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The concept-oriented reading instruction (CORI) framework was designed to increase student reading motivation, strategy usage, and conceptual learning. Thus far, CORI has only been studied in regards to science education. This descriptive mixed method case study examined two classes of sixth-grade students' responses to CORI in nutrition education that relied heavily on inquiry, reading, and performance-based tasks which was implemented to help students develop conceptual knowledge in nutrition and improve their abilities to analyze influences on eating behaviors and habits. Each sixth-grade class participated in a six-day CORI nutrition unit (N=63). Pre and post nutrition concept and skill questionnaires, pre and post student interest surveys, observations and field notes, and student artifacts were used to answer the following questions: 1) To what extent do students acquire conceptual knowledge when CORI is used to teach nutrition education?; 2) To what extent can students apply a health skill (analyzing influences) when CORI is used to teach nutrition education?; 3) In what ways does the use of CORI in nutrition education engage students?; 4) What interests students about reading informational and narrative texts provided in a CORI health class?

Students in case 1 experienced significant gains in concept acquisition after a CORI nutrition unit; however concept gains in case 2 were non significant. There was no statistically significant evidence to suggest that the CORI unit

affected students' skill acquisition and application. Gender and ethnicity did not have a statistically significant effect on students' concept and skill acquisition following a CORI nutrition unit. Responses to student interest surveys suggest a high level of interest in the hands-on activities and qualitative data report specific interest in the reading activities that were a part of the health education instruction. Quantitative data indicate increases in students' interest in information texts and using texts to find new information; however, quantitative data also suggest there is no change after a CORI nutrition unit in students' self-reported persistence when a text is difficult to read. Qualitative data suggest an increase in student engagement in the CORI hands-on activities, reading assignments, cognitive processing of the material, and application in authentic tasks.

Limitations of this study and implications for future research are also discussed.

EXAMING STUDENT RESPONSES TO CONCEPT-ORIENTED READING INSTRUCTION IN NUTRITION EDUCATION

by

Michele H. Wallen

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To Tim, this work would not have been possible without you, your help, and your understanding.

APPROVAL PAGE

This dissertation has been approved by the following committee of the Faculty of The Graduate School at the University of North Carolina at Greensboro.

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CHAPTER I

INTRODUCTION

The ability to read is a critical gatekeeper to success in today's society. The demands and expectations of readers will continue to increase in our information-based world. The type of texts and the format of texts will continue to evolve and will become increasingly necessary at all levels of the workplace and for many day-to-day activities. Surveys conducted by the American Management Association found that more than 30% of employers test literacy skills and the failure rates on these exams climbed from 18.9% in 1996 to 35.5% in 1998 (Haycock & Haung, 2001). Global competition has left employers with higher skill needs than ever before. Fifty-one percent of manufacturers surveyed indicated that workers hired in the next three years will need stronger reading and writing skills (The Manufacturing Institute, 2005). Despite recent modest improvements in reading skills nationally, today's North Carolina middle school students are no better prepared than their peers a decade ago (National Center for Education Statistics, 2007). While the National Assessment of Educational Progress (NAEP) reading scores increased in 2007, North Carolina experienced a significant decrease in scores (262-259) when compared to scores from 1998 (National Center for Education Statistics, 2007).

Another gatekeeper to success in the 21st Century will be the ability to maintain healthy behaviors and avoid unhealthy behaviors. This study will focus specifically on nutrition education, primarily because of the high rates of obesity in this country; however, a variety of health factors can limit one's potential to be successful in many facets of life. It is evident that health status and academic success are inextricably linked.

> A student who is not healthy or suffers from an undetected vision or hearing deficit, or who is hungry, or who is impaired by drugs or alcohol is not a student who will profit optimally from the educational process. Likewise, an individual who has not been provided assistance in the shaping of health attitudes and beliefs, and habits early in life will be more likely to suffer the consequences of reduced productivity in later years (Manna & Symons, 1992, p.vii).

Health instruction should be offered in a developmentally-appropriate scope and sequence and allocated sufficient time for instruction. The School Health Evaluation Study noted that moderate gains in knowledge, attitude, and behavior required 10, 35, and 45 hours of instruction, respectively (Connell, Turner, & Manson, 1985). Unfortunately, schools cannot devote this amount of time to each health skill and health behavior necessary for optimal health by teaching health education exclusive of other subjects. Because there is a limited amount of time in the instructional school day and there are a multitude of high-stakes assessments in reading, writing, mathematics, and science, it is increasingly clear that integration between health education and other content areas is critical in order for young students to build necessary health enhancing

knowledge and skills. “Curriculum integration provides a framework for children to apply knowledge from several disciplines and to use this knowledge to solve real-life problems at work and at play” (James & Adams, 1998, p.3). Concept-Oriented Reading Instruction with a focus on nutrition is an example of how health and literacy concepts can be integrated into the instructional day. Health and reading are necessary skills and when taught in isolation the relevance and application of each declines.

Statement of Problem

In previous years, parents had more control and authority over the food consumed by their children. Today’s hectic schedules, working families, and the availability of convenience foods and fast-food options have made parental monitoring of children’s eating patterns increasingly more difficult. When combined with the continual rise in childhood overweight status, the need for school-based nutrition education is more essential now than ever before. Establishing healthy eating habits at a young age is essential for proper growth, development, and academic success (Alaimo, Olson, & Frongillo, 2001; Schoenthaler, 1991).

The link between nutrition and learning has been established in past research (Schoenthaler, 1991). Schools have a responsibility to help students develop and maintain lifelong, healthy eating patterns. “Well planned and well-implemented school nutrition programs have been shown to positively influence students’ eating habits” (Bogden, 2000, p.3). Research has shown that eating

habits developed during childhood continue into adulthood (US Department of Health and Human Services, 2000). Children who maintain healthy eating patterns will be less likely to experience heart disease, cancer, and diabetes as adults when compared to children whose diets are high in fat, salt, and calories (Centers for Disease Control and Prevention, 2006).

Poor eating habits and inactivity are the root causes of overweight and obesity. Many children and adolescents have diets too low in fruits and vegetables and too high in saturated fat (United States Department of Agriculture, 1994-1996, 1998). Only 2% of children actually meet the recommendations of the Food Guide Pyramid, more recently known as MyPyramid (Mathematica Policy Research, Inc., 2001). The prevalence of overweight among children ages 6-11 has more than doubled in the past 20 years, going from 7% in 1980 to 18.8% in 2004. Overweight among youth ages 12-19 has tripled during this same time period, going from 5% to 17.4% (U.S. Surgeon General, 2006). Obesity is not the only health problem related to eating patterns. It has been estimated that as many as 7 to 8% of females in the United States suffer from eating disorders in their lifetime (American Psychiatric Association, 2000).

These factors, and many more suggest the need for greater emphasis on nutrition education in schools. Schools are the optimal environment for offering nutrition education because 95% of all children and adolescents ages 5-17 are enrolled in school (Centers for Disease Control and Prevention, 2006). Schools

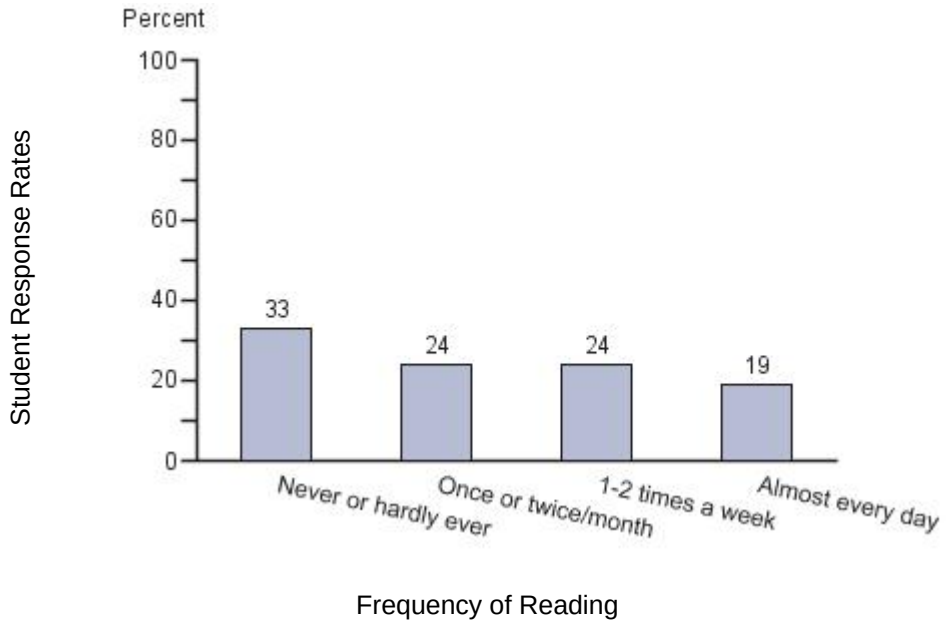
can serve as the conduit between the teaching of nutrition concepts and healthy eating behaviors to the practice of these health-enhancing behaviors because most children eat at least one, if not two, meals at school.

It is unfortunate that even though a need exists for increased nutrition education, there has been a 6% decline over the last two years in the number of middle and high schools requiring health education in North Carolina public schools (NC Department of Public Instruction, 2007). This is despite the fact that the statutes require health to be taught at all grade levels K-high school. More than one-third middle school and high school teachers report that less than nine weeks are devoted to health instruction, within which schools are required to cover more than 30 instructional objectives and seven health skills at each grade level (NC Department of Public Instruction, 2007). Data specific to the teaching of health at the elementary level in North Carolina is not available; however, the Nutrition Education in Public Elementary School Classrooms K-5 report found that 88% of elementary school teachers report they taught lessons about nutrition to their students in the 1996-1997 school year (Celebuski, Farris, & Burns, 2000). The amount of teaching devoted to nutrition is inversely related to grade level, with more time allocated to nutrition education at the kindergarten level than at the fifth grade level. Only 14% of elementary teachers offering nutrition education report integrating lessons into reading and language arts lessons (Celebuski et al., 2000). Rafiroiu & Evans (2005) report that although 93% of teachers surveyed believe nutrition should be taught in all grades, teachers

indicate the following factors are the greatest inhibitors to teaching nutrition education: lack of time to plan, coordinate, and implement nutrition lessons; lack of proper preparation and confidence in teaching nutrition education; and the school calendar is already overloaded with ‘academic activities’ (p. 34). Research actually suggests that nutrition education interventions should be “relatively brief and non-burdensome” (Olandar, 2007, p.3). It is also clear that sufficient time needs to be devoted to nutrition education and allowance for the practice of necessary skills; however, the key is finding the critical balance between the necessary brevity to avoid attrition and the essential time devoted to concept and skill building. A review of the literature identifies the need for more experimental and quasi-experimental nutrition education studies which will contribute to a greater body of research devoted to determining the minimum dosage of health education required for positive behavior change.

Nutritional habits of young children have declined in recent years as have the hours devoted to reading for fun. As part of the 2007 National Assessment of Educational Progress, eighth graders were asked about the amount of time spent reading for fun. The following graphic shows the distribution of 8th grade student responses to this question. The national percentage of students who never or hardly ever read for fun increased from 15% in 2002 to 18% in 2007. Nationally, the number of 8th grade students who report reading for fun almost every day decreased from 45% in 2002 to 40% in 2007 (NAEP, 2007).

Figure 1. How often do you read for fun? (NAEP 8th grade reading question and response, 2007)



Because reading is a purposeful activity, educational researchers have devoted a lot of time and energy to examining what increases children's interest and motivation to read. One approach that has been used in the field of science education to increase reading motivation and comprehension is Concept-Oriented Reading Instruction (CORI) (Grant, Guthrie, Bennett, Rice, & McGough, 1993). Hands-on science activities are used to spark student interest and teachers use a multitude of interesting texts related to the topics being studied to connect conceptual science information and the application of this knowledge in a purposeful setting. Teachers using Concept-Oriented Reading Instruction teach reading comprehension strategies and allow students to communicate and

collaborate with each other to deepen their comprehension of the text and science knowledge. Comparative research has shown that students who receive CORI surpass students who receive traditional instruction in reading comprehension, reading motivation, and science concepts (J. T. Guthrie, Anderson, Alao, & Rinehart, 1999). No research has been conducted to measure the effects of using CORI to teach nutrition education.

Purpose/Objectives

The purpose of this study is to examine student responses to utilizing Concept-Oriented Reading Instruction when teaching nutrition education. The development of a CORI nutrition education unit was guided by the Concept-Oriented Reading Instruction framework established by Guthrie, Wigfield, and Perencevich (2004) (see example Appendix A).

Because this study is a descriptive study, students receiving CORI instruction are not being compared with a comparison group. The following research questions will guide the study:

1. To what extent do students acquire conceptual knowledge when CORI is used to teach nutrition education?
2. To what extent can students apply a health skill (analyzing influences) when CORI is used to teach nutrition education?
3. In what ways does the use of CORI in nutrition education engage students?

4. What interests students about reading informational and narrative texts provided in a CORI health class?

Definitions

Constructivism

The conceptual framework guiding this study is the theory of learning known as constructivism. Constructivism is a "psychological theory of learning that describes how structures and deeper conceptual understanding come about" (Fosnot, 1996). Constructivists theorize learning is an interpretative and reflective process conducted by active learners interacting with both the physical and social worlds (Fosnot, 1996).

In defining constructivism, it is also important to address some of the myths related to constructivism, and misunderstandings related to this learning theory. Constructivism is not a theory of teaching or a model of teaching, although it suggests certain types of models and methodologies are more conducive to student learning. The foci of constructivism are not behaviors and skills, they are concept development and deep understanding; stages are not the result of maturation, rather they are understood as constructions of active learner reorganization (Fosnot, 1996). Constructivism does not promote regurgitating a wide array of facts and figures; it promotes an in depth understanding of a centralized topic. Constructivism is a student-centered theory; however, this does not diminish the role of the teacher. The teacher becomes a facilitator of instruction, not a lecturer or disseminator of facts and figures. A constructivist

teacher's role is "…to guide, focus, suggest, lead, and continually evaluate the progress of students" (Marlowe & Page, 1998. p.11).

Constructivism is not rejecting the teaching of standards in an effort to placate students' interests; rather it is finding that of interest to students and capitalizing on these interests to design an instructional plan for reaching pre-determined standards. Constructivism is not defined by experiments, field trips, projects, cooperative learning, and student choice. These activities are often seen in constructivist classrooms; however, it is how activities are developed and facilitated that represent examples of constructivism and promote constructivist thinking. A simple field trip to an aquarium in which the students have no interaction with the ocean environment or sea creatures is not an example of constructivism. A field trip in which the students are answering questions, asking questions, creating projects that require interacting with and inquiring about particular aspects of the aquarium, with each other is a better example of guided practice grounded in constructivist theory. Group work and presentations are not automatically examples of methods based in constructivism. If the group is not using each other's opinions, knowledge, and questions to formulate new ideas and concepts and if the students involved in developing the presentation do not truly understand the material in the presentation and are simply copying facts and numbers out of textbooks, then this is not an example of constructivism at work either. Sometimes students will have total choice, sometimes students will have no choice, and other times the decisions will be shared between the

teacher and the student in a constructivist classroom. The purpose, the context, and the goal of the instructional activities are what constitute constructivism in action or not.

The theory of constructivism asserts that as students formulate meaning and interact with the environment, objects, and people around them, they are also receiving cues that affect their further processing. Cues are generally indications that new information is being processed such as noticing a slight difference in texture or color after an experiment, questions, comments, or information that causes the students to make new links between prior knowledge and a new construct. These cues can come from teachers, reactions to their interactions, peers, and their own personal reflection and may result in a change in direction, change in understanding, or change in student response. The cues themselves become formative assessments that occur during the instructional and learning process. Constructivist teachers allow assessment to be a continuous part of the learning process that informs their instruction and on-going assessment serves as an essential element within their instruction as well (Kugelmass, 1995, as cited in Marlowe & Page, 1998).

