

White Paper

**Education for Healthy Kids -Primary Prevention of Obesity in the Grade School Setting:
Fox Valley, Wisconsin Experience 1997-2000 in Kindergarten-Third Grade**

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**Education for Healthy Kids -Primary Prevention of obesity in the Grade School Setting:
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Context Community-based action research can provide the impetus for policy and practice changes in school settings, which can positively impact student health.

Objective To assess the effects of increased physical education (PE) time, health curriculum, policy, and cultural changes in the school setting on K-3 student physical fitness and self-efficacy in relation to physical activity and nutrition.

Design, Setting, Participants 3-year pilot in 2 schools (1 public, 1 parochial), 1997-2000, funded by local health care providers, State of Wisconsin Department of Instruction grant, and community donations. Data analysis focused on third grade students although interventions were implemented for K-3.

Interventions 1) Structured daily (30 minute) PE for K-3 curriculum, 2) integrated health education in core K-3 curriculum, 3) adding nutritious food choices in school menus, 4) involving families in school-based, health education events. School policy changes eliminated soda vending machine use during school hours.

Main Outcome Measures Outcomes were measured with parent and third grade surveys, FitnessGram, and physical measurements. Process measures included PE activity levels and dietary analysis of lunch menus. Research methods were modeled after the 1991 NHLBI Child and Adolescent Trial for Cardiovascular Health (CATCH) studies.

Results At a cost of \$100/child/year Education for Healthy Kids (EHK) demonstrated:

- Improvement in aerobic conditioning (100% achieving standard for their age at the spring measurement).
- Improvement in exercise and healthy eating behaviors (improved self-efficacy scale scores for healthy eating ($p=.001$) and physical activity ($p=.005$)).
- Increased involvement in healthy lifestyle choices.
- Anecdotal outcomes, noted through parent and faculty focus groups, included decreased number of playground incidents at school requiring adult intervention, improved direction-following skills in the kindergarten class, and a “spillover” effect of adoption of healthier lifestyle choices among families of children participating in EHK.

Conclusions School-based programming, targeted at younger elementary students, can effectively address risk-related behaviors.

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Education for Healthy Kids

Primary Prevention in Grade School Setting: Fox Valley, Wisconsin Experience 1997-2000 in Kindergarten-Third Grade

Financing primary prevention at the grade school level is a topic of heated debate. Despite the fact that one of Appleton, Wisconsin's alternative high schools had been profiled in a recent documentary "Supersize Me" for the beneficial effect its nutrition program has had on adolescent learning for "at-risk" students, the community still struggles with funding daily physical education and health programs in the schools. Local (county) mortality statistics show that coronary heart disease, cancer, stroke, respiratory conditions, and diabetes are the leading causes of death for this community.¹ Modifiable risk factors include hypertension, elevated serum cholesterol, cigarette smoking, physical inactivity, and diet.

Obesity is one of the major risk factors associated with the development of chronic diseases, such as cardiovascular disease, Type II diabetes mellitus, hypertension, stroke, dyslipidemia, osteoarthritis and selected cancers.² Lowering health risks and maintaining a no-risk status over time are associated with lower health insurance costs.³ In Wisconsin, prevalence of overweight adults has increased to 58%.⁴ Twenty four percent of Wisconsin high school students are overweight or at risk of becoming overweight.⁵ Childhood obesity is increasing at an alarming rate in Wisconsin.

Preventing deaths due to cardiovascular disease, stroke, cancer, and diabetes and decreasing the economic burden for chronic conditions such as diabetes and hypertension can be addressed by changes in activity/exercise and nutritional behaviors.^{6 7 8 9 10 11} Annual health care costs for persons with chronic conditions, which included care for both their chronic

conditions and any acute health care problems average \$3,074 per person per year compared with \$817 for persons with only acute conditions.¹² Primary prevention at an early age is the answer.

In 1997, this community identified the importance of targeting risk behavior prevention programs at younger students as a local community need. Previous prevention programs focused on smoking, drugs, and obesity had targeted middle school students. Students are making choices related to risk behaviors earlier and need to get positive lifestyle messages at an earlier age. The hypothesis of this protocol was that a modest financial investment for kindergarten through third grade students would have a positive impact on their exercise and nutritional behaviors.

