pineapple or pineapple juice	53.9	70.0
Pizza	53.9	50.0
Pork or pork chops	53.9	100.0
Red salsa	53.9	90.0
Sour cream	53.9	70.0
Spicy sausage	53.9	100.0
Yogurt	53.9	70.0
Bananas	53.8	50.0
Cheddar cheese	46.2	70.0
Enchiladas	46.2	60.0
Mexican rice	46.2	100.0
Tacos	46.2	60.0
Water flavored with hibiscus	46.2	100.0
Cereal	38.5	100.0
Spaghetti	30.8	70.0

Foods with 100% Agreement between Parents and Children (n=10 pairs)

Food Group	Criterion Validity Percent Agreement	Test/Re-test Percent Agreement
Atole	100.0	84.6
Atole (listed in Milk group)	100.0	69.2
Beans	100.0	84.6
Bread rolls	100.0	69.2
Chile rellenos	100.0	76.9
Crullers or fritters	100.0	76.9
Custard/flan	100.0	92.3
Flautas	100.0	92.3
Fry bread	100.0	69.2
Goat	100.0	84.6
Green salsa	100.0	76.9
Guavas or guava juice	100.0	76.9
Jicama	100.0	76.9
Mexican cheese	100.0	69.2
Mexican crema	100.0	84.6
Mexican-style drinks	100.0	69.2
Mexican-style grilled beef	100.0	76.9
Mole	100.0	84.6
Mexican sweet bread	100.0	69.2
Papayas	100.0	84.6
Pork green chile	100.0	84.6
Posole	100.0	69.2
Prickly pear	100.0	84.6
Rice pudding	100.0	76.9
Taquitos	100.0	84.6
Thin Mexican-style steak	100.0	69.2
Tomatillos	100.0	84.6
Tostadas	100.0	61.5
Tripe, menudo	100.0	92.3
Yucca	100.0	76.9

Significance of Acculturation on Foods Based on Logistic Regression and Controlling for Method of Administration (n=228)

Food Group	Food	Significance (p-value)
Combination Foods	Pork green chile	.055
	Posole	.001
	Tamales	.125
	Burritos	.135
	Enchiladas	.016
	Tacos	.065
	Chilaquiles	.001
	Taquitos	.001
	Tostadas	.037
	Quesadillas	.001
	Pizza	.886
	Flautas	.001
	Chile rellenos	.001
	Rice pudding	.001
Breads, Tortillas, and Cereals	Flour tortilla	.059
	Corn tortilla	.001
	Pasta	.197
	Mexican rice	.001
	Rice	.567
	Cereal	.196
	Atole	.001
	Oatmeal	.344
	Bolillos	.001
	Sliced white bread	.957
	Bagels	.721
	Pan dulce	.001
	Crackers	.509
	Donuts	.013
	Fry bread	.541
	Pancakes	.151
Vegetables	Fresh corn	.001
	Canned corn	.067
	Red salsa	.020
	Green salsa	.001
	Tomatillos	.001
	Tomatoes	.278
	Jicama	.001
	Chile peppers	.001
	Green peppers	.179
	Guacamole	.001
	Cabbage	.508
	Sweet potatoes	.648
	Broccoli	.819
	Spinach	.753
	Potato chips	.779
	Potatoes	.765
	Squash	.012
	Peas	.234
	Yucca	.036

Vegetables	Carrots	.943
	Lettuce salad	.807
	Vegetable salad	.132
	Vegetable soup	.042
Fruit and Fruit Drinks	Orange juice	.674
	Apple juice	.730
	Fruit drinks	.412
	Mexican fruit drinks	.001
	Oranges	.599
	Bananas	.665
	Apples	.676
	Mangoes	.001
	Pineapple	.001
	Cantaloupe	.854
	Watermelon	.559
	Raisins	.721
	Grapes	.478
	Strawberries	.454
	Peaches	.001
	Apricots	.917
	Guava	.061
	Prickly Pear	.008
	Papaya	.001
Milk and Calcium Foods	Milk	.021
	Canned milk	.061
	Chocolate milk	.128
	Atole	.001
	Smoothie	.041
	Mexican crema	.001
	Sour cream	.678
	Mexican cheese	.001
	Monterey Jack cheese	.840
	Cheddar cheese	.013
	American cheese	.505
	String cheese	.018
	Cottage cheese	.955
	Custard	.001
	Yogurt	.201
	Ice cream	.729
Meats, Beans, and Eggs	Beans	.019
	Eggs	.014
	Higaditos	.009
	Chorizo	.029
	Ham	.444
	Pork	.220
	Thin sliced steak (bifstek)	.001
	Steak	.069
	Sliced beef strips	.003
	Barbecued beef	.485
	Grilled beef	.001
	Hamburgers	.810
	Hot dogs	.406
	Fish	.085
	Chicken	.684

Meats, Beans, & Eggs	Goat	.062
	Mole	.001
	Tripe	.001
	Peanut butter	.171
Soda and Snacks	Soda	.209
	Water with Hibiscus (Agua Jamaica)	.137
	Crullers or fritters	.001
	Cookies	.081
	Cake	.113
	Candy	.158
	Fried pork rinds	.065

Peripheral Foods Consumed by More than 75% of Children

	Low Acculturation		Moderate Acculturation	High Acculturation
Combination Foods	Rice pudding	Atole	Tamales Taquitos	
Breads, Tortillas, & Cereals	Corn tortilla Sweet bread (pan dulce)	Rice	Rice	Rice Oatmeal Bagels
Vegetables	Canned corn Jicama Cabbage Vegetable salad	Tomatoes Guacamole Sweet potatoes Vegetable soup	Green salsa	Canned corn Peas
Fruits	Oranges Pineapple	Mangoes Cantaloupe	Oranges Pineapple Peaches	Oranges Pineapple Raisins
Milk & Calcium Foods	Canned milk Sour cream Cottage cheese Yogurt	Smoothie Mexican cheese Custard (flan)	Sour cream Mexican cheese	Peaches Sour cream Cheddar cheese String cheese Cottage cheese Yogurt
Meats, Beans, & Eggs	Eggs with chicken livers (higaditos) Grilled beef Tripe	Thin-sliced steak Fish		Barbecued beef (sloppy joe's)
Soda & Snacks	Water with Hibiscus			
Total	*30*		*9*	*15*

Bold denotes no difference across all acculturation levels.

Peripheral Foods Consumed by Fewer than 25% of Children

	Low Acculturation	Moderate Acculturation	High Acculturation	
Combination Foods	Pork green chile		Posole Flautas	Chilaquiles Atole
Breads, Tortillas, & Cereals			Sweet bread (pan dulce)	
Vegetables	Yucca	Yucca	Jicama	**Yucca**
Fruits	**Apricots**	**Apricots** Guava Prickly Pear	Guava Papaya	Prickly Pear
Milk & Calcium Foods			Mexican cream	Custard (flan)
Meats, Beans, & Eggs			Eggs with chicken livers (higaditos) Goat	Mole Tripe
Soda & Snacks		Water with Hibiscus	Water with Hibiscus	Crullers/fritters
Total	*3*	*5*	*18*	