Health Skills

Also foundational to this study is effective health education curricula, which uses a skills-based approach. Skills-based instruction in health education provides students with the ability to act on knowledge and concepts learned. For

example, students may be able to conceptualize the dangers of tobacco; however, they often lack the necessary communication skills to assertively refuse the pressure by a peer to smoke a cigarette. The National Health Education Standards identify seven health skills that are critical to the healthy development of children and adolescents:

- Note – **Standard 1** is not skill based it is content oriented: Core Concepts – students will comprehend concepts related to health promotion and disease prevention to enhance health.
- **Standard 2: Analyzing Influences** – students will analyze the influence of family, peers, culture, media, technology, and other factors on health behaviors.
- **Standard 3: Accessing Information** – students will demonstrate the ability to access valid information, products, and services to enhance health.
- **Standard 4: Interpersonal Communication** – students will demonstrate the ability to use interpersonal communication skills to enhance health and avoid or reduce health risks.
- **Standard 5: Decision Making** – students will demonstrate the ability to use decision-making skills to enhance health.

- **Standard 6: Goal Setting** – students will demonstrate the ability to use goal-setting skills to enhance health.
- **Standard 7: Advocacy** – students will demonstrate the ability to advocate for personal, family, and community health. (Joint Committee on National Standards, 2006)

The focus on developing skills in health instruction in this study reflects the goal of health educators, which is fostering the development of health literate students. Students who are health literate are critical thinkers and problem solvers, responsible, productive citizens, self-directed learners, and effective communicators.

Nutrition Education

Nutrition education is the process by which we assist people in making decisions related to their food and beverage choices. Nutrition education should allow learners to apply knowledge from the field of nutrition science about the relationship between dietary habits and health and well-being. This education process must also include skill development so that individuals have the ability to analyze the power and variety of influences that contribute to decisions made related to eating patterns and food selection. Students can utilize this information to help make health-enhancing decisions, establish appropriate goals for attaining and maintaining healthy eating patterns, and analyze the various influences on their nutrition choices and habits.

Reading

The process of reading is multifaceted. The Partnership for Reading, the National Reading Panel, and the Reading First legislation define reading to be: "A complex system of deriving meaning from print that requires all of the following: the skills and knowledge to understand how phonemes, or speech sounds are connected to print; the ability to decode words; the ability to read fluently; sufficient background information and vocabulary to foster reading comprehension; the development of appropriate active strategies to construct meaning from print; the development and maintenance of a motivation to read" (The Partnership for Reading, the National Reading Panel, & the Reading First Legislation, retrieved on Feb. 27, 2007 from: http://www.nifl.gov/partnershipforreading/explore/reading_defined.html). It is imperative that good readers today have the ability to do more than read simple directions and low-level books. Richard Lyon eloquently describes reading in his 1998 report for the Council for Basic Education as:

> In general, if children can read the words on a page accurately and fluently, they will be able to construct meaning at two levels. At the first level, literal understanding is achieved. However, constructing meaning requires far more than literal comprehension. Children must eventually guide themselves through text by asking questions such as: "Why am I reading this, and how does this information relate to my reasons for doing so?" "What is the author's point of view?" "Do I understand what the author is saying and why?" "Is the text internally consistent?" It is this second level of comprehension that leads readers to reflective, purposeful understanding. (p.4)

The Progress for International Reading Literacy Study (PIRLS) defines reading literacy as "the ability to understand and use those written language forms required by society and/or valued by the individual. Young readers can construct meaning from a variety of texts. They read to learn, to participate in communities of readers, and for enjoyment" (International Association for the Evaluation of Educational Achievement, 2000, p.3).

Characteristics of good readers have been described by multiple entities. The following characteristics were the basis of the Reading Framework developed by the National Assessment for Education Progress. Good readers:

- read with enough fluency to focus on the meaning of what they read;
- form an understanding of what they read and extend, elaborate, and critically judge its meaning;
- use various strategies to aid their understanding and plan, manage, and check the meaning of what they read;
- apply what they already know to understand what they read;

- read various texts for different purposes;
- possess positive reading habits and attitudes (National Assessment Governing Board, 2007).

Common threads among these cited definitions of reading are factors such as the necessity to develop a deep level of understanding, the ability to use a variety of texts for different purposes, and the ability to reflect on a text and ask questions of the text.

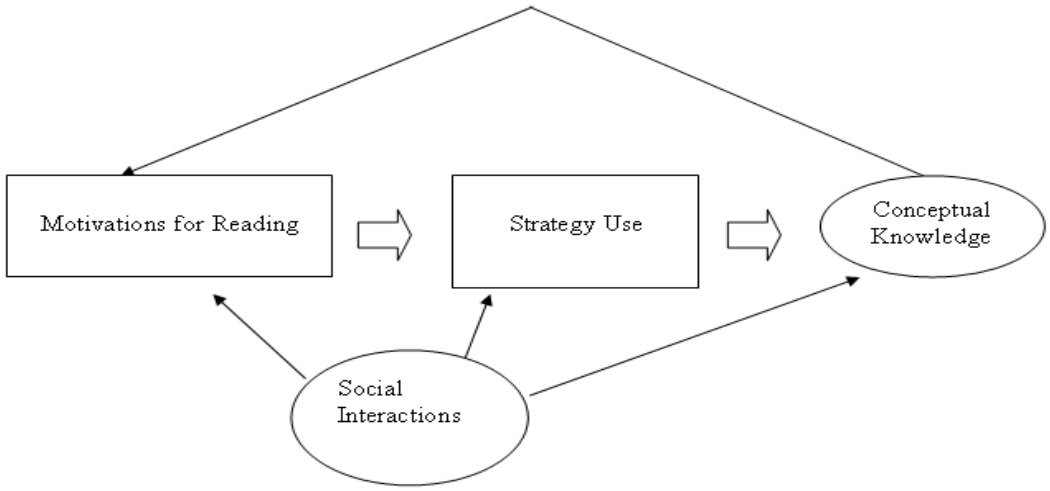
There is an international understanding in the reading research community that there are various purposes for reading at any level. The three commonly referenced contexts are: “reading for literary experience, reading for information, and reading to perform a task” (National Assessment Governing Board, 2007, p.4). It is important to note that these contexts for reading can exist independently and they can also coexist. For example, a person can read for pleasure (literary experience) yet also read for information at the same time; however, the perceived context of the reader will lead to the use of different reading strategies and skills (Baker, Dreher, & Guthrie, 2000).

Concept-Oriented Reading Instruction

Concept-Oriented Reading Instruction (CORI) was developed by Dr. John Guthrie in 1993 and a team of elementary teachers and graduate students at the University of Maryland. CORI was developed based on the following instructional principles: social interaction and intrinsic motivations to read such as curiosity, challenge, and involvement. Science was originally used in CORI as

the content through which reading strategies were taught. Students are initially motivated to read by authentic learning tasks, which require inquiry, searching for information and answers in socially collaborative environments. The developers of Concept-Oriented Reading Instruction believed that readers who are engaged in reading want to read because it is fun and interesting. The motivation to read is to learn something new or to find answers to questions. Figure 2 exemplifies the process by which engagement in reading builds both strategy usage and conceptual knowledge through CORI.

Figure 2. Engagement in Reading



(J. T. Guthrie, Meter, Hancock, & Alao, 1998)

Performance Assessment

Performance assessment items are measures for assessing both conceptual understanding and application. These tasks require students to perform or construct a product in order to demonstrate their knowledge and skills. Performance assessments can be project-based such as conducting a peer health education unit, or creating a public service announcement. Performance assessments can also be essays or extended response assessment items. Using constructivism as a grounding theory for this study allows for the assumption that knowledge and skills are not acquired through memorization or from disconnected instructional material and lessons; rather, knowledge and skills are gained only when students are engaged in an active learning process which allows them to interact, inquire, and utilize concepts and skills through relevant real-world application. Well-designed performance assessment items can make the learning process relevant in a challenging and motivating manner. Performance assessment items can capitalize on students' interests and assess student knowledge and skills in a real-world setting or situation. Performance assessment items in combination with selected response items will be used to measure both student conceptual knowledge and skill application in this study.

In summary, a critical problem is the lack of health instruction, specifically school-based nutrition education, while there are excessively high rates of obesity among young people that are continuing to increase annually (Centers for Disease Control, 2006). The time allocated to nutrition education is limited for

a variety of reasons including: lack of teacher preparation, low teacher self-efficacy, and competing time with subject areas that require high stake assessments (Rafiroiu & Evans, 2005). The lack of sufficient time devoted to nutrition education will remain a factor as long as schools and educators are judged based on high-stakes assessment results in reading, mathematics, and science. This trend is not likely to change; therefore, more research related to the integration of nutrition education instruction is necessary, as previous reviews of the literature suggest little has been conducted in the past (Contento & Balch, 1995). This study may be one method of addressing both the necessary material needed for high-stake assessments, such as reading skills and essential nutrition concepts and skills.

Previous studies have shown that CORI can improve reading strategy usage, reading motivation, and conceptual knowledge in science education (Guthrie, Anderson, Alao, & Rinehart, 1999; Grant, Guthrie, Bennett, Rick, & McGough, 1993; Guthrie, Wigfield, Barbosa, & Perencevick, 2004). Previous studies have also suggested positive effects of integrating nutrition and mathematics (James, D.S. & Adams, T.L., 1998). This purpose of this study is to measure student responses to a nutrition education CORI unit, which will integrate reading and nutrition through the use of authentic learning tasks and interesting texts related to nutrition concepts. The study will be a case study measuring student responses in two health classrooms in one year-round middle school located in the southeastern United States. The study will measure

student acquisition of conceptual knowledge, health-skill application, student engagement in the CORI nutrition unit, and student interests in narrative and informational texts during the CORI nutrition unit.

CHAPTER II

REVIEW OF THE LITERATURE

Conceptual Framework

The conceptual framework that grounds this study is the theory of constructivism. Constructivists theorize that learners will apply previous knowledge and understandings when encountering new or different information. Learners must work with new material in a manner that allows them to apply previous thoughts and concepts in order to make new meanings, lasting connections, and construct an understanding of the new material. This is an active learning process in which the learners are required to interact with the new concepts by questioning and creating new meaning, knowledge, and skills. Constructivism assumes that rote memorization cannot lead to conceptual understanding or application of new concepts and skills. Learners must interact with the material to create an understanding of concepts and transfer the concepts from surface level knowledge to more meaningful and permanent cognitive structures which can be applied in real life settings.

This study used constructivism as the grounding theory because of the focus on conceptual understanding through active and purposeful learning. Constructivism is essentially a psychological construct which stems from the field

of cognitive research (Fosnot, 1996). Constructivism is a theory about knowledge and learning in which there is no objective reality and, no one truth, as we are all constructing our own meanings and interpretations of reality and truth. One of the central propositions of constructivism is that "…learning means constructing, creating, inventing, and developing our own knowledge" (Marlowe & Page, 1998, p.10). In the simplest form, Catherine Fosnot (1996), best describes constructivism as "both what knowing is and how one comes to know" (p.ix). A concise extended version of the meaning of constructivism was offered by Schuell (1996):

> The learner does not merely record or remember the material to be learned. Rather he or she constructs a unique mental representation of the material to be learned and the task to be performed, selects information perceived to be relevant, and interprets that information on the basis of his or her existing knowledge and existing needs. In the process, the learner adds information, not explicitly provided by the teacher whenever such information is needed to make sense of the material being studied. This process is an active one in which the learner must carry out various operations on the new materials in order for it to be acquired in a meaningful manner. (p.743)

I created a visual model of an example of using CORI to teach nutrition concepts and skills (Appendix A, B, C). Questions are asked, time for search and retrieval of information is allowed, an interesting task is presented, more time for search and retrieval of information is allowed, and another task is presented. This continuous cycle of questioning, reading, and activities is offered to help students construct their own meanings of nutrition concepts and skill applications

while actively interacting with the new material. Constructivist theory asserts that reading, discussing, and applying the new information through these various tasks helps students to frame and reframe their current understandings of the concepts being taught and allows for a deeper understanding and increased accuracy in application.

Within this framework, it is evident that students will have an opportunity to link hands-on experiences with texts and content knowledge. Students share individual self-expressions of conceptual knowledge in a collaborative setting. In this particular description of a CORI unit, students can link nutrition concepts with related literature and adhere to state standards for language arts and healthful living, while also pursuing their own interests related to this topic as well.
The overarching proposition for this study is the notion that interesting texts accompanied with motivating tasks can engage the learner in a manner that he/she can construct a deeper conceptual understanding of nutritional facts and better apply skills necessary to make healthier choices.

Most if not all of nutrition information is quite abstract. It is difficult for young learners to understand concepts of fat grams, calories, low sodium, high in vitamins, when these concepts cannot be seen, touched, or tasted in some instances. “In order for individuals to follow the advice, eat a diet low in fat, they must be able to determine the fat content of a food, determine some acceptable level, and then make dietary choices appropriate to the “low fat” message, a task that is difficult for even adults” (Lytle, Eldridge, Kotz, Aberasturi, Williams, &

Kalina, 1997, p.128). Lytle et al., (1997) conducted a study which has limited external validity due to sample selection and size; however, this study's initial findings suggest that children in grades K-6 found it difficult to translate basic nutrition messages into meaningful information. For instance, students in K-2 had difficulty describing what "eat a variety of foods" and "maintain a healthy weight" actually mean. Grade 3-6 participants in the study were better able to articulate the basic understanding of these messages; however, few students were able to transfer these basic messages into practice when reading food labels and making food selections. All students had trouble determining serving size, and giving specific examples of foods that are low in sugar, high in salt, and low in fat. Although these findings are not generalizable, it does offer initial insight into how some children interpret nutrition messages and poses questions about ability transfer and deep conceptual understandings as a part of nutrition education programs.

Some nutrition education programs enable students to respond correctly to questions asked, yet students lack the ability to actually apply the concepts that were addressed in the program (Contento, Randell, & Basch, 2002; Lytle et al., 1997). This lack of true understanding and application may contribute to the discrepancies indicated in studies which report nutrition knowledge gain and little to no change in eating behavior in children (Kelder, Perry, Lyltle, & Klepp, 1995 as cited in Lytle et al., 1997).

Constructivism

Constructivism was developed within a non-positivist epistemology. The underlying goal of constructivism, and that which has caused the greatest controversy is the operational definition of the term, understanding. Understanding as defined in the theory of constructivism is deep and conceptual, not rote memory or surface level understanding. Two of the most commonly occurring words in constructivism theory writings are active and meaning.

Piaget gave examples of assimilation and accommodation as representations of the cognitive processes in constructivism. Assimilation has been operationalized in constructivism as, “the organization of experience with one’s own logical structures or understandings” (Fosnot, 1996, p.13). Individuals have the tendency to view the world based on what they currently know and understand. It is when they encounter new situations that do not fit within their self-constructed framework, that they attempt to reflect on what they already know and how it fits with the new situation.

This period of reflection and interaction with the new situation and integration of the new experience into existing cognitive structures is called accommodation (Fosnot, 1996). Sometimes these new experiences contradict current understandings and over time, the interaction with these new experiences creates cognitive dissonance. Depending on the stage of one’s cognitive development, the level of reasoning or the ability to assign an explanation for observed differences creates a new construction or understanding. This intrinsic,

self-organizing process allows the cognitive structures to remain in a flexible and open state so that new information and new understandings are always being developed. Piaget theorized three types of accommodations that might be constructed by learners when experiencing cognitive dissonance, which Fosnot (1996) explains as follows:

> 1) they might ignore the contradictions and persevere with their initial schema or idea; 2) they might waver, holding both theories simultaneously and dealing with the contradiction by making each theory hold for separate, specific cases; or 3) they might construct a new, more encompassing notion that explains and resolves the prior contradiction.(p.16)

Constructivism rejects the notion of *tabula rosa*, in which children are thought of as blank slates waiting to be filled with knowledge. Children bring previous experiences and prior knowledge to each learning situation, which influences how each child will interact with the new material being taught and also influences the manner in which children will construct meaning from new learning experiences. Constructivism holds another constant thread: children are not passive learners and there is no fixed or ideal example of *meaning*. Each of us constructs our own understandings and meanings based on our prior experiences and interactions; therefore, we cannot come to know any concept in exactly the same manner as someone else.