Methods

Program Inception: Community Involvement and Collaboration

Education for Healthy Kids (EHK) was a pilot program designed to demonstrate that for approximately \$100/child/school year, primary prevention interventions effectively integrated into the school curriculum could impact students' nutrition and physical activity behaviors. EHK addressed (in kindergarten through third grade children) a number of the Healthy People 2010 Leading Indicators set by the US Department of health and Human Services as key health improvement areas for the nation - physical activity, overweight and obesity, tobacco use, substance abuse, injury and violence.¹³

Impetus for initiating the EHK 3-year pilot came from a community assessment, "The Partnership Project." This assessment pointed out the importance of fostering prevention as a means of improving the health status of the Fox Valley community.¹⁴ The EHK pilot was collaboratively funded by local health care providers, Department of Public Instruction (DPI)

grants, and community donations. The collaboration between the public and parochial school systems, prominent health care organizations, state public instruction (DPI) officials, and researchers from the University of Minnesota and the University of Wisconsin-pediatric epidemiology department, makes this school-based health education program unique. The EHK Advisory Committee included school superintendents, principals, physicians, a nutritionist, and ad hoc research experts from various Midwestern universities.

Conceptual Framework and Links to Previous Research

This research exemplifies participatory action research.¹⁵ It provided community-specific information on the results of school-based healthy lifestyle interventions targeted at reducing childhood obesity by investigating the links between self-efficacy and nutritional behavior/physical activity in both a public and a parochial elementary school. Previous research noted in “The Guide to Community Preventive Service” reviews found strong evidence to support school-based physical education (PE) as an effective means of increasing levels of physical activity and improving physical fitness.¹⁶ The Child and Adolescent Trial for Cardiovascular Health (CATCH) study demonstrated that increased PE time, classroom curriculum focused on promoting cardiovascular health, school policy changes and home/family components, had a positive impact on students’ level of physical activity as well as self-efficacy scores. CATCH was a large multi-center research project funded by a grant from the National Heart, Lung, and Blood Institute which involved 96 schools in 4 states and focused on interventions with third through fifth graders and their parents.¹⁷ The CATCH process evaluation format is detailed in the 1994 Health Education Quarterly-Supplement.¹⁸

Building on work done in 1991 through CATCH, the EHK program was aimed at an even earlier school-age child. The conceptual model that underlies both the CATCH and the EHK

interventions is social learning (cognitive) theory which posits that cardiovascular disease risk factor status is related to the interaction between behaviors, personal attributes, and the physical and social environments. The hypothesized relationships, among the key concepts measured through the CATCH methodologies, were reflective of the systematic changes that were introduced in the schools, and the effect of those changes on the knowledge, behaviors, and intentions of the preadolescents targeted for the intervention.¹⁹ Based on Bandura's theory of self-efficacy, EHK evaluates student self-efficacy as a means of defining and measuring an individual's capabilities to become involved in a successful adoption of new behavior.²⁰ Research has shown that self-efficacy can be used as a gauge for predicting increases in physical activity and sustained behavioral change.²¹

Two behavior change theories that have been cited with intervention-related healthy lifestyle research efforts are the transtheoretical model and the self-efficacy theory²². The self-efficacy model utilizes the concept of self-efficacy as a means of defining and measuring an individual's capabilities to become involved in a successful adoption of new behavior. Research has shown that self-efficacy can be used as a gauge for predicting increases in physical activity. The underlying conceptual model for the EHK interventions and outcome measures focused on 4 areas, previously described by McAuley and Courneya,²³ as ways of influencing self-efficacy. (TABLE 1). Children aged 5 through 10 are developmentally focused on mastery and achieving success through their performance at school and home. Proficiency and self-efficacy can be enhanced through structured, age-appropriate education in exercise and nutritional behaviors.²⁴

Program Goals

The goal of EHK was to demonstrate whether the planned interventions would have a positive impact on both fitness levels and student self-efficacy relative to physical activity and

nutritional behaviors. To summarize, EHK interventions promoting physical activity and healthy eating, included:

1. targeting students at an earlier age (kindergarten through third grade)
2. structured daily (30 minute) exercise and physical fitness component to K-3 curriculum
3. integrated health education in core K-3 curriculum, with participation of entire teaching and administration staff, including staff development
4. adding nutritious food choices in school menus
5. involving parents/families in health education program through school-based events.