Because these great differences in methods for deriving meaning exist, constructivist frameworks propose a challenge for teachers to create innovative environments in which they and their students are encouraged to think and

explore in a multitude of ways learning both from their own experiences as well as each others' (Fosnot, 1996) . These environments must be free of bias, judgment, and scrutiny in order for the learner to feel free to explore and bring their personal experiences to each learning situation. This does not mean that constructivism would exclude feedback from external sources such as the teacher offering guidance, modeling, and feedback when necessary. In order for children to associate and assimilate in an effort to make personal meaning, a learning environment needs to a safe place for students to explore without inhibition and fear of failure. It is a place where students' opinions and understandings, and ways of knowing are not criticized, rather valued and honored because of a recognition that each student's meaning will be constructed in a different manner and that there is no cookie cutter method for teaching and learning.

Constructivism is not a teaching method; however, it is important to illustrate this definition of constructivism in terms of what constructivism might look like in an educational setting. Examples of methodologies that are rooted in constructivist theory include questioning, investigating, inquiry, problem generating and problem solving. Constructivist teachers design tasks and environments that allow students to question, internalize and reshape, or transform new information (Brooks & Brooks, 1993). One will often find evidence of the following beliefs in classrooms of teachers who base their pedagogical practices on constructivist theory:

- Teaching is centered around problems that are real, meaningful, and age-appropriate;
- Students' perspectives such as cognitive levels, home experiences, and motivation should be honored and utilized when analyzing students' responses;
- Students' responses are in congruence with their current level of understanding;
- Conflicts and confusion that initially occur when students are searching for meaning should be embraced not avoided;
- It is necessary to encourage and accept student autonomy;
- Essential tools for learning are raw data and primary sources, along with manipulative, interactive, and physical materials;
- Tasks are framed with terminology such as "classify," "analyze," "predict," and "create."
- Inquiring about students' understanding of concepts occurs before sharing the teachers' own understandings of those concepts;
- Students should be encouraged to engage in dialogue between each other and the teacher;
- Asking thoughtful, open-ended questions and encouraging students to ask questions of each other allows for effective student inquiry;
- Students should be engaged in experiences that might cause contradictions to their initial beliefs and prompted for discussion related to this discovery;

- Wait time after posing questions is critical;
- Effective assessment occurs within the context of teaching

(Brooks & Brooks, 1993; Elliott, Kratochwill, Littlefield Cook, & Travers, 2000).

It is important to understand that constructivist classrooms do not all look the same or follow a predetermined plan or schema. However, one common thread in a constructivist classroom is that teachers work to support and facilitate instruction rather than dictate and control it. In the model illustrated in Figure 1, the phases of CORI are cyclical in nature and during these phases, students are interacting with the new information through authentic learning tasks and search and retrieval exercises in which they are using reading comprehension skills to glean information and answer questions that were developed as a result of the tasks. According to constructivist theory, this interaction between the authentic learning tasks, the text readings, personal experiences, and the collaborative sharing allows students to create deeper individual understandings of nutrition concepts. The tasks enable students to ask questions and the readings allow students to search for facts and decide on their meaning and connections to the concepts involved in the tasks.

Concept Oriented Reading Instruction

Concept-Oriented Reading Instruction (CORI) is not a traditional reading program. There is no teacher's manual, specified book list, or list of assessments for comprehension; rather, it is an instructional framework for integrating content knowledge and literacy skills. CORI was titled to reflect the central position of conceptual knowledge in teaching reading comprehension (Guthrie & Wigfield, 1997). It was developed to: increase interest and motivation, expand higher-order reading strategies, broaden conceptual understanding, and enhance the social processes of literacy (Grant, Guthrie, Bennett, Rice, & McGough, 1993). This instructional framework merges reading strategy instruction, conceptual knowledge in science, and support for student motivation (Guthrie, Wigfield, Barbosa, & Perencevich, 2004).

The anchor of this instructional framework is the self-determining learner. The major focus when developing CORI is the learner, which is clear in the theory selected to support the framework, the framework itself, and the studies designed to test the impact of the framework on student achievement and motivation. In short, teachers of CORI create stimulating tasks to pique students' interest and begin a phase of inquiry related to a central concept or theme. These tasks usually involve active, hands-on learning by the students. Students are also given opportunities to access a variety of books related to the central concept or theme. Teachers provide support, model reading strategies, and facilitate student inquiry to enhance students' success in reading comprehension

and further motivate students to continue their quest to build upon their newly found information and questions. As students are gathering and synthesizing new information, they are also connecting and collaborating with each other through various tasks (both whole and small group). Students will eventually amalgamate this new information into a format for sharing with each other. Glimpses of inquiry-based learning, scientific experimentation, project-based learning, cooperative learning, and strategy coaching are evident in CORI.

CORI is unique in that it emphasizes scientific observation, yet also focuses on strategy instruction and peer-to-peer interaction, which makes it an inclusive framework.

> Programs that emphasize cooperative learning usually do not provide strategy instruction or real-world orientations. Programs that center on strategy rarely situate those strategies in a student-selected pragmatic context or allow for peer-peer social learning. Reading programs devoted primarily to language seldom place enough emphasis on going beyond literature to explore the scientific and social world around us. (Grant et al., 1993, p.340)

Reading engagement has been defined by Guthrie and Wigfield as, “the interplay of motivation, conceptual knowledge, strategies, and social interaction during literacy activities” (Guthrie, Wigfield et al., 2004, p. ix). Promoting reading engagement and reading comprehension are the central tenets on which CORI is based. In order to attain and maintain these central tenets, there must be “support for cognitive strategies and knowledge construction during reading and support for motivational development of learners” (Guthrie, Wigfield et al., 2004,

p.3). The developers of CORI firmly believed that reading engagement and comprehension could be enhanced by integrating the teaching of reading strategies, inquiry skills, and scientific concepts.

Engagement and comprehension in reading are inextricably linked. It is difficult if not impossible to comprehend material from text without some level of engagement and in order to be engaged in reading there is an intersection between reading strategies and motivation. Engaged readers monitor comprehension and ask questions. Monitoring comprehension is essential when developing in-depth knowledge. The motivations for reading create strategy usage resulting in students' development of conceptual knowledge. Students' growth in reading comprehension is significantly influenced by the amount of engaged reading in which they participate. Substantial evidence suggests that when teachers create an environment that supports and allows reading engagement to be extensive and fulfilling, students' reading comprehension and achievement increases (Guthrie & Cox, 2001 as cited in. T. Guthrie, Wigfield et al., 2004). Guthrie & Wigfield (1997), suggest that the individual environment inclusive of belief, self-efficacy, expectation, interest, involvement, and strategy, interacts with classroom contexts, defined to include personal inquiry, learner-centered instruction, social interaction, coaching, and coherence. All of these factors are addressed in a CORI classroom.

Teachers using the CORI framework introduce both diverse narrative and interesting informational texts with stimulating tasks that are related to science

activities to create situational interest. Stimulating tasks have often been referred to as tasks that teachers design, which stimulates students to think in new and different ways (Nolen & Nichols, 1994 as cited in Guthrie et al., 2006). The type of interesting texts used, varies according to the concepts being taught. Interesting texts refers to texts that are relevant to the learning and knowledge objectives being studied. A recent study examined the factors that contribute to readers' interest in texts and found those factors to be: important, new, and valued information which were also associated with student interest (Wade, Buxton, and Kelly, 1999 as cited in Guthrie & Cox, 2001). Diverse and interesting texts in a CORI classroom might include: chapter books, stories, legends, trade books, newspaper articles, poetry, music lyrics, and selected reliable excerpts from the Internet.

Teachers in a CORI classroom will have class texts, group texts, and individual texts. Anderson (2003) offers the following guidance related to interesting text organization when using CORI. Class sets (one per student) might include trade books on the conceptual theme or core topic, typically falling in the middle of the class reading level. Team sets (one for each group of 3-6 students) would include both more and less challenging texts that allow for students of different reading achievement levels to participate in guided reading and practice reading comprehension strategies. Individual texts (one per classroom for individual use) would cover a variety of topics related to the core topic or conceptual theme. The individual texts should consist of varying reading

levels, so that students from different achievement levels can use different texts to gather facts and concepts related to a core topic.

CORI teachers provide strategy instruction when utilizing interesting texts and work to sustain a motivating environment within which the students are reading and learning. Students are often good strategy users in a motivated context, which explains the acquisition of intrinsic motivation in literacy development. Intrinsic motivation is best exemplified by the student who is motivated to read in an effort to learn more about a particular topic to answer personal questions, or to learn something new. These readers read because it is fun, not because they will be rewarded or will win some sort of challenge.

The CORI phases follow the research that suggests students gain conceptual knowledge when five conditions exist. These five strategies were first offered by Glynn & Duit's review of the research in 1995 (as cited in Swan, 2003): existing knowledge is activated; new information and experiences are related to existing knowledge; intrinsic motivation is developed; new knowledge is built; new knowledge is applied, evaluated and revised. In short, a CORI unit will: create interest; allow for time to read; interact and observe; synthesize findings; and teach new concepts to others. Below are explanations of the phases of CORI (Guthrie, Bennett, & McGough, 1994; Guthrie & Wigfield, 1997; Guthrie, Wigfield et al., 2004; Swan, 2003).

- Observe and Personalize: During this phase, the students' attention is captured and their curiosity is piqued. You will often find real world

interactions, teacher involvement, and social collaboration implemented during this phase.

- Search and Retrieve: It is during this phase that students are taught where to look for information and how to access and utilize the information once it has been discovered.
- Comprehend and Integrate: Teachers will incorporate strategies such as scaffolding, organizing ideas, summarizing and questioning the text during this phase. Students will activate prior knowledge, make connections with the text, strengthen their vocabulary, create visual imagery, and make inferences related to the text. As a result of these interactions, students will learn to synthesize the information gathered from a variety of sources.
- Communicate to Others: Although students will share information with each other throughout the various phases of a CORI unit, it is during this particular phase that students will design and create a method for sharing the information learned in a meaningful manner. This might involve peer teaching, creating a video, an informational poster, a public service announcement, writing a story book of their own, just to name a few examples of ways in which students can communicate collaboratively to others the information they have uncovered.
- Some CORI researchers and practitioners include a 5th phase entitled peer-peer interaction, in which a cycle of opportunities for social

interaction is created. Others choose not to label this as a phase; rather, explicitly refer to the continuous opportunities to socially interact in a CORI unit such as peer led group discussion or small group tasks.

It is important to know that these phases are not static, nor are they always linear. The phases were designed to be fluid in nature, meaning that they can flow into each other and it is okay to move back and forth through stages as opposed to starting and stopping each phase before moving on to the next one. Appendix (A) demonstrates what I have found to be the best and most concise method for summarizing the instructional framework and the strategies within this framework for CORI. I have customized the framework to give an example of a health education nutrition energy consumption and expenditure CORI unit.

Concept-Oriented Reading Instruction is grounded in the areas of theory and research on cognition and motivation. It is the interplay between these two factors (cognition and motivation) in reading and inquiry-based content instruction that created the need for and eventually the development of CORI. Guthrie & Wigfield (1997) characterize motivation as beliefs, specifically beliefs students have about themselves and motivation is described as affect, involvement, and interest. CORI is also based on an assumption that motivation and strategies interact during reading, which has been validated by Schunk & Zimmerman and Corno & Randi (as cited in Guthrie & Wigfield, 1997).

Several different dimensions of reading motivation were proposed by Guthrie & Wigfield: curiosity - a desire to learn about a topic; involvement – enjoyment while experiencing a text found to be interesting; challenge - orientation to learning complex ideas from text; reading efficacy – belief that one can be successful at reading; importance of reading – subjective personal task value; recognition - gratification in receiving a tangible form or reward for success in reading; and grades - favorable evaluations from a teacher. These motivations were identified by Guthrie & Wigfield (1995), but mostly based on the work of Deci et al, 1991 - intrinsic motivation; Wigfield and Eccles, 1992 - values and goals; and Czikszentmihalyi, 1978 - flow experiences (as cited in Guthrie, et. al., 1994). Guthrie et al., 1994, also include social emphasis - processes of constructing and sharing meanings in groups; compliance - adaptation to an external goal; competition – the desire to outperform others in reading; and reading work avoidance – reasons given by students as why they do not like reading, to their lists of proposed dimensions of motivation. These 11 dimensions were used to create the Motivations for Reading Questionnaire (MRQ), which has been validated and used in many CORI studies to measure students' reading motivations.

A study conducted by Guthrie et al., (1994) found that students in a CORI classroom reported more intrinsic motivations for reading and fewer extrinsic motivations for reading than did students a basal classroom. "Students who experienced the CORI approach gained substantially in the higher order

cognitive strategies involved in searching for information, comprehending informative texts, constructing conceptual knowledge, and transferring conceptual knowledge to solve novel problems" (Guthrie et al., 1994).

Two quasi-experimental studies were conducted to compare students who received a year of traditional teaching in literacy and science and a year of CORI with students. CORI students had higher measures of engagement and conceptual learning than students in traditional classrooms in both the third and fifth grade classrooms in which this study was conducted (Guthrie, Meter, McCann, Andersen, & Alao, 1996). Students in the third grade CORI classrooms demonstrated higher levels of achievement and conceptual learning than students in fifth grade traditional teaching classrooms (note 3rd and 5th grade students were placed on the same scale with the same performance assessments in order to make this inference). Researchers also found that CORI students performed higher than traditional students on the literacy and science sections of the Maryland School Performance Assessment (note – CORI students did not perform higher than traditional students in areas that were not taught – math, social studies). The measurable achievement differences seem attributable to the effects of the instructional design rather than student background or teacher characteristics (Guthrie et al., 1996).

Increases in intrinsic motivation were tied to amount and breadth of reading. Students who became more involved, curious, and social in the CORI classrooms reported more reading than students who were less motivated. The

researchers concluded that students in this study expanded their reading activities as their intrinsic motivation increased. Wigfield & Guthrie (1997) later documented that reading motivation correlates with the amount students read and other researches have shown that reading motivation predicts reading achievement on standardized tests (Gottfried, 1985, as cited in Guthrie et al., 2006) and school grades (Sweet, Guthrie, & Ng, 1998 as cited in Guthrie et al., 2006). Helping students develop conceptual knowledge through CORI has proven to be a motivational learning factor beneficial not just to a particular content area, but also to literacy development as well.

Nutrition Education

An extensive review of the literature related to nutrition education for school-aged children conducted by Lytle et al. (1994) found the following common elements in successful nutrition education programs:

- Interventions focus on specific behaviors
- Inclusion of activities that include self-assessment
- Involve family intervention in some capacity for younger children and peer involvement for middle and high school students
- Create connections between the classroom and the school cafeteria (with modification in the cafeteria to reflect the nutrition education program if needed)
- Allow for an attempt to impact the community
- Increase exposure to nutrition education.

School-based nutrition education should focus on knowledge and conceptual understandings of factors such as: nutrients, food preparation, food preservation and storage; social and cultural aspects of food and eating; enhanced self-esteem and positive body image; but also skills such as: behavior management, analyzing influences; decision making, goal setting, and accessing information skills (Centers for Disease Control and Prevention,1997; Dixon, Tershakovec, McKenzie, & Shannon, 2000; Perez-Rodrigo & Aranceta, 2001; Sullivan, 1998; Zabinski et al., 2006). Without skill development, conceptual knowledge is meaningless, because without decision-making, goal setting, accessing information, and analyzing influences skills, students lack the ability to apply the conceptual knowledge in practice.

To be effective, strategies within nutrition education must be creative, engaging, and inexpensive (Perez-Rodrigo & Aranceta, 2001). Other key factors that have been found to increase the effectiveness of transferring knowledge to practice in school-based nutrition education are: addressing the needs and interests of the students, teachers, and school; relevant objectives; using what students already know and can do; and ensuring cultural and developmental appropriateness (Perez-Rodrigo & Aranceta, 2001).

The literature related to nutrition education impact evaluation offers several examples of early adoption behaviors with high attrition rates. More often than not, the literature related specifically to school health education does not attempt to measure impact on behavior; rather, these studies measure

knowledge gains and identify social influences. Findings from these studies suggest that nutrition education interventions should be “relatively brief and non-burdensome” (Olandar, 2007, p.3). It is clear that sufficient time needs to be devoted to nutrition education and allowance for the practice of necessary skills; however, the key is finding the critical balance between the necessary brevity to avoid attrition and the essential time devoted to concept and skill building. A review of the literature identifies the need for more experimental and quasi-experimental nutrition education studies which will contribute to a greater body of research devoted to determining the minimum dosage of health education required for positive behavior change.

Olandar (2007) defines nutrition education dosage as the amount of exposure individuals have to an educational message or intervention. In the context of this study, dosage will refer to the number of lessons students receive, the length of time associated with each lesson, and the duration of the nutrition education unit. In reviewing the literature it is also necessary for nutrition education studies to identify the medium through which the messages are given (e.g. health education classroom, individual or small group after-school counseling or session, after-school activities with families), otherwise comparative generalizations are unattainable.

The literature related to school health education is not always clear in defining dosage in the way in which this term is being operationalized for the purpose of this study, nor is the literature consistently clear on the medium

through which these messages are delivered. Given these inconsistencies, it is still safe to suggest a positive association between intervention dosage and dietary improvements based on recent research (Olandar, 2007). Reviews of school-based intervention conclude that 10-15 hours of classroom education produce only minimal behavior changes, while considerable effects are not found until the intervention dosage reaches 50 hours (Connell, Turner, & Manson, 1985; Contento & Balch, 1995).

It is important to note that fidelity in delivering nutrition education programs is a problem (Lytle, 1995). A review of the nutrition education literature found, when curricula were disseminated to the teachers in classroom settings, a median of 3 hours was spent on nutrition education (Olandar, 2007). Very few of classroom teachers implementing nutrition education programs teach the minimum 10-15 hours of classroom education needed to produce behavior change. Given the fact that classroom teachers are not devoting the necessary time to nutrition education, it is important to note that small dietary effects regardless of intervention dosage and intensity are consistently found in the research related to nutrition education (Olandar, 2007). Therefore, low dosage interventions cannot be ruled out as insignificant or ineffective. In fact, research reviewed found that statistically significant gains in behavior change can be found as far as twelve months post intervention in low dosage interventions (Beresford, Farmer, Feingold, Graves, Sumner, Baker, 1992; Campbell, DeVellis, Strecher, Ammerman, DeVellis, Snadler, 1994; Delichatsios, Friedman, Glanz,

Tennstedt, Smigelski, Pinto, 2001; Kristal, Curry, Shattuck, Feng, Li, 2000; & Marcus, Heimendinger, Wolfe, Fairclough, RImmer, Morra, Warnecke, Himes, Darrow, Davis, Julesberg, Slevin-Perocchia, Steelman, Wooldridge, 2001 as cited in Olandar, 2007).

Powers, Struempler, Guarino, Parmer (2005) found that third-grade students participating in less than six hours of nutrition education demonstrated a statistically significant increase in overall nutrition knowledge when compared to the control group in this study. This is evidence that even modest doses of nutrition education can result in positive gains in nutrition knowledge. The emphasis on time devoted to nutrition education will remain a problem as long as schools are responsible for implementing and reporting high-stakes assessment results in specific subject areas other than health education. Little research on integrated nutrition education instruction has been conducted in the past (Contento & Balch, 1995). This study may be one method of addressing both the necessary material required for high-stake assessments, such as reading skills and essential nutrition education concepts and skills.

In a review and analysis of evaluation measures used in nutrition education intervention research involving school-aged children, Contento et al. (2002) report the “most commonly measured mediating variable is attitude” (p.8). Sixty-five percent of the studies reviewed, were based on a knowledge-attitudes-behavior paradigm. Diet self-efficacy was commonly measured in studies during the 1990s. Children were assessed to measure their confidence in their ability to

select healthful food choices. Measures of behavioral intentions or intended dietary behaviors/expectations have been used more frequently in recent studies (Contento et al., 2002). No studies measuring health skills related to nutrition education have been identified.

Although much research has been conducted in the area of nutrition education measurement and evaluation, “selecting the appropriate diet-related outcome measures still remains a dilemma each educational intervention has to confront, whether it is a research study or an intervention in a practice setting” (Contento et al., 2002, p.12). Four categories of factors have been found to influence food consumption: consumers’ incomes; food prices, and the prices of other products and services; consumers’ knowledge of health and nutrition; and consumers’ tastes and preferences. In order to change consumption, one of the factors above must be changed (Variyam & Blaylock, 1998). Therefore, a curriculum targeted to a limited number of behaviors is a more effective use of limited instructional time available for nutrition education (Contento, Mannign, & Shannon, 1992).

Reviews of the literature also suggest that nutrition education evaluation measures should be “appropriate to the purpose, duration, and power of the intervention” (Contento et al., 2002, p.12). Contento et al. (2002) assert, “different evaluation tools may be needed to evaluate programs delivered to individuals and small groups vs. those directed to communities at large or social marketing activities, for interventions of short duration vs. long-term interventions,

and for interventions targeting specific behaviors such as fruit and vegetable intake vs. those directed at more complex behaviors such as eating a balanced diet from the food groups" (p.12).

Analyzing influences

Children are exposed to a multitude of external influences which include, family, peers, media, culture, and social norms which affect their food choices and eating patterns. Children spend more free time watching television than any other activity (Brown & Walsh-Childers, 1994). The Center for Science in the Public Interest, a non-profit nutrition advocacy organization, determined that nine of ten food commercials on Saturday morning television advertised foods high in sugar, salt, or fat (Center for Science in the Public Interest, 1992). Half of all the ads that children view are for food, especially sugar sweetened cereals and high calorie snacks (Brown & Walsh-Childers, 1994).

Social norms and cultural tendencies play a critical role in children and adolescents' food selection and eating habits. Many more families are eating out today than they were even a decade ago (Lin, Frazao, & Guthrie, 1999). Food eaten outside the home is typically higher in fat and lower in micronutrients than food prepared at home (Lin et al., 1999). Restaurants and entertainment venues charge a minimal amount more for larger size orders of soft drinks, candy, popcorn, and French fries, which it is also important to note the standard serving size of these foods has dramatically increased in the past decade (Young & Nestle, 1995). Given the large amount of funding devoted to advertising food and

beverages toward children, and the distorted portion sizes outside the home, the need to effectively analyze the influences of social, cultural, and environmental factors related to food selection and eating patterns is critical.

Past nutrition education studies have measured concept knowledge gains and attitude changes; however, few if any have measured health skill acquisition, which is a necessary factor in applying nutrition knowledge (Lytle, 1995). Little research has been conducted on integrating nutrition education with other subject areas in school-based health instruction (Contento, & Balch, 1995). Concept-Oriented Reading Instruction has been found to be an effective method motivating students to read and use reading strategies while learning scientific concepts (Guthrie, Anderson, Alao, & Rinehart, 1999; Grant, Guthrie, Bennett, Rick, & McGough, 1993; Guthrie, Wigfield, Barbosa, & Perencevick, 2004). This study will address the need for more research in the area of integrating school-based nutrition education with other subjects and measuring health skill acquisition while using the CORI framework as the guide for curriculum development and implementation. The study is grounded in constructivist theory with the belief that learning is a reflective and interpretive process, which can only occur through personal interaction with both the physical and social worlds (Fosnot, 1996). This belief is illustrated in the curriculum design and implementation, which allows and encourages students to question, investigate, and apply new findings in authentic settings.

CHAPTER III

METHODOLOGY

Purpose of the Study

The purpose of this study was to examine student responses to a CORI nutrition education unit among sixth-grade students at a year-round middle school located in the southeastern region of the United States. The questions of interest guiding this study were: To what extent did students acquire conceptual knowledge when CORI was used to teach nutrition education? To what extent did students apply a health skill (analyzing influences) when CORI was used to teach nutrition education? In what ways did the use of CORI when teaching nutrition education engage students? What interests students about reading informational and narrative texts provided in a CORI nutrition education class?

To answer these research questions, I conducted a case study of the implementation of a CORI-based nutrition education unit in two sixth-grade middle school health education classes with a total of 63 students participating. Student developed artifacts, pre and post concept and skill questionnaires, pre and post student interest surveys, and field notes were used to collect data to answer each of the research questions. A case study was selected because I deliberately wanted to analyze contextual conditions of the study. The context

was as important to me as the statistical tests to determine the significance of cognitive gains after participating in CORI nutrition classes. While student cognitive factors are an important aspect of CORI, equally important are students motivation and affective needs. In order to observe, record, and analyze student reactions, responses, and interactions related to the CORI unit, a mixed method case study was essential.

This was an interpretative case study using a mixed methods approach to data collection to quantitatively and qualitatively examine student responses (concept acquisition, skill application, engagement, and interest) to integrating reading and nutrition education in a suburban sixth-grade public middle school health class. The mixed method research strategy was selected in an effort to describe an intervention and the real-life context in which it occurred (Yin, 2003). A concurrent mixed method approach was used to better understand the responses of students to a CORI nutrition unit by triangulating both statistical tests for significance using quantitative data with detailed contextual descriptions of the intervention provided by qualitative data (Creswell, 2003). It is my intention to not only establish the pre and post cognitive and interest measures but to also examine and present observations of student and instructor behaviors, patterns, and communication to create a rich description of student responses to a CORI nutrition unit. The concurrent mixed method was selected so that I could collect both qualitative and quantitative data at the same time during the study and later integrate the information when interpreting the overall

results (Creswell, 2003). The preliminary assumption was that participation in a CORI nutrition education unit would actively engage students in the act of constructing meaning for nutrition concepts through active reading and application of knowledge necessary to complete interesting tasks and that this would lead to a deeper understanding of the concepts and the ability to apply the skills when making nutrition choices within and outside of the classroom.

This is a case study using a sample of convenience. This is not an attempt to compare the patterns of change in a CORI classroom to changes in a comparison or control group. This is also not an attempt to analyze all components of a complex classroom environment to determine the influence of each classroom factor on the student learning process. The intention of this study is not to generalize the results of the sample to the population; rather, the purpose is to clearly and accurately depict the participants, the setting, and the students' responses to CORI unit.

In this convenience sample, there are students for whom English is not their heritage language and exceptional children with learning differences and disabilities. The average reading and achievement levels of the convenience sample are slightly above State averages based on End of Grade (EOG -high stakes assessment) scores. Other than the homogeneity of the geographic location within which the study occurs, the sixyh-grade students participating in the study are diverse in nature. Readers of the study are likely to relate to the

convenience sample selected because of the diverse nature of the classes, which is quite typical of most classrooms in North Carolina today.

Within an interpretive paradigm, each case is viewed as both an example of a general case but also in context of its own unique way, which does not equate to the definition positivist researchers use for external validity and generalizability (Denzin & Lincoln, as cited in Mertens, 1998). Instead, the burden of generalizability lies within the reader, who may or may not be able to generalize subjectively from the study to personal experience.

The CORI framework was selected for this study because of previous success reported in the literature from multiple studies in the field of science education (Guthrie, Wigfield, 1997; Guthrie, Wigfield, Barbosa, & Perencevich, 2004; Grant, Guthrie, Bennett, Rice, & McGough, 1993). No research regarding student responses to CORI with a focus on health concepts was available at the time of planning and upon completion of this study. However, the purpose of the study was not to expand upon the current literature related to the effectiveness of CORI in comparison to other types of reading or science instruction. Rather, the focus of this study is to explore student responses to CORI in a health education class and assess levels of engagement, conceptual knowledge gains, skill application, and student interest in reading and hands-on tasks during health instruction.

A pilot of the CORI nutrition education curriculum was conducted during the fall of 2007 with a group of 11 and 12-year-old boys and girls attending an

after-school program in the same city in which the current study occurred; however, the participants did not attend the middle school in which the current study occurred. Based on the pilot study, revisions were made to the curriculum to enhance the instructional design and reduce the breadth of the curriculum in order to accomplish several objectives in six 50-minute classes. Revisions were also made to the assessments to measure interest instead of motivation given the length of the intervention. Fewer nutrition concepts were measured, also due to a limited amount of time with the participants.

A teacher who continually seeks professional development was recruited to participate in this study due to her interest and willingness to try a different approach to health education instruction. Her school was also selected, because the school and district were supportive of this type of research in the area of nutrition education (Appendix D). The cases involved in this study are comprised of two different classes of sixth-grade students taught by Ms. Smith (pseudonym). Each class is on a different track (track 2 and track 3) at their year-round middle school. Both cases were a part of this study at the beginning of their fourth block (sometimes referred to as fourth track-in) during the 2007-2008 school year. Both qualitative and quantitative data were collected during the study and further detail related to the instruments used and analysis of the data will be offered later in this chapter.

Research Questions

Research Question 1: To what extent do students acquire conceptual knowledge when CORI is used to teach nutrition education? This question was derived from previous research, which suggests that the integration of reading and science instruction through CORI can increase science-based conceptual knowledge (Glynn & Duit, 1995; Guthrie, Bennett, & McGough, 1994; Guthrie, Anderson, Alao, Rinehardt, 1999; Guthrie & Wigfield, 1997; Guthrie, Wigfield, Barbosa, Perencevich, 2004; Guthrie, Anderson, Alao, & Rinehardt, 1999; Guthrie, Meter, Hancock, & Alao, 1998; Swan, 2003). The experimental findings of Guthrie, Meter, McCann, Anderson, & Alao, (1996), suggest that principles of CORI such as hands-on activities, real world experience, and self-expression of conceptual knowledge through informational projects intertwined with the learning experience, are responsible for increased conceptual understanding in science. No work has been conducted to study student responses to CORI in the context of health education; therefore, this study is the beginning of an exploration examining effects of integrating reading and health education through the use of CORI on conceptual understanding.

Research Question 2: To what extent can students apply a health skill (analyzing influences) when CORI is used to teach nutrition education? School-based nutrition education programs are most likely to be effective when they help young people learn and apply skills not just fact-based knowledge (CDC, 2006; Perez-Rodrigo, & Aranceta, 2001; Contento, Randell, Basch, 2002; Lin, Frazao,

& Guthrie, 1999). Although research suggests the significance of a skills-based approach to nutrition education programs, no studies of a nutrition education programs measured health skills; therefore, I felt it was important to examine student skill application after a CORI nutrition unit.

Research Question 3: In what ways does the use of CORI when teaching nutrition education engage students? CORI increases student engagement in the learning process (Baker, Dreher, & Guthrie, 2000; Guthrie, Wigfield, Barbosa, & Perencevich, 2004; Swan, 2003). This notion of engagement emphasizes the combination of choosing and comprehending (Guthrie, Bennett, & McGough, 1994). In studies where CORI was used to teach science concepts, students in CORI classrooms reported more intrinsic motivations for reading such as curiosity. Students who experienced the CORI approach report higher levels of interaction with their peers during “hands-on” instruction which resulted in motivation for learning and using strategies (Guthrie, Bennett, & McGough, 1994). Studies of student experiences in CORI have documented growth in literacy skills related to searching for information in multiple texts, representing ideas through drawing and writing, and transferring conceptual knowledge to new situations (Guthrie, et al., 1996). Given the high levels of student engagement in science concepts reported in previous research, it was an important factor to observe and document while measuring student responses to CORI.