The school principals were responsible for reengineering the school environment to foster healthy behaviors, i.e. instituting smoke-free environment policies. A part-time (20 hours/week) nutritionist worked with school lunch staff to decrease the fat content of meals and to increase offerings of fresh fruit and vegetables. Regular in-services were part of ongoing training for the staff. Parent sessions were planned, which included both didactic and hands-on activities at each school. Students were also encouraged to become involved in community fitness activities, for example community fun runs/walks, etc.

Data Analysis and Outcomes Measurement

Outcomes were measured through paper/pencil parent surveys and third grade surveys, as well as physical measurements (height and weight) and cardiovascular fitness measurements. (TABLE 2). Statistical analysis included descriptive analysis - frequency percents, scale means and standard deviations, ANOVA and correlation studies utilizing Pearson 2-tailed correlation computation for both the parent and student surveys. Mean scale scores were computed for certain sections of data on the student survey to allow for comparison between baseline and subsequent surveys administered. Coding the responses collapsed the data into the following

scales: Food Choice Intention, Food Choice Behavior, Food Choice Knowledge, Physical Activity Support, Healthy Eating Support, Healthy Eating Self-Efficacy and Physical Activity Self-Efficacy. Institutional Review Committee permission was obtained through one of the health care organization's ethics board. While the EHK interventions were implemented, K-3, the student survey was administered at the third grade level only, due to literacy constraints associated with younger children.

The Prudential FitnessGram, developed by the Cooper Institute for Aerobic Research, Dallas, Texas was used to assess aerobic capacity, body composition, muscular strength, endurance, and flexibility. The FitnessGram was administered to all students K-3 at the beginning and end of each school year, beginning with fall 1997. The Pacer measures aerobic capacity. The Pacer (Progressive Aerobic Cardiovascular Endurance Run) is a multistage fitness test adapted from the 20 meter shuttle run published by Leger and Lambert and revised in 1988²⁵ (Leger et al). The test is progressive activity set to music. Body composition was measured using the Body Mass Index (BMI), calculated from height and weight.²⁶ Muscle strength, endurance, and flexibility were measured through curl-ups, trunk lifts, push-ups, and back-saver sit and reach activities. Results were classified as "Needs improvement" or "Healthy fitness zone," previously established standards which represent a level of fitness that offers some degree of protection against disease, which result from sedentary living. The one disadvantage of using the FitnessGram software is that it has certain "norms" built into the computer program and does not allow for superior performance ratings to be included in the calculations. Since superior performance was not the goal of this study, it did not present a problem.

Process measures included assessing the intensity of physical activity in PE classes and analyzing the nutrient content of lunch menus. Physical fitness and survey measurements were

synchronized with the beginning and end of the school year. An assessment of previous health education practices was accomplished through a staff survey.

RESULTS

Nutritional Behaviors

The majority of respondents for the student survey were English-speaking (93% Year One, 95% Year Two and 92% Year Three). In describing their nutritional activities, most students (81% to 91%), despite their young age, selected their own breakfast and fixed their own snacks (76% to 90%). Only about half of the students helped with food selection at the grocery store. Students were asked to select between two food choices (healthy and non-healthy). The students knew which food choices were healthier. Only 4 out of 14 item choices indicated that their behavior was not consistent with their knowledge level. Follow-up surveys indicated that the biggest changes in the students' selection of foods were substitution of fruit for cake, low fat for whole milk, margarine for butter and apples for cookies. (TABLE 3).

Self Efficacy

Self-efficacy was measured by asking the students to indicate how sure they were about being able to eat certain foods. Over half of the respondents indicated they were very sure that they could select the healthier food choices. When students were asked about what other people want them to eat, larger percentages of respondents indicated that their parents and teachers would encourage healthy food choices. In Year Three, there was a significant improvement in perceived support from parents and teachers ($<.001$) for healthy eating. The ongoing exposure of parents and teachers to "NutriNews" and other parent-school publications and health-related events may have had an impact on the parent and teacher support levels.