Research Question 4: What interests students about reading informational and narrative texts provided in a CORI nutrition education class? Evidence

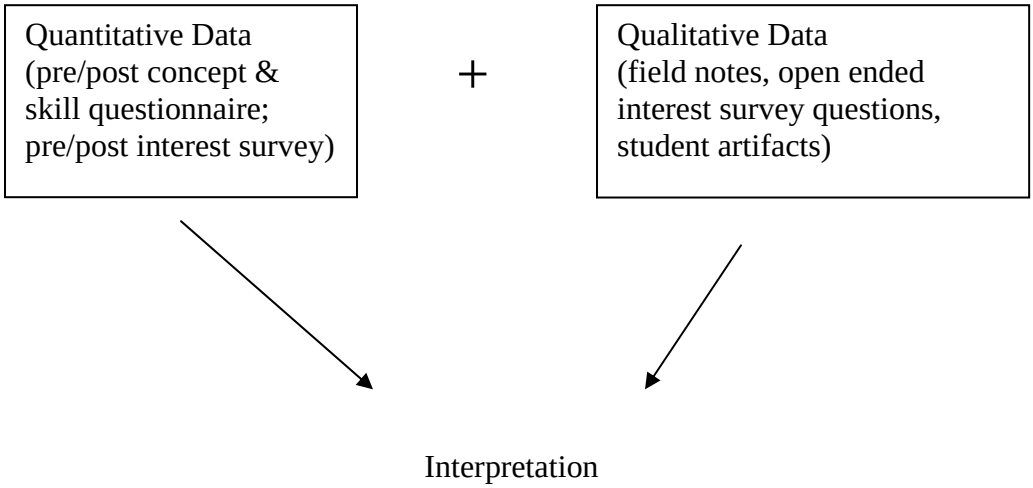
suggests that comprehension increases in an environment that supports reading engagement, reading interest, and motivation (Baker, Dreher, & Guthrie, 2000; Grant, Guthrie, Bennett, Rice, & McGough, 1993; Guthrie, Bennett, & McGough, 1994; Guthrie & Cox, 2001;Guthrie, Wigfield, Barbosa, & Perencevich, 2004; Guthrie, Wigfield, Humenick, Perencevick, Taboada, & Barbosa, 2006). Students who participate in CORI report higher levels of intrinsic motivation and positive effects on choosing to read (Guthrie, et al., 1996). Even though the intervention was short in duration, it was important to measure student interest in reading informational and narrative texts before and after the CORI nutrition unit.

Design of the Study

The goal of this study is to explore student responses to nutrition education using a CORI approach by analyzing student artifacts, pre and post concept and skill questionnaires, pre and post student interest surveys, and classroom conversation and activity. Given the complex nature of a learning environment, I opted to analyze student responses using both qualitative and quantitative measures. A mixed method design allows the research to expand, elaborate on, and explain findings (Creswell, 2008), which is particularly useful when using a case study with a small sample size. I used Creswell's (2008) triangulation design to frame this study. I collected both qualitative and quantitative data simultaneously so that, "…one data collection form supplies strengths to offset the weaknesses… (of the opposite form)" (p.557). The simultaneous collection of qualitative and quantitative data has allowed me to

make comparisons and interpretations as to whether the data from each set is supportive or contradicting of the other. Qualitative data such as engagement observations from field notes, direct quotes, and student artifacts were used to support findings and in this study contradict some of the quantitative findings. An example of Creswell's (2008) triangulation model is offered in Figure 3.

Figure 3. Triangulation Mixed Method Design



Participants

Participants in this study included: (1) me, the researcher, who also served as the instructor, (2) a research assistant who was a graduate student in health education at a nearby university, (3) the classroom teacher who recorded field notes, and (4) two classes of sixth-grade students from a year-round suburban middle school in the southeastern United States. The student

participants of this study are enrolled in a combined health and physical education course in which the instruction alternates every two weeks between health and physical education. The students in this study had not received any nutrition education instruction during the 2007-2008 school year prior to the implementation of this study. There were 63 student participants. Parental permission and student assent was requested of all students in each case (Appendix E, F). Students for whom assent or parental consent was not obtained, were participants in the CORI lessons, which served as their nutrition health unit; however, I did not collect data from these students for the purposes of this study. Case one was a sixth-period, track-three, grade-six health education class. Parental permission and student assent was granted for 36 of the 39 students in this class; therefore, case one includes 15 females and 21 males [N=36]. The students who made up case one describe themselves as White (61.1%), African American (30.6%), Hispanic (5.6%), and Multi-Racial (2.8%). Case two consisted of third-period, track-three, grade-six students. Parental permission and student assent was received from 27 of the 28 students; therefore, case two consists of 10 females and 17 males [N=27]. The students who made up case two describe themselves as White (63%), African American (33.3%), and Hispanic (3.7%). The ethnic makeup of these cases reflects this southeastern suburban middle school's population which is comprised of students who self identify as White (51%), African American (30%), Hispanic (11%), Asian (3%), and Multi-Racial (5%). One female Hispanic student in

case 1 and one male Hispanic student were identified as students with Limited English Language Proficiency. Table 1. provides the demographic data for participants in both cases in this study. Table 2. further defines the sample by gender and ethnicity.

Table 1. Student Participant Demographic Data

	Total Student Participants	Female	Male	White	African American	Hispanic	Multi-Racial	Students with disabilities
Case 1	36 (57%)	15	21	22	11	2	1	2
Case 2	27 (43%)	10	17	17	9	1	0	3
Totals	63	25 (40%)	38 (60%)	39 (62%)	20 (32%)	3 (5%)	1 (1%)	5 (8%)

Table 2 – Student Participant Ethnicity X Gender Demographic Data

Case	Gender	Ethnicity			
		White	African American	Hispanic	Multi-Racial
Case 1	Female	8	5	2	0
	Male	14	6	0	1
Case 2	Female	6	4	0	0
	Male	11	5	1	0

The economic status of the sample population includes affluent, middle class, and economically disadvantaged families. The school resides in a residential suburban community, which includes professional, industrial, and service oriented community members. The county that surrounds this school has

a population of 786,522 (US Census, Bureau 2006). The school's student population is 1,119 and the average grade six class size is 23 students (note the health education classes in the study have 39 and 28 students enrolled). There are 73 classroom teachers at this school. There are 11 mobile units on the school grounds. Three of the mobile units serve as health education classrooms. The healthful living department members are each allotted six computers for their classrooms and all of the teachers within the department decided to pool their resources and create a healthful living technology lab with Internet connection for all computers in one of the vacant mobile units. One class was held in the technology lab during the study in both cases.

I served as the researcher and as the instructor in an effort to maintain fidelity during the teaching of the CORI nutrition unit and to reduce the variance of instruction afforded the two case study classes. My role as the researcher is commonly known as a collaborative participant in which I am close to being considered a participant; however, my identity and purpose in participation is clearly known to everyone involved (Denzin & Lincoln, 2005; Merriam, 1998). I am a Caucasian/white female. I maintain an M license (K-12) in health education for the state in which this study occurred. I have five years of experience teaching public school students health education, six years of experience serving as a health education curriculum consultant for a state Department of Public Instruction, and two years of experience as an instructor for school health education at the university level.

The classroom teacher is Caucasian/white, and maintains an M licensed health educator (K-12). She has over 22 years of teaching experience at the middle grades level in public schools. Ms. Smith recorded field notes throughout both cases and I was able to debrief with her at the end of each class and member check the field notes and qualitative findings. Ms. Smith is actively involved in a leadership role for the professional association for health education and serves as the department chair for healthful living and as chair of the school improvement team at her school. She consistently seeks new opportunities to learn and grow as a teacher in the fields of health and physical education and she has a positive rapport with her students. Ms. Smith's students are used to a cooperative classroom environment, active learning, and open dialogue. Ms. Smith uses technology, hands-on learning strategies, and inquiry techniques to enhance her health education instruction. Therefore, the tenets of active learning during the CORI unit in this study was not a new mode of instruction for either class.

Sample Limitations

Students were only allowed to participate in the study if both parental and student assent forms were signed and returned. These forms were not obtained from three students in case one and one student in case two. Absenteeism did not affect the data collection from the student participants because we were able to see all students each day of the study. Ms. Smith reported that absenteeism is typically less in a year-round school because parents can plan for vacations,

doctor appointments, and other situations that generally require students to miss school during the track-out periods. She also noted that the absenteeism rate is far less at the beginning of each block (or track-in period) because students come back rested and well from the track-out period.

Students are not allowed to leave health classes or any other classes for what is traditionally known in other schools as pull-out programs and the school does not operate on a bell system. Disruptions during and between classes at this school are minimized intentionally by school faculty and administration. Teachers dismiss students at the end of the period using a school wide clock that is evident on the television screens in each classroom and mobile unit. There are no announcements made via the school intercom system until the lunch hour and just before school dismissal. All announcements and concerns are relayed from the administration to teachers electronically or by use of the school-based telephone system. The only school event that could have (but did not appear to) altered the school culture differently on one day when compared to another was a bus accident on the second day of instruction during the study with case two. None of the students in this class were involved in the accident; however, it created a lively discussion prior to the start of class and students were interested in the news camera crew on campus earlier in the day.

The sample size in this study, just two cases, is small, which limits the use of quantitative statistics and only one school is included due to the timing during the school year of the study, which greatly reduces external validity (Yin, 2003).

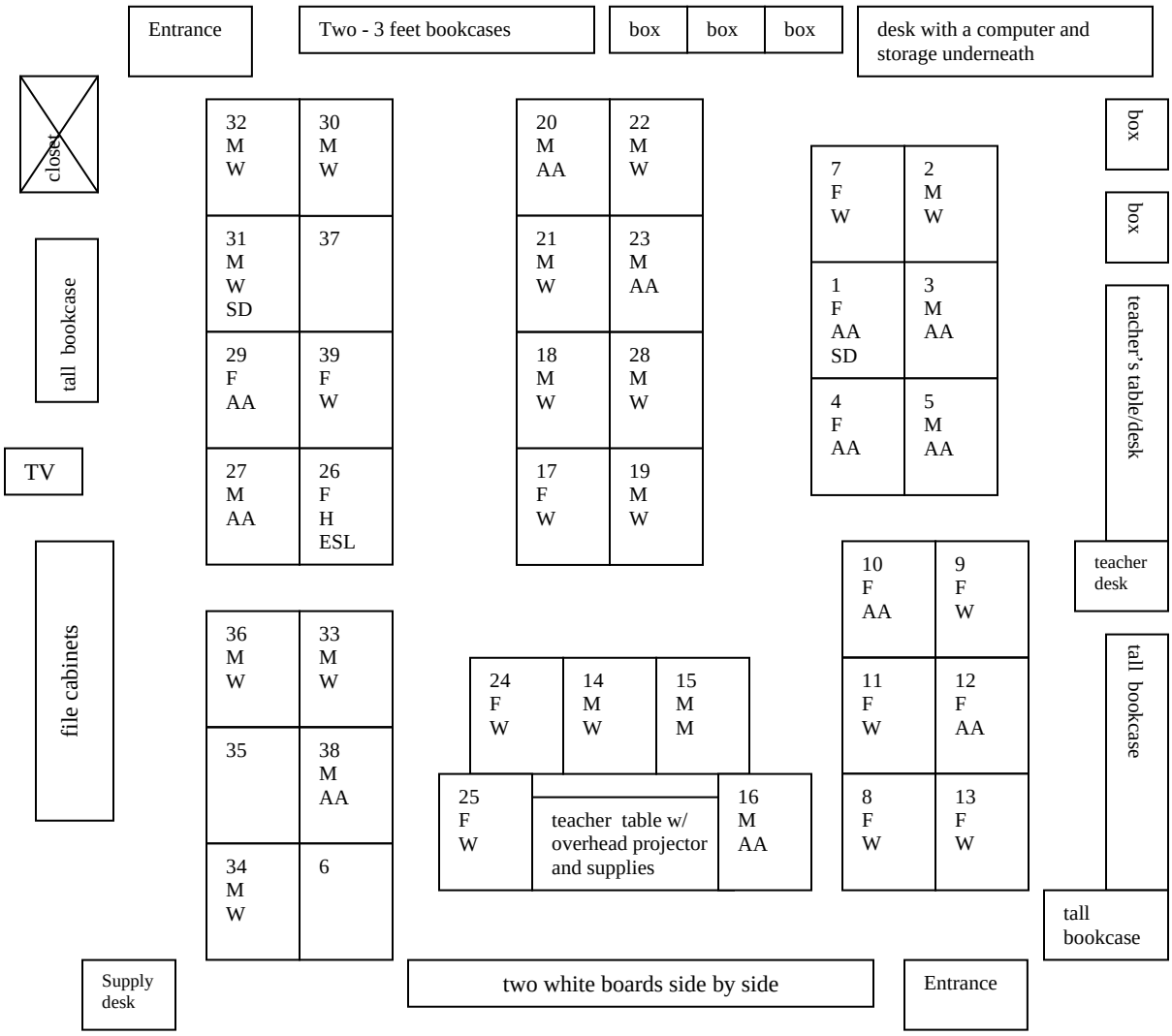
The students at this school consistently perform slightly above state averages on the End of Grade Tests in reading and math at all three grade levels; therefore, the academic abilities of the students at this school do not reflect the broad population of students across North Carolina (NC School Report Card, 2006). Generalizability is not the purpose of this study and the transferability of the results rests with the reader and his/her personal experiences in comparison to the case studies as described in detail.

Context: The Learning Environment

The classroom in which both cases met is a mobile unit that has limited space and much of the area surrounding the students' desks is used for storing health and physical education instructional resources. The room has no windows and there was moderate overhead florescent light. Student work is displayed on the bulletin board above the short bookcases on the back wall. Health-related posters and messages related to character education, refusal skills, and physical activity are displayed throughout the classroom on the walls. There were many manipulatives on the shelves of the tall bookcases, multiple books that could be used as resources for health education, and variety of critical thinking games. Although the instructional environment contains lots of storage and has no windows, it is a comfortable learning environment, which is quiet and arranged in the best possible format for student interaction and class participation in group work and whole class instruction. There are two white boards at the front of the room, an overhead projector, and a television, which can be utilized for

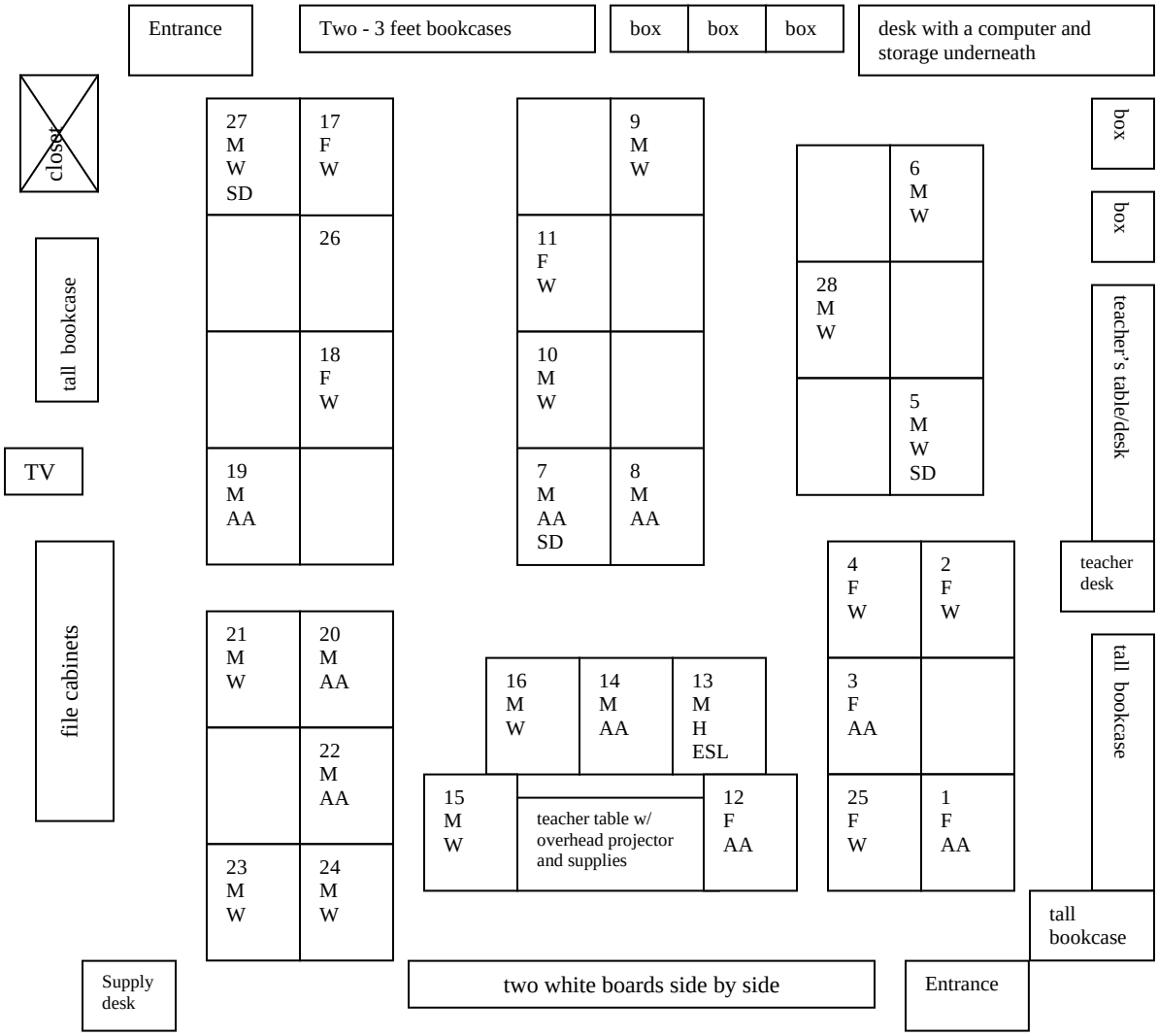
instruction. For case one there are just enough desks to accommodate the students. There is not a lot of space for walking; however, the students in both cases are arranged in groups by their table-like desks and report having worked in groups before. The seating arrangements are designed by the teacher, as seen in Figures 4 and 5, and students are moved on occasion depending on group productivity or lack thereof.