Physical Activity

Most of the students felt their parents were physically active (82%-88%) and reported exercising with parents (72%-90%). Most reported that their friends were physically active

(92%-99%). The percentages increased fall to spring each year, with some regression noted over the summer. The majority indicated that they had fun when involved in physical activities. Most students received positive support for being physically active from parents, PE teachers, and classroom teachers. School B students indicated more frequently that they received support and encouragement from parents, classroom teachers, and PE teachers for being involved in physical activities. For each sampling period, almost three-fourths of the respondents felt very sure that they could be physically active 3-5 times a week and could improve their physical fitness by running or biking 3-5 times a week. (TABLE 4).

In subsequent follow-up studies, the percent of physically active parents increased as well as the number of parents exercising with students. More students reported that their friends were physically active (fall to spring each year). Almost all respondents indicated that they had fun when physically active playing together. Reinforcement from teachers in PE classes and at recess increased. Students reported more positive responses when physically active.

Self-Efficacy Measures

Scale scores demonstrate that students have a fairly high level of knowledge regarding healthy food choices. (TABLE 5). Food choice knowledge, intention and behavior all increased significantly above the baseline measurement. (FIGURE 1).

Self-efficacy scores for both healthy eating and physical activity were above the mid range. (FIGURE 2) and both increased significantly from fall to spring each year, (healthy eating ($p=.001$) and physical activity ($p=.005$), indicating that the support provided by teachers and peers did help students to be more self-assured about their nutrition and exercise choices. Food choice intention and behavior correlated with parental healthy eating support for all time periods. The more supportive parents were of healthy eating, the more likely that the student's intention

and behavior were healthier. Healthy eating self-efficacy correlated with food choice knowledge for all time periods. Students who were knowledgeable about healthy food choices were more confident in making those choices. Confidence in choices correlated positively with student intentions and self-reported behaviors.

The scale for Healthy Eating Support demonstrates that parents and teachers provided more support for healthy eating than did peers. Perceived support increased over time for both the teacher and peer groups. Food choice knowledge scores were consistently higher than intention and behavior. Food choice intention correlates with both behavior and knowledge for all study periods.

Physical Fitness Measurement

While students reported an increase in self-efficacy scores related to physical activity, the self-reported physical activity level changes were not significant. However, fitness testing demonstrated increased aerobic conditioning in the groups tested during each school year. Spring results of the Pacer demonstrate that all three grade levels had 100% of students tested achieving the standard for their age. Muscular strength, endurance and flexibility also increased for both boys and girls, although at different rates. Other reports are pending which delineate the relation of student fitness levels to other outcomes measures, such as standardized test scores for both schools.

Anecdotal Findings

The increased emphasis on healthy lifestyle choices have had an impact on the culture of the schools persisting beyond the end of the study. Carrot crunches have replaced bake sales. Birthday treats from home now include fruits and vegetables fixed in attractive ways instead of cupcakes and cookies. One of the schools offers a daily salad bar to students as part of the hot

lunch program. Teachers at both schools have reported a decrease in altercations on the playground requiring adult interventions. Children are more active on the playground, involved in active playground games such as four squares. Kindergarten teachers report that students are more alert and able to follow directions after their physical education classes. Parents have become very receptive to the monthly nutrition news, which contains the fat/cholesterol/calorie content of daily hot lunch offerings. Students are involved in whole-school activities such as “Walk across America”. Parent testimonials “I just wanted to let you know what a fantastic program (EHK) is. My daughter used to cry on gym days and just hated it. It made her hate any kind of sports or physical activity. Now my children love it!.....They bring home all kinds of enthusiasm for exercise and physical activities. This week they learned a game of tag that teaches about heart disease. They are teaching their parents and the enthusiasm is rubbing off on us! I hope that...you... will continue to seek ways to expand it to more schools.”

Changing the culture and practices of the faculty has been more difficult than affecting the habits and attitudes of the students. Some faculty and staff are not as invested in promoting healthy lifestyle changes as their peers. The principals at both schools have been very active in promoting the cultural changes needed to support this pilot program. The research protocols for this pilot program do not include any attitudinal measurement of faculty or staff unless they are parents of kindergarten through third grade students.