Figure 4. Case 1 Seating Chart



Legend
M= Male
F= Female
W= White
AA= African American
H=Hispanic
ESL= English as a Second Language
SD = Students with Disabilities

Figure 5. Case 2 Seating Chart



Legend
M= Male
F= Female
W= White
AA= African American
H=Hispanic
SD = Students with Disabilities (both students with disabilities in this class have been diagnosed with autism)
ESL= English as a Second Language

Curriculum: The CORI Nutrition Education Unit

The unit of instruction carefully integrates grade six state standards for healthful living and the grade six state standards for language arts according to the North Carolina Standard Course of Study (http://www.ncpublicschools.org/curriculum/ncscos). A matrix demonstrating how the curriculum unit is aligned with both the language arts and the health state standards is provided in Appendix G. The CORI nutrition unit includes stimulating tasks, which require the students to construct meaning of new concepts through problem solving, creating products, and answering critical questions. Tasks require various configurations of students including, whole class, small group, pairs, and individual investigation and creation.

Each stimulating task is accompanied by whole class reading excerpts and individual readings, which are selected by the students from a packet of reading material or from the class library (a set of books I provided related to nutrition). The texts are both informational and narrative and the purpose of these readings is to offer additional insight to the new concepts presented and provide guidance for attempting the various tasks. The texts range from science-based informational pamphlets and non-fiction books to children's trade books. Internet narratives, excerpts from books, and purposefully-designed material such as the Energy Balance Reference Manuals were used to help students develop deeper conceptual knowledge. The lesson on day six required students to find information on the Internet and from any of the readings available to them,

in order to create products for the various tasks presented. The concepts, tasks, and texts used to facilitate CORI during this nutrition unit are detailed in Appendix H.

Data Sources

Qualitative and quantitative methods were used to gather data in an effort to examine student responses to a CORI nutrition education unit. This examination included analyzing nutrition concept knowledge gains, skill application, student engagement in the learning process, and student interest in the activities and texts used during the CORI nutrition unit.

Crosswalk

A crosswalk assists researchers in aligning research questions with data collection methods (O'Sullivan, 1991). This study utilizes four methods for collecting data: 1) pre and post pen and paper tests with selected response questions assessing nutritional concept knowledge and the effective application of the analyzing influences health skill, 2) pre and post survey measures of student interest in various instructional tasks and reading, 3) student artifacts, and 4) field notes recorded by the research assistant, classroom teacher, and the researcher. A visual of a crosswalk between the research questions and the data collection methods is presented in Table 3.

Table 3. Crosswalk Between Research Questions and Data Collection Methods

Research Questions	**Student Artifacts**	**Pre/ Post Concept and Skill Question naire**	**Pre/Post Student Interest Survey**	**Researcher Field Notes**
1. To what extent do students acquire conceptual knowledge when CORI is used to teach nutrition education?	X	X		X
2. To what extent can students apply a health skill (analyzing influences) when CORI is used to teach nutrition education?	X	X		X
3. In what ways does the use of CORI in nutrition education engage students?			X	X
4. What interests students about reading informational and narrative texts provided in a CORI health class?			X	X

Data Collection Procedures

Two teachers, Ms. Smith and Mr. Thomas, from two different school districts were recruited to participate in the study because of their previous engagement in professional development opportunities and interest trying new instructional strategies in the health classroom. After both school districts and the university Internal Review Board (IRB) granted approval, I requested an opportunity to work with sixth-grade students for a minimum of seven days. Ms.

Smith was able to schedule the CORI unit into her spring semester for two 6th grade classes. Mr. Thomas had an intern in his classroom and was unable to participate in the study because he was supervising an intern who had to fulfill internship hours. Parental consent forms (Appendix E) and student assent forms (Appendix F) were distributed and collected prior to the implementation of the curriculum unit and the gathering of any data. Consent and assent forms provided a brief description of the study and emphasized the confidentiality of student responses. Students were also given a verbal explanation of the study and the assent forms were read aloud with time to answer questions from the students before they signed the forms. An assigned student number identified all questionnaires, surveys, and student work. The classroom teacher maintained a list of student numbers and corresponding participant names, which was never shared with me and kept in a locked file drawer. However, she often referred to this list in order to return student work and to help students recall their assigned number throughout the curriculum implementation.

Pre and post questionnaires (Appendix I) were used to measure students' nutrition conceptual knowledge based on the objectives of the CORI nutrition curriculum (energy and nutrients, balance between energy consumption and energy expenditure, MyPyramid and nutritional balance, meal planning, interpreting food labels to make healthful food choices, and portion selection/control). The alignment between the concept knowledge assessment and the lessons taught is available for reference in Appendix J. The pre and post

questionnaires were also used to measure students' ability to apply the analyzing influences health skill. The alignment between the analyzing health skill and the lessons taught is located in Appendix K.

Validity refers to the extent to which an instrument measures what it is intended to measure while reliability refers to the extent to which an instrument measures a variable consistently. Data collection instruments have validity when they are appropriate for the specific purpose and population being studied. Content validity is the degree to which an instrument measures the concepts taught. The concept questionnaire was developed using items from the State Collaborative for Assessment and Student Standards (SCASS) Health Education Assessment Project (HEAP – a national health collaborative sponsored by participating states and the Council of Chief State School Officers) concept items for middle school students. These items have been piloted tested by middle school students using nutrition concepts from the national health education standards on which the state standards addressed by these lessons are based. I requested a review of the items in comparison to the objectives of the lessons and the content covered in each lesson by the classroom teacher and a full professor in the field of health education with over 33 years of experience teaching health pedagogy to further address content validity. Both professionals offered feedback and agreed that the revised instrument measured the health concepts and skills addressed by the nutrition unit.

Data collection instruments have internally-consistent reliability when individual statements are determined to measure the same construct. Cronbach's alpha is a measure of internal consistency, one of several tests of reliability. The closer Cronbach's alpha is to 1.0, the more reliable the instrument is. The internal consistency for the concept questionnaire computed using Cronbach's alpha (computed with SPSS) is .874 (item N=18), which indicates an acceptable level of consistency.

Pre and post surveys measuring student interest in the texts and learning activities were administered (Appendix L, M). The surveys contained affirmative statements related to students' feelings toward various teaching strategies, which were offered in the CORI unit. The students read each question and responded using a Likert scale as to whether they strongly disagreed, disagreed, agreed, or strongly agreed with each statement. There was an open-ended question at the conclusion of the survey, which asked students to list their top three favorite class activities and explain why. Questions used on this questionnaire were derived from the Reading Motivation Questionnaire (Wigfield & Guthrie, 1997). Because no previous studies have measured student reading interest in health education, further research will need to be conducted to address the validity of this instrument.

Student artifacts such as the nutrient concept map, energy balance clinic patient notes (Appendix N), nutrient assessment chart (Appendix O), How Big is Big portion investigation record (Appendix P), serving size comparison chart

(Appendix Q), and the meal designs (Appendix R) were used to assess conceptual knowledge levels and student engagement. Students completed these items to display their learning, thus providing additional data about knowledge acquisition to triangulate with the pre and post knowledge assessment.

Another data source, which provided evidence used in answering all of the research questions was the use of field notes. During each lesson the research assistant and/or the classroom teacher (depending on the availability of both) recorded questions of students, questions of the teacher, and general classroom activity. I used these records and my daily reflections to provide vignettes, which illustrate classroom interactions throughout the study and serve as evidence for signs of student engagement in the learning process.

Data Analysis Procedures

Data were analyzed at the conclusion of the study. Table 4 provides a summary of the data collection sources and analysis procedures utilized when answering each research question.

Table 4. Summary of Data Collection and Analysis

Question	Data Source	Analysis
1. To what extent do students acquire conceptual knowledge when CORI is used to teach nutrition education?	Pre & Post Nutrition Concept Questionnaires	Gain Score Analysis
	Student Artifacts Field Notes	Content Analysis
2. To what extent can students apply a health skill (analyzing influences) when CORI is used to teach nutrition education?	Pre & Post Skill Application Questionnaires	Gain Score Analysis
	Student Artifacts Field Notes	Content Analysis
3. In what ways does the use of CORI in nutrition education engage students?	Pre & Post Student Interest Surveys	Gain Score Analysis
	Student Artifacts Field Notes	Content Analysis
4. What interests students about reading informational and narrative texts provided in a CORI health class?	Pre & Post Student Interest Surveys	Gain Score Analysis
	Field Notes	Content Analysis

At the conclusion of each lesson during both data collection cycles, there was time to debrief with the research assistant and the classroom teacher about specific observations, student questions, student behaviors, student interactions, and student work. Field notes and reflections were compared, suggestions were made for the next lesson, and different perspectives of how the lesson went each day were shared. The classroom teacher's reflections were particularly helpful because she could compare student reactions, interactions, behaviors, and questions to previous patterns established in her classroom. Once the field

notes were grouped by case and by day of the week for setting purposes, I used a simple coding scheme, which involved classifying student quotes or notes related to student activity by concept knowledge, skill acquisition, engagement, and reading interest.

At the conclusion of each day, during the data collection process, I reviewed the students' folders to examine their work. I offered corrective and supportive feedback on the tasks completed each day. I also referenced these artifacts when writing my reflective notes each day. During the data analysis, I used quotes from these artifacts, and summaries of student work to provide evidence when answering the research questions.

At the conclusion of the data collection process, demographic data and student responses from the pre and post questionnaires were split into concept and skill sections and entered into SPSS. Data were reconfigured to indicate correct and incorrect responses, total scores for each assessment, and gain scores for all cases. I conducted a paired samples *t*-test to compare the mean of the pre and post concept and skill questionnaire scores. I conducted mixed design ANOVA tests to examine effect differences by gender and ethnicity in concept score differences. The internal consistency for the concept questionnaire computed using Cronbach's alpha is .874 (item N=18). A post hoc factor analysis was conducted and an acceptable level of consistency was found for each concept construct measured: nutrient and energy consumption .837,

nutritional balance and MyPyramid .792, food and beverage labels .804, meal design .837, portion control .593.

The skill section of the pre and post questionnaires were also used at this time to examine differences between skill application prior to and upon completion of the CORI nutrition unit. A paired-samples *t* test was conducted to determine if there was a significant difference between pre and post CORI scores. Mixed design ANOVA tests were used to examine effect differences by gender and ethnicity in skill score differences as well. The internal consistency for the skill questionnaire computed using Cronbach's alpha is .703 (N=6 items).

At this point during the study, I also entered all pre and post student survey responses to the Likert scale questions, and all open-ended responses related to the questions, which asked, "List your top three favorite class activities, and explain why." I looked for differences between the pre and post qualitative responses. The Likert scale questions related to student interest were grouped into disagreement and agreement frequencies and the differences between the pre and post tests were configured and analyzed. The internal consistency for the student interest survey computed using Cronbach's alpha is .855 (item N=17).

Dependability, Confirmability, and Credibility

In addition to the role of researcher, I also assumed the role as the instructor of the CORI nutrition unit in both classes. Denzin & Lincoln (2005) and Merriam (1998) would categorize my participation in this study as a collaborative

participant. As a collaborative participant, I worked closely with the participants in the study and interacted with them through an instructor role daily; however, my role as researcher was also clearly explained before the study began. I have spent the last eight years of my career developing curricula, which integrate health education with other subject areas. I have also dedicated a significant amount of time to offering professional development opportunities for teachers of health focusing on creating active learning environments and instruction for students. I have focused on the integration of books, texts, and music in the health classroom to teach a variety of concepts in recent years and learned of CORI while conducting a literature review for my graduate studies. I studied this curriculum framework in depth and felt confident piloting this approach to nutrition education with the population in this study.

Given the interpretative nature of this study, it is important that I acknowledge my biases. It is my background in health education and personal belief that active learning allows for stronger personal connections and construction of meaning, which results in an interpretive bias toward active learning strategies. Based on anecdotal evidence, I have found learners of all ages to engage at higher levels of thinking and reflection when actively involved in the learning process in an environment, which allows for the creation of personal meaning and honors different experiences and differences in prior knowledge. I also frequently use a constructivist lens when analyzing curriculum and student responses. Moss (1994) offers an explanation of an alternative to

reliability grounded in the interpretive paradigm, which includes "…integrative interpretations of collected performances that seek to understand the whole in light of its parts…"(p.7). Multiple and varied sources of evidence were used in this study. Collaborative inquiry and member checking between the research assistant, the classroom teacher, and me were used to compare and revise initial interpretations. This often took place after school during the first case and during lunch when collecting data from the second case. Ms. Smith had a planning period prior to 6th period during the first round of data collection. We used this time to talk about student questions, behaviors, and work from the previous day. Once all qualitative data were collected, coded and triangulation was determined, I contacted Ms. Smith again to check my interpretations of the data for a more formal check. The quantitative and qualitative data referenced in this study can be tracked back to their original sources.

Summary

The purpose of this study is to examine student responses to the use of Concept-Oriented Reading Instruction to teach nutrition education. This instructional framework was used to design the nutrition unit consisting of stimulating tasks and interesting texts to help students practice utilizing health knowledge and skills to create meaning around constructs such as balanced meal planning, interpreting food labels to make healthy choices, nutrient energy and expenditure, and portion control. Pre and post questionnaires and survey data were collected to analyze differences in conceptual knowledge, health skill

application, and interest in various classroom activities before and after the CORI nutrition unit. Observational data was collected through field notes recorded by Ms. Smith, the classroom teacher, a research assistant, and self reflection notes which I recorded at the end of the day during the data collection process. Student artifacts were collected during the CORI nutrition unit to determine students' progress and understandings. These data were used to answer the following research questions: 1) To what extent do students acquire conceptual knowledge when CORI is used to teach nutrition education?; 2) To what extent can students apply a health skill when CORI is used to teach nutrition education?; 3) In what ways does the use of CORI in nutrition education engage students?; 4) What interests students about reading informational and narrative texts provided in a CORI health class? Findings for these questions are presented in the next chapter, Chapter 4.

CHAPTER IV

FINDINGS

The purpose of this study was to examine student responses to the integration of a concept-oriented reading framework and nutrition education in grade six public school health classes. A case study was conducted using two classes on different tracks at a year-round middle school located in the southeastern region of the United States. This study sought to answer the following research questions: 1) To what extent do students acquire conceptual knowledge when CORI is used to teach nutrition education?, 2) To what extent can students apply a health skill (analyzing influences) when CORI is used to teach nutrition education?, 3) In what ways does the use of CORI in nutrition education engage students?, and 4) What interests students about reading informational and narrative texts provided in a CORI health class? This study was conducted and the data were analyzed using an interpretative case study, mixed methods approach. The following sources of data were collected and analyzed to answer the research questions: student artifacts, pre and post student interest surveys, pre and post concept and skill questionnaires, and field notes.

This chapter offers the findings of the study and is organized by research questions. Both quantitative and qualitative data analyses are presented.

Pseudonyms have been used to protect and maintain the anonymity of all participants, other than myself, in this study. Supportive and contradicting findings are reported in this chapter. When using a mixed methods approach it is as important to explore and document the possible reasons for contradictions in the findings.

Moss (1994) suggests,

> Inconsistency in students' performance across tasks does not invalidate the assessment. Rather, it becomes an empirical puzzle to be solved by searching for a more comprehensive or elaborated interpretation that explains the inconsistency or articulates the need for additional evidence. A well-documented report describes the evidence available to other readers so that they may judge its adequacy for themselves in supporting the desired generalization. (p.8)

It has been my experience when working in public school classrooms that few answers are dichotomous in nature. The complexities that surround the learning process, student readiness, student interest and motivation, and general student responses to instruction are great in number and make simple and clear answers nearly impossible to attain. It is my intention to thoroughly describe student responses observed and measured in multiple ways and provide sufficient evidence to the readers, which support findings related to each research question. What follows is a detailed and rich description that depicts the implementation and progression of the week-long concept-oriented nutrition unit implemented as a part of this study. The story begins with the first instructional day:

Concepts taught during this six-day unit were guided by the sixth-grade health education state standards. In alignment with the CORI framework, I asked each class if they had questions to which they wanted answers during our time of investigation together. Student responses were as follows: What are energy drinks and do they really give you more energy? How do energy drinks work? What snacks are good for you? What are bad foods? What is healthy? How do you find calories? Is it bad if you are overactive? How many calories should you burn in a day? Can apples be bad for you? Is spinach pizza healthy? How many calories can you burn by jumping on a trampoline? Is it healthy to eat fried chicken then burn it off?

Autonomy in learning and activating student interest are supported in the CORI framework and in constructivist theory, so I felt strongly about assessing what the students were interested in learning and making a concerted effort to address these issues within the unit. Energy drinks were integrated into the nutrient reading and debate activity lesson with an additional activity that required students to make a recommendation related to whether an athlete should drink an energy drink prior to competition. It was a positive experience at the beginning of the unit to see students' interest and responses to the challenge of answering questions posed by each other.

I then asked students, "What is energy?" and students responded with answers based in science: "the ability to work, potential, and movement." I asked students, "If we use your collective definition of energy as the ability or

potential for work or movement, then where does energy come from?" Students again responded from a science perspective "solar, kinetic, nuclear, wind, heat." Katie gave electricity as a source and Cameron quickly expressed that, "electricity is the result of the transfer of energy," which led us into the next phase of our discussion.

I asked, "How do humans get the energy we need, what are the sources of energy for humans and how is it transferred?" Students quickly responded with food as the answer. I asked, "How can food give energy?" John answered as follows: "Plants get energy from the sun through photosynthesis and then we eat the plants and get energy from the plants." He was on the right track when thinking about energy being stored and transferred. A student volunteered to read a brief excerpt from the book, *Fats, Sugars, and Empty Calories* (Energy is the key: An introduction to calories) and we discussed the notion of a calorie and what that entails. I set up three foods in the front of the room: a teaspoon of olive oil, three almonds, and a teaspoon of rice. I asked the students, "If I were to set each of the foods on fire what would happen?" Katie said, "the oil would explode", Mark said, "they wouldn't burn", and Cali said, "everything would catch on fire." I explained that, "we cannot actually conduct this experiment because Cali was right there is a possibility that things could catch on fire so I will explain what would happen if we could conduct this experiment."

I offered the following for thought, "Each food contains energy that would be released when burned in the form of heat. The heat from the food's fire could

increase the temperature of water – think of boiling water on a stove. Each temperature degree the water rises is the equivalent of one calorie." I asked the students to, "Make a prediction, if we could conduct this experiment and measure the water temperature after burning each of the foods, which would have the highest temperature or would they all be the same?" Students' answers varied. I asked Kevin why he thought the oil would burn longer. He said, "Because oil is a better fuel than rice – cars run on fuel not plants." His statements suggest that he is trying to link this concept to what he knows and understands about fuel and energy resulting from burning fuel. I asked, "Why might that be the case?" No students responded, so I encouraged the students to keep thinking about the answer to this question and indicated we would revisit this question before the end of the lesson.

The nutrient mission was the students' next challenge. Students were divided into small groups, which usually consisted of students in the closest proximity to their desks. Each small group was assigned a nutrient (fat, protein, carbohydrate, calcium, and fiber, although not a nutrient, was included in this research project). I told students that for the next few minutes they would assume that I am am alien who just landed and needed to adopt a human lifestyle. They were to inform me if I should eat this nutrient and if so, provide reasons why. I needed to know the benefits of this nutrient and how I can find this nutrient (i.e. what foods would be a good source of this particular nutrient).

Students worked in small groups to split the reading packets and used a concept map to record their findings in order to present them to the class.

The students' concept maps revealed a variety of levels of reading comprehension and different understandings of the task. Some students read material on each nutrient and recorded notes on the importance of each nutrient. Some students were reading but not recording any notes and other students recorded partially inaccurate comments such as, "it gives us nutrition, without fat you would be nervous." Some students were very thorough in their note taking and were clearly building a strong case for the importance of the nutrient they were assigned.

After students completed their concept maps, I referred the students back to our question related to the three foods on the table and asked the students to guess how many calories were in a gram of each nutrient while writing: 1 gm of Fat =___ calories, 1 gm of Carbohydrate = ___ calories, and 1 gm of Protein = ___ calories on the board. The students' guesses ranged from 1-100. One student looked in his packet to find that carbohydrates have 4 calories per gram. I added the correct answers to the board 9, 4, and 4 as calories per gram of fat, carbohydrate, and protein respectively. I asked students to explain any differences they noticed. Students discussed how fat has more than twice the number of calories per gram as compared to protein and carbohydrates, which had the same number of calories per gram. After much discussion related to the calorie content of each nutrient, we concluded the lesson by agreeing that the

olive oil would raise the temperature of the water higher than the almonds and the rice because if all are equal in weight, the oil will contain more calories and take longer to burn completely. Sarah made an important point at the conclusion of the lesson, “if you don’t want calories you shouldn’t eat fat.” Again, while this student was thinking of the concept of energy consumption and expenditure, she was missing the bigger picture which was the need for balance and incorporate more protein and carbohydrate than fat in your diet since per gram fat has double the calories. Even after reminding students of this critical point, I am not sure they completely understood the concept of energy consumption and expenditure.

We continued with the concept of calories and burning of calories in the next lesson on day two. The class brainstormed ways in which humans burn calories. Students calculated their resting metabolic rates using a formula provided. Some students were surprised to learn they burn calories even if they do not exercise or do any type of physical activity. Joe asked, “You mean even if I just lay in bed all day, I can burn calories?” After students calculated their resting metabolic rates, they were asked to brainstorm the types of activities they frequently participate in and find how many calories they burn when participating in these activities by researching tables in the Energy Reference Manuals provided. This turned their attention the concept that burning more calories through additional activities requires additional calories in the diet or one would lose weight and that the reverse is also true. Many students added additional calories to their daily rate as a result of this analysis. If more calories are

consumed than expended through activity, one would gain weight. I had printed their MyPyramid (http://www.mypyramidtracker.gov/planner/launchPage.aspx) recommendations based on their age, gender, height, weight, and activity levels and gave students an opportunity to read the recommendations provided on the MyPyramid guide. Students discussed differences among themselves and asked questions of me and each other related to individual recommendations.

Students then split into pairs and were assigned a client and a client file. The client had a specific request for help. There was a profile of foods eaten and activities in which the client regularly participates. A formula for calculating calories consumed and expended was provided and students used the Energy Reference Manuals to answer questions for the client and provide guidance to help the client reach his/her goals. The students read quietly and asked questions of each other and of me to make sure they were moving in the right direction. Some students said initially they could not answer these questions but when redirected to the Energy Reference Manuals they soon continued with their work. Some students only finished the energy in and energy out calculations and did not complete the recommendations. Other students were able to finish the entire activity and provided strong recommendations for their client.

On day three the students used their MyPyramid recommendations to design balanced meals that met the calorie recommendation on their personal profiles and also met the recommendations for servings from each of the groups listed. When reviewing MyPyramid a student asked, “Why does it say milk when

all of the other groups say grain or fat or meats, milk is only one thing." It was an excellent question and demonstrated that this particular student is thinking on a deeper level. It also provided an opportunity to share background information on how these recommendations are formulated. This provided an opportunity for students to discuss how they were either allergic to milk or didn't like milk and we processed how you can acquire calcium and other nutrients that are often found in dairy products from various foods such as green leafy vegetables and options such as lactose-free dairy products as well. Many students shared personal experiences with lactose-free food products and their opinions on the taste and preferences for these foods. These students were making connections to their personal experiences. Students had an opportunity to design meals using food cards with individual servings of a variety of foods pictured on each card (nutrient and calorie content are provided on the back of each card). Students worked individually to create three meals and a snack following their personal MyPyramid recommendations while also keeping in mind their personal preferences.

After students had an opportunity to design at least one meal, we worked in small groups to sort the foods into the categories of MyPyramid to see if we were using a balanced approach to our meal designs. Many groups found their grain and oil categories to be full quickly and examined the concept of combination foods arose. The class processed how to count a foods such as sandwiches, pizza, and tacos and students made appropriate changes such as

substituting foods after recalculating servings once they understood the concept of combination foods. Students referred back to the guidelines often and asked questions such as “what is a serving of a vegetable” or “is a slice of bread one or two servings?” These types of questions indicated they were comprehending the guidelines that are specific to their needs and applying these concepts in an authentic situation such as a meal design. Students seemed to like selecting different food cards, talking with their friends about their meals, and switching foods around or sharing cards with each other. It seemed as though most students were anxious to share their meal designs with the whole class. Ms. Smith agreed that students appeared to be proud of their work and there was a sense of confidence that they had properly addressed the given task.

Day four offered students a chance to learn how to read a food label and discover common terms used to describe the ingredients of foods, which can be deceiving and confusing. Students had packets, which offered guidance for decoding the color scheme on a food label, recognizing items to look for when reading a label to determine a food’s nutritional value, and identifying examples of commonly used words for sugar and fat on the ingredients label. Students were able to refer back to this packet or any other classroom resource to help them order snack items from least to most in terms of calories, fat, carbohydrate, protein, fiber, calcium, and cholesterol content. The students were able to use ingredient labels provided and classroom resources; however, they were not allowed to read the food facts labels until they had attempted to order all of the

foods at least once on the food-ranking matrix (Appendix O). Once they had an estimated order for each nutrient, they checked the food facts labels for accuracy. In reviewing students' papers, there appeared to be many self-corrections on each paper. It seems as though students did well guessing calories and fat but had a difficult time estimating sodium, carbohydrates, protein, fiber, and cholesterol. One realization by Kathy was, "I thought a fruit roll up was like candy, I was surprised that it didn't have much fat." Jana thought the fruit snacks should have more calories than the crackers so we investigated the ingredients label again to determine the presence of things such as canola, corn, and palm oil while the fruit snacks contained mostly sugar substances and no ingredients that would indicate fat.

Many students were surprised that snacks like peanuts were high in fat, which gave us an opportunity to discuss saturated and unsaturated fat and animal vs. plant fat. One of the most graphic conceptualizations of saturated fat came from John, "you mean like when bacon grease turns white when it gets cold – that is saturated fat?" It was a visual, to which most students could relate and disturbed many students. It was a good comparison to use when contrasting the bacon grease and the olive oil at room temperature, which we observed on day one, to distinguish between saturated and unsaturated fat. The students discussed the similarities and differences and how this might affect the body. Some students referred back to their concept maps from day one for more information. It was clear that some of the students were starting to make

important distinctions between the different types of fat, foods high in calories, and foods low in fat.

The next task involved investigating nutrient levels in beverages. Nine different beverages were displayed on the shelf below the white board at the front of the room. Students were asked to use a small white board to rank each of the beverages by calorie and sugar content. Small groups of students were then given a beverage option that they might typically drink (e.g. Starbucks® Frappuccino, Coke®, Minute Maid® apple juice box, Capri Sun® juice box, Nestle Quick® chocolate drink, Propel® fitness water, OrangeAid®, and Diet Coke®). Students were asked to record as much information as possible from the container they were given. Students recorded factors such as number of servings per package, calories, grams of sugar, fat, sodium, calcium, claims on the packaging, and first three ingredients. The students were able to share their findings with the class and after each presentation, students rearranged their findings on the white boards. During student presentations, comments such as, “see I told you it had real milk in it,” “I knew fruit juice had lots of calories,” “I thought it would have more than that,” indicated that students were considering other people’s findings and rearranging their original predictions. At the conclusion of the activity, we went through the correct order and very few groups were wiping their boards to erase their findings. It was apparent that most groups had been following the student presentations and making changes as they connected the new information to their original estimations.

Only one class had time to review cereal options and give a 30 second recommendation for, or advocate against, the cereal based on the nutrient contents and benefits offered. Students had five minutes to read the labels, ingredients, make a decision, and prepare their notes. Limited time only allowed three groups to present and of those who presented, they reported fiber, sugar, calorie, and sodium content, which are all essential aspects of judging a nutrient rich cereal. The groups who presented were able to accurately assess the nutrient value of the cereal.

During the lesson on day five, students were able to examine portion sizes commonly found at fast food restaurants and of items typically sold `a la carte at various locations. Students were given the task of determining how many actual portions exist within each food item. In order to answer the questions about the food items (biscuit, bagel, cookie, small and large French fries, a large drink from McDonald's and a brownie) students weighed foods and used formulas provided to calculate the number of servings in each food and food equivalencies (i.e. 1 bagel = 4 slices of bread). Students worked in small groups of three to complete these tasks (Appendix P). Once students worked through each problem, they had the option of reading any of the following excepts about portion distortion: The ever increasing portion, profit, and portion, skewed hunger mechanisms from *Fats, Sugars, and Empty Calories*, An Empire of Fat from *Fast Food Nation*, and Big, Monster Thickburgers, and The American Disease from *Chew on This*. Students were trying to answer this question: How might the typical American

portion size affect one's health and well-being? A discussion was held related to how skewed the American portions are and reasons why. Students reported answers from the reading and their previous investigation.

Some students found the portion task to be "gross." They were remarkably surprised by the amount of calories and multiple servings in each food item. They were able to decipher that one bagel is the equivalent of more than four slices of bread and that a typical cookie sold `a la carte contains approximately 440 calories, and there are 32 teaspoons of sugar in a large McDonald's Coke. Students' papers also indicate they had started to develop an understanding of what appropriate portions look like.

We conducted a comparison activity in which the students matched objects such as a CD, deck of cards, postal stamp, 9-Volt battery and other items to portions of food. This activity created a lot of discussion among the students trying to figure out what would be the best example of a portion equivalent (Appendix Q). There was agreement, disagreement, and even arguing over what would be the right answer. The hands-on comparisons seemed to bring this concept to life for the students.

Day six may have offered the greatest surprise related to CORI engagement and conceptual understandings. The class met in the technology lab. Each student had a partner and each pair was assigned to one of four stations. Stations one, two, and three required student research on the Internet to address the assigned tasks and the fourth station required research from

books and the development of meals based on their findings from the readings (Appendix R). Ms. Smith and I were amazed to find the students with the most detail on their papers and the students who were talking the least and focused the most were the students at station four researching the vegetarian diets and designing meals. I thought this would be the least interesting and least productive station with a misconception that students would not enjoy learning about a vegetarian diet and that they would rather research on the computer, play a simulation game, or analyze menu options from their favorite restaurant; however, they were more focused and created the best work at station four. Students in both classes were only able to go through two rounds of the stations due to time limitations so we were unable to witness all groups at each station; however, of those students who participated in station four they appeared to be the most intrigued and most productive. Students at the other stations were able to research various cuisines and play a timed game, which allowed them to select foods with the most power for rocket fuel (i.e. most nutrient dense) and make substitutions at their favorite restaurants. They were talking among themselves quietly and as far as we could tell successful at their attempts; however, these three stations offered the least amount of high-quality student work in terms of student-created products. I am unsure if it was the unfamiliarity of the vegetarian diet, or the ability to search through a variety of books, or a break from the computers, but station four offered the most evidence of high-quality product development. Students were careful to create complete proteins,

they found meat substitutes, and offered variety to the diet, while creating meals that were tasteful and pleasing to their personal preferences.