Limitations

This pilot project extends to only two schools in this area. The third grade students and parents of K-3 students were used to obtain baseline measures. Limited finances, and the political implications of selecting one school in a district, prevented the use of other schools in

the district for controls. Survey data was not linked longitudinally by child or parent. The initial EHK pilot did not have funds to cover the longitudinal tracking, or to address the issue of replicating results with varied levels of physical education time. The question yet to be answered is whether the students will maintain their ability to make healthy lifestyle choices when they reach a middle school. Future research is underway to gather and evaluate data to demonstrate the pilot program's longitudinal effects as these students progress to the middle school level, and to measure the program's effectiveness at varying levels of physical education time. The overriding goal is to design a program that can easily be replicated in other schools.

Discussion

At a cost of \$100/child/year, this study demonstrated improvement in physical fitness components and student self-efficacy in relation to healthy nutrition and physical activity. Parent and child surveys, focus groups, and physical conditioning measurement demonstrate the following results:

- Improvement in aerobic conditioning
- Improvement in exercise and healthy eating behaviors
- Increased involvement in healthy lifestyle choices
- Increased self-efficacy in younger students
- Decreases in the number of playground incidents at the school (anecdotal)
- Improved direction-following skills in the kindergarten class (anecdotal)
- Organizational culture change in the schools
- Adoption of healthier lifestyle choices among families of child/ren participating in EHK (“spillover” effect) (focus groups)

Five day a week fitness activities, led by an educator who is focused on teaching healthy lifestyles, can make a positive impact on the health of school children, their teachers, and their families. The integration of health concepts into the culture and curriculum of the school can help to move the nation closer to its goals for promoting healthy living.

The student survey provided a snapshot of self-reported behaviors related to healthy nutrition and physical activities. There were significant improvements noted between baseline measures and follow-up measures in both parent and third grade responses related to physical fitness levels and nutritional habits. The follow-up surveys indicated improvement in levels of physical activity, involvement in family physical activity, and increased understanding and application of healthy eating habits. Self-efficacy scales for both healthy eating ($p=.001$) and physical activity ($p=.005$) increased significantly from fall to spring each year, indicating that the support provided by teachers, parents, and peers was effective in increasing student self-efficacy. Students demonstrated more self-assurance about their nutrition and exercise choices. Despite the fallback (summer regression), self-efficacy increased from baseline in these young students. The reiterative effect of multiple years of exposure to EHK interventions - school PE curriculum, structured lunch menu, as well as the social support from parents, classroom teachers and PE teachers did have an impact on the students' self-efficacy. The FitnessGram demonstrated improvement in aerobic conditioning, as well as the other parameters measured.

The results clearly demonstrate that child involvement in healthy lifestyles did increase each year. This involvement and the confidence gained in making these choices should have a positive impact on future lifestyle choices. The challenge will be to garner the needed community resources for funding the expansion of EHK to all schools in the Fox Valley, public and parochial, and to find the funds needed to support the longitudinal research needed to demonstrate the long term effects of primary prevention in Fox Valley grade school settings.

Table 1

Contrasting McAuley & Courneya' Self-efficacy Influencers with EHK Interventions

Self-Efficacy Influencer	Definition	EHK Intervention
Performance Accomplishment	Mastery experiences	Walk around the USA games Learning rules to physical games Learning how to play a sport
Social Modeling	Looking to peers and others in a social setting	Allowing students to carry water bottles to class Promoting healthy "birthday treat" snacks
Social Persuasion	Providing information which supports the belief in one's capabilities	Reinforcement from parents and teachers for behavior changes, i.e. trying new, nutritious foods
Physiological States	Monitoring physical changes	Teaching students how to obtain target heart rate

Table 2
Education for Healthy Kids
Study Design

Instrument	Target Group	Date of Administration	Rationale
Parent attitudinal survey Paper/pencil scannable survey to each family in school with kids in K-3.	Parents of children K-3 1 survey to each family unit in the school Respondent-primary female child care provider for the child/ren	Fall 1997 Spring 1998 Spring 1999 Spring 2000	Provides baseline data Provides comparison from baseline for grades 1-3 from previous year, baseline for K parents
FitnessGram Administered by school staff during fitness activity period	Children K-5	Year 1 Sept and May Year 2 Sept and May Year 3 Sept and May	Provide comparison between pre/post for the year. Repeat measures of 4 th and 5 th graders in subsequent years will provide comparison for "control" group Measure of fitness changes over time.
Height/Weight Measured with Fitness Gram	Children K-3	Same as above	Measure of obesity for age cohorts Measure of physical fitness changes over time.
Health behavior questionnaire	Children grades 3	Sept 1997 May 1998 Sept. 1998 May 1999 Sept. 1999 May 2000	Provide baseline data on present habits and changes over time with intervention Measure of level of health knowledge.
Process Measures Analysis of school menus for fat content/use of fresh fruits/vegetables and % of children using school lunches	Analysis of one week's lunch menu per quarter for fat content, etc. at each pilot site.	Periodic	Provide baseline data on present habits and changes over time.
Analysis of degree of physical activity in fitness classes	Observational test-SOFIT protocol	Annual	Provides measure of physical activity in class

Table 3

Comparison of Selected Responses-Third Grade Survey-Nutrition

Items	Year 1 Fall	Year 1 Spring	Year 2 Fall	Year 2 Spring	Year 3 Fall	Year 3 Spring
Select own breakfast	81%	85%	85%	90%	91%	87%
Fix own snacks	76%	84%	84%	90%	79%	80%
Eat fresh fruit at home	91%	94%	94%	94%	99%	97%
Fix own lunch on school days	30%	33%	33%	28%	22%	27%
Eat chips at home	76%	71%	71%	58%	72%	61%
Eat ice cream at home	84%	74%	74%	67%	75%	63%
Do not use salt at the table	63%	76%	63%	69%	65%	73%
Salt popcorn at a movie	75%	66%	66%	48%	72%	53%
Select fruit instead of candy bar	56%	67%	67%	82%	71%	88%

Table 4

Comparison of Selected Responses-Third Grade Survey-Physical Activity

Items	Year 1 Fall	Year 1 Spring	Year 2 Fall	Year 2 Spring	Year 3 Fall	Year 3 Spring
Parent physically active	82%	87%	80%	86%	85%	88%
Exercise with parents	80%	81%	72%	90%	78%	81%
Friends are physically active	92%	94%	90%	99%	92%	96%
Physical activity is fun	96%	98%	96%	98%	97%	98%
Receive support from PE Teacher	95%	99%	91%	94%	96%	99%
Sure about 3-5 x/week activity	73%	83%	NA	87%	79%	84%
Improve physical fitness bike/run	76%	82%	NA	83%	78%	81%

Table 5**Mean Scale Scores from Third Grade Survey**

Section	Scale Name (Mean Range)	Fall 1997	Spring 1998	Fall 1998	Spring 1999	Fall 1999	Spring 2000	F	P
A	Food Choice Intention (1-13)	5.82	6.57	7.43	7.97	6.16	7.69*	11.02	<.001
B	Food Choice Behavior (1-14)	5.89	6.79	7.34	7.85	6.73	7.50*	6.51	<.001
C	Food Choice Knowledge (1-14)	9.64	10.57	10.08	11.23	9.54	10.85*	9.06	<.001
E	Physical Activity Support (1-18)	10.73	10.20	10.31	10.56	10.46	10.54	1.43	ns
H	Healthy Eating Support (1-7)	3.17	3.22	2.72	3.88	3.10	3.51*	4.82	<.001
	Parents	1.35	1.98	1.77	2.71	2.29	3.16*	10.99	<.001
	Teachers	.73	.89	.72	1.35	1.19	1.28	3.70	0.003
	Friends								
I	Healthy Eating Self Efficacy (1-30)	19.87	21.46	21.06	23.37	20.62	22.12	4.00	.001
J	Physical Activity Self Efficacy (1-15)	7.72	8.25	7.66	8.44	7.70	8.39	3.41	0.005