Analysis of the questions asked and questions answered by students and a review of student work, suggested students were able to develop basic conceptual knowledge related to energy expenditure and consumption, balanced diet according to MyPyramid, the importance of a variety of nutrients, and selecting foods by using food labels and nutrition information. Evidence provided through students' written work, verbal conversations, and performance with hands-on activities suggested they were able to develop and apply concepts to real world situations. These findings were based on observations by the teacher and research assistant, the researcher's field notes, and an analysis of student work samples. What follows is findings relevant to each of the research questions posed for this study.

Research Question #1

To what extent do students acquire conceptual knowledge when CORI is used to teach nutrition education?

Three different measures were used to gather data to answer this research question: 1) qualitative content analysis of student artifacts, 2) quantitative analysis of pre and post concept questionnaires, and 3) qualitative analysis of field notes recorded by the classroom teacher, a research assistant, and me.

Quantitative data were collected through 18 selected-response items on pre and post questionnaires, which measured students' knowledge of basic nutrition concepts that were included in the CORI nutrition unit.

The mean scores and standard deviations for the concept questionnaire scores across time are provided in Table 5. The mean pretest score for Case 1 was 9.17 (sd=3.017), and the mean posttest score was 11.14 (sd = 2.727). The mean pretest score for Case 2 was 9.81 (sd=3.211), and the mean posttest score was 10.52 (sd=2.737).

Table 5: Concept Score Descriptive Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Case 1	Pre Concept Score	9.17	36	3.017	.653
	Post Concept Score	11.14	36	2.727	.455
Case 2	Pre Concept Score	9.81	27	3.211	.618
	Post Concept Score	10.52	27	2.737	.527

A paired samples *t* test was calculated to compare the mean pretest concept questionnaire score to the mean posttest concept questionnaire score. The results of analysis of significance between the pre and posttest scores are provided in Table 6. A significant increase from pretest to posttest was found in Case 1 (t (35)=-4.104, $p<.01$). No significant increase from pretest to posttest was found in Case 2 (t(26)=-1.166, $p>.01$).

Table 6: Concept Score Paired Samples *t* test

		Paired Differences					T	df	Sig. (2-tailed)
		Mean	Sd. Deviation	Std. Error Mean	95% Confidence Interval of the Differences				
					Lower	Upper			
Pair 1	Pre Concept – Post Concept	-1.972	2.883	.481	-2.948	-.997	-4.104	35	.000
Case 2	Pre Concept-Post Concept	-.704	3.136	.603	-1.944	.537	-1.166	26	.254

A 2x2 mixed design ANOVA was calculated to examine the effects of gender (male and female) and time (pretest and post test) on scores. Means and standard deviations for males and females across time are provided in Table 7. Both male and female mean scores increased in Case 1 by 17% and 20% respectively. Male mean scores increased in Case 2 by 13.2%. The female mean scores in Case 2 reflect a slight decrease of <1%.

Table 7: Concept Score Descriptive Statistics for Gender

		Gender	Mean	Std. Deviation	N
Case 1	Pre Concept Score	Female	9.60	3.661	15
		Male	8.86	4.151	21
		Total	9.17	3.017	36
	Post Concept Score	Female	11.24	2.374	25
		Male	10.63	3.008	38
		Total	10.87	2.727	36
Case 2	Pre Concept Score	Female	11.30	2.869	10
		Male	8.94	3.152	17
		Total	9.81	3.211	27
	Post Concept Score	Female	11.20	2.898	10
		Male	10.12	2.643	17
		Total	10.52	2.737	27

A significant effect for time (F (1,34) = 15.338, p<.01 was found in Case 1; however no significant effect was found for gender (F (1,34) = .212, p>05) or the interaction between gender and time (F (1,34) = .283, p>.05). Case 1 concept mean scores significantly increased after the CORI unit was offered; however, it appears as if gender did not influence the scores.

No significant main effects or interactions were found in Case 2. The time x gender interaction (F(1,25) = 1.045, p>.05), the main effect for gender (F(1,25) = 3.13, p>.05), and the main effect for time (F(1,25) =.743, p>.05) were all non significant. Case 2 concept mean scores were not affected by the CORI unit or gender.

A 2x4 mixed design ANOVA was calculated to examine the effects of ethnicity (White, African American, Hispanic, and Multi-Racial) and time on concept questionnaire mean scores of students in Case 1. A 2x3 mixed design ANOVA was calculated to examine the effects of ethnicity (White, African American, Hispanic) and time on concept questionnaire scores of students in Case 2. Means and standard deviations for ethnicities across time from both cases are provided in Table 8. African American males in Case 1 experienced the greatest gains with an increase in the mean concept score of 3.25. Multi-racial and Hispanic students in both cases experienced decreases in mean concept scores -2.0 (Multi-racial, Case 1), -2.67 (Hispanic, Case 1) and -3.00 (Hispanic, Case 2) following the CORI unit.

Table 8: Concept Score Descriptive Statistics for Ethnicity

Case 1		Ethnicity	Mean	Std. Deviation	N
	Pre Concept Score	White	9.72	4.165	22
		African American	7.45	3.417	11
		Hispanic	12.00	.000	2
		Multi-Racial	10.00	.	1
		Total	9.44	3.618	36
Case 1	Post Concept Score	White	11.15	2.434	22
		African American	10.70	3.230	11
		Hispanic	9.33	3.055	2
		Multi-Racial	8.00	.	1
		Total	10.87	2.727	36
Case 2	Pre Concept Score	White	9.94	3.307	17
		African American	9.67	3.391	9
		Hispanic	9.00		1
		Total	9.81	3.211	27
Case 2	Post Concept Score	White	10.76	2.137	17
		African American	10.56	3.539	9
		Hispanic	6.00		1
		Total	10.52	2.737	27

No significant effects or interactions were found in Case 1 for ethnicity or time. The time x ethnicity interaction ($F(3,32) = 2.546$, $p>.05$), the main effect for time ($F(3,32) =.364$, $p>.05$), and the main effect for ethnicity ($F(3, 32) = .728$, $p>.05$) were all non significant. Concept questionnaire scores were not influenced by the CORI unit or ethnicity. Results from tests mentioned previously, suggest scores were affected by the CORI unit; however, due to low power in this test (Type II Error due to small sample size), no statistically significant changes were found.

No significant effects or interactions were found in Case 2. The time x ethnicity interaction ($F(2,24) = 3.568$, $p>.05$), the main effect for time ($F(2,24) =.709$, $p>.05$), and the main effect for ethnicity ($F(2, 24) = .580$, $p>.05$) were all non significant. Students' concept questionnaire scores in Case 2 were not influenced by the CORI unit or ethnicity.

The quantitative data collected did not demonstrate notable differences between male and female students in either case, nor did it demonstrate key differences between ethnicities; however, it does provide evidence to indicate students were attaining conceptual gains as a result of the CORI nutrition unit. Although significant quantitative differences were not found in posttest concept questionnaire mean scores, field notes related to student dialogue, questions, and behaviors and student artifacts suggest students were creating conceptual meanings associated with the content of the CORI nutrition unit. During the first

day of instruction students made the following statements during a class discussion related to benefits or risks of energy drinks:

> Case 1 - Energy drinks give you an energy boost but then you crash and are weak. One serving of an energy drink is equal to 15 servings of coke. Energy drinks give an energy boost for a limited amount of time. There are a lot of extra calories from sugar and it can cause tooth decay. There are high levels of sugar and caffeine.
>
> Case 2 - Too many calories from sugar. You don't need energy drinks – it is better to have water. There is a lot of caffeine in an energy drink and it can take 3-5 days to become dependent on energy drinks. Energy in energy drinks mostly comes from sugar and caffeine. You may get a short blast of energy, but it will not last. Some ingredients are not approved.

Similar statements were also found when analyzing student artifacts regarding advice for the athlete based on facts from their readings. Ms. Smith said that Steven (Case 1) usually does not participate in class discussions and can often be distant and unresponsive and unwilling to complete assignments. I witnessed an eagerness about his willingness to share what he had found and ask questions about energy drinks. Steven actually started this discussion by first asking, "where does the energy come from" and other students responded with, "from the caffeine and sugar." Steven later reported that he would not recommend energy drinks to an athlete because he was an athlete and he would not want his energy levels to crash during a game. One student countered the

advice not to drink the energy drink because he read, “a skateboarder says he drinks these drinks for an extra energy boost and it works.” I asked, “Does the skateboarder mention how long the boosts lasts or how he feels once he looses the boost?” Another student responded, “Yeah but does he have to drink a lot more drinks the next time?”, which offers an initial understanding of caffeine tolerance indicating the same amount of the drink over time would not offer the same effect. The students were interested in the topic and excited to answer each other’s questions. I, as the teacher, let them play the role of the expert given the fact that they could find the answers to the questions if they were willing to look for them.

Some students exuded a sense of empowerment and I found it interesting that Ms. Smith indicated that students who rarely spoke out in class seemed to enjoy playing this role of “the expert”. She was surprised that two young men (Case 2) who rarely spoke or offered any contributions to class were actively involved in the discussion and asked questions of me and other students. I propose that having the material to help them formulate their answers and having someone else ask questions, which required them to read the material with a purpose and gave them a sense of confidence in their answers. When their classmates responded affirmatively, it appeared to boost their esteem and increase their knowledge base because they were searching for answers and presenting their findings (informally) to the class for discussion. For example, the

following phrases were found when analyzing students' concept maps (excerpts were taken from concept maps from groups in each case):

Fat

Case 1 - Fat in foods helps people feel satisfied so they don't have to eat as much. Most fat is found in nuts, oils, and butter. Saturated fat is in meats. Fruits and vegetables have almost no fat. Fat insulates the nervous system tissues in (the) body.

Case 2 - Trans fat is in margarine and some candy. You need about 30% of calories from fat. Three types of fat are trans, saturated, and unsaturated. Fat is good – don't eliminate it. You need fat to live. Fats fuel the body and help absorb some vitamins.

Protein

Case 1 - Complete and incomplete proteins are due to types of amino acids and you need all of them. Beef, poultry, fish, eggs, dairy products, nuts and seeds, and some beans provide protein. Proteins make your legs move, your lungs work, and protect you from disease. Protein helps your brain and nervous system develop correctly, especially in young children. Food like nuts, oils, butter, and meats contain this nutrient. Most fruits and vegetables don't.

Case 2 - Protein is important because it makes lots of specialized protein molecules that have specific jobs. Your body uses protein to make hemoglobin. Kids should have 35 grams of protein a day. Your muscles, organs, and immune system are made up of mostly protein. Your body uses protein to make special

molecules. Proteins can be complete and incomplete due to types of amino acids.

Carbohydrate

Case 1 - Carbohydrates are one of the three main energy sources in food. There are two main groups – simple and complex. Carbohydrates can be found in cereal, pasta, rice, corn, peas, potatoes, bagels, biscuits, bread, crackers, taco shells, and tortillas. It's the balance between the carbs and insulin - your blood glucose levels rise after you eat.

Case 2 – Carbohydrates are what keep your blood glucose level to stay in your target range. There are different types of carbohydrates. Carbohydrates are one of the three main energy sources in food. Cereal, pasta, rice, corn, biscuits, crackers, tortillas, potatoes, sweet potatoes (are sources of carbohydrates). They are groups into categories by fructose, dextrose, glucose, and sucrose.

While not all of the notes reflected a complete understanding of the various facets of nutrient processes and facts, even the inaccurate understandings indicate that students are beginning to form meaning around the concept. Misunderstandings were presented in class: for example, Kayla (Case 1) said, "you need fat because if you did not have it you would be nervous." She had read about the importance of fat for proper development and maintenance of the nervous system but did not completely understand the nervous system to fully comprehend what this meant. John (Case 2 - who is frequently willing to share his knowledge) offered another viewpoint, "fat helps the nervous system so

you can move, think, and grow." Jamie added, "Fat helps to keep you warm" which allowed us to transition into how the body uses calories and all calories, regardless of the source of nutrient, if not burned would be stored as fat. I reiterated, "these fat layers do help to insulate the body and keep your body's temperature regulated."

During a discussion related to nutrient calorie content Kevin (Case 2) made the following observation, "the fat has more calories which means it has more energy so it is a better fuel." While he was correct that fat contains more energy, it was important that students understand how energy is used and energy balance. So, I asked students to look back at their nutrient concept maps to find out which fuel was the most efficient. Kia said, "carbohydrates are easiest for the body to use." I acknowledged Kia's answer as being correct and explained that the body could transfer carbohydrates into energy more efficiently than any other nutrient. Kevin asked if carbohydrates were like diesel and fat was like gasoline. I could not answer his question because I am unfamiliar with how fossil fuels are refined, so I asked the class to try to find the answer after class and we could discuss it tomorrow. Unfortunately, Kevin's question was not answered, but his question offers evidence that he was trying to connect the concept of fuel efficiency in terms of food to what he knew about gasoline and fuel efficiency with cars.

Student client recommendations as a result of the profile activity offered the following recommendations to their clients such as additional activities or

changes in their food selections with specifics such as “switch your hamburger for a low fat and low calorie sandwich and eat carrots instead of chips.” Students also made recommendations for additional fun activities if the client was trying to lose weight. There appears to be an understanding among the students who were able to complete the client recommendations that they understood the energy balance equation and made recommendations for how to reach this balance while including mostly nutrient-rich options. Moderation or “eat less” and substitution or “eat ___ not ___” were the themes in their suggestions. Although grades were not assigned to student work, of the work completed the student average for case one was 86.5 and 91 for case two.

After students reviewed their MyPyramid recommendations, students began to make comparisons among themselves and asked questions such as, “I need more calories because I do a lot of stuff”, “why does her chart give her more calories than mine?” and “why do I have to eat so many calories?” We answered these questions collectively with students providing answers such as: “boys need more calories than girls”, “if you are active you need more calories”, and “if you weigh less than someone else, you might need more calories to catch up.” Again, while not all of their responses were completely accurate, it demonstrates they engaged with the concepts and were beginning to make meaning of the questions asked and concepts being learned. I facilitated the discussion by offering accurate information, and while honoring their responses I provided corrective guidance when necessary.

Students were able to use their MyPyramid recommendations to design meals that were balanced and later by reconfiguring the cards into the pyramid, they were able to self-assess the nutritional balance of the meals created. Students later traded food item cards and combined cards to make meals that were pleasing to them, yet also within their MyPyramid recommendations. Students also demonstrated a progression of concept construction during the food-label activity in which they were required to read the contents of the food label, read any sources of information available and organize the snack foods in their bag from most to least caloried, fat, carbohydrate, protein, sodium, and fiber content. Some students simply guessed, some groups let one group member take the lead on organizing the food order, others worked to try to deconstruct the food contents and accurately estimate the nutrient contents, and a few groups worked as though they were in competition to finish first and get everything in the correct order. Even those who were guessing had conversations that were meaningful because within their group they were debating the correct order and students were using information from the class to support their decisions. During the whole class processing of the activity when students were allowed to share their estimates and finally read the food label to determine their levels of accuracy, Ms. Smith and I observed several, “ah hah” moments. Linking high fructose corn syrup to calories and carbohydrates and not fat, recognizing natural oils in food such as peanuts will affect the fat content,

and whole grains results in higher fiber content. Students made corrections to their papers as they read the food labels.

It was apparent that students were beginning to build a conceptual understanding of how to read food labels and deconstruct food contents. Student triads were given the task of ranking various beverage options displayed by calorie and sugar content. Each triad was then given one of the beverage items and asked to find as much information from the food label as possible to share with the class. As each group presented their findings, other groups were reconfiguring their order estimates based on the new information.

Prior to an activity related to exploring portion sizes of commonly consumed foods among adolescents, students were asked to research facts related to Americans' distorted portion sizes. Students used reading material provided from various sources to create the following responses:

> Case 1- In 1957, the typical fast-food hamburger patty weighted one ounce today the typical burger patty weighs six ounces. In the 1950s if you bought a Coke at McDonald's it was eight ounces and today a kid's Coke