* Significant at<.001 from Fall, 1997

Figure 1

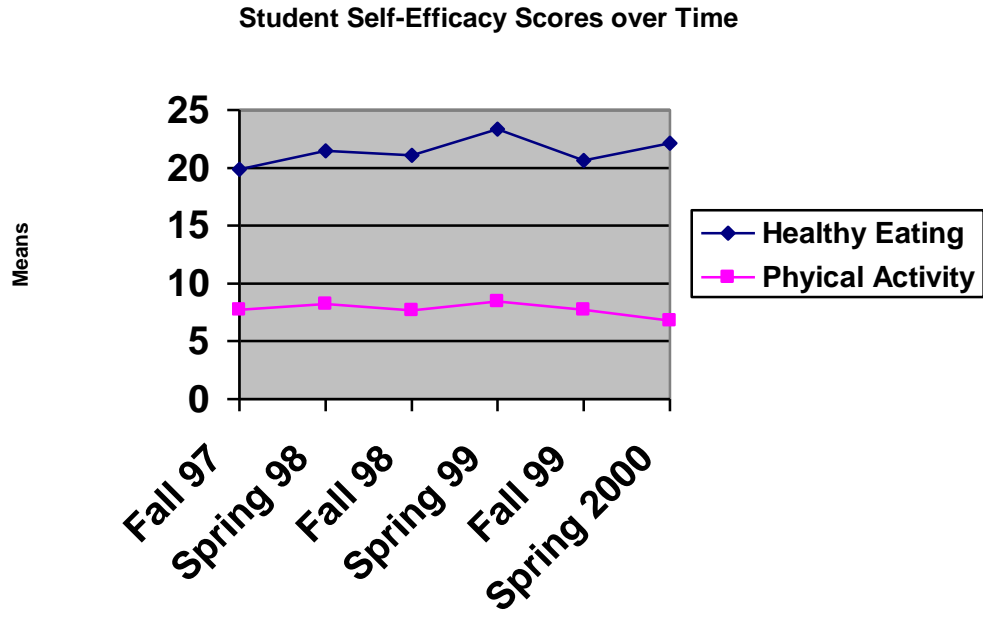
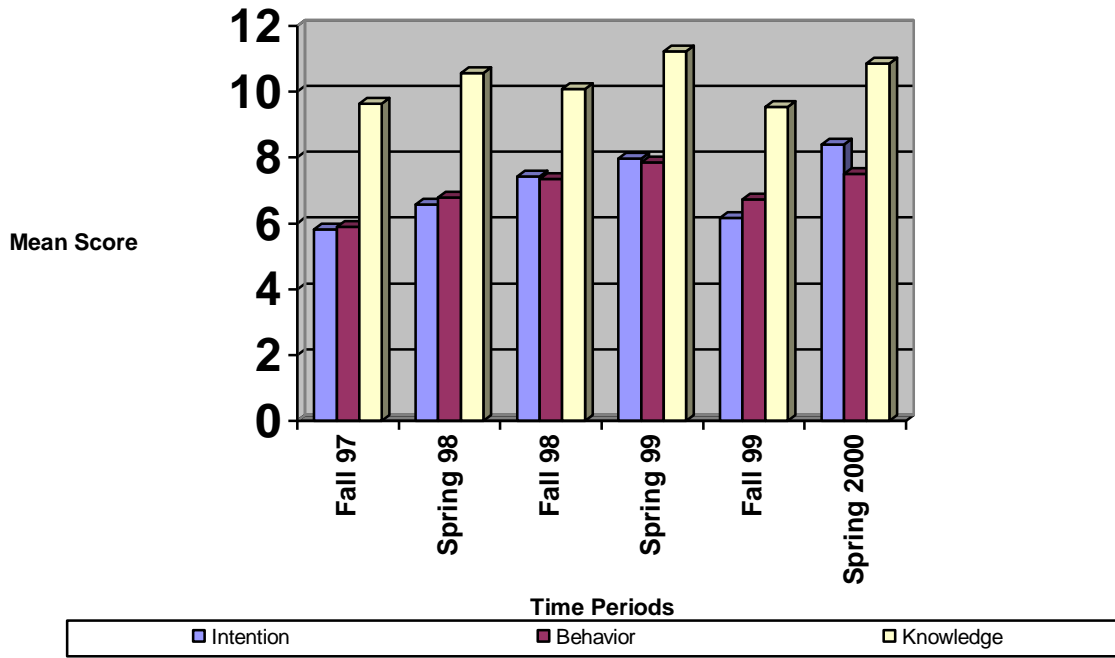


Figure 2

Third Grade Survey-Changes in Food Choice
Intention, Behavior and Knowledge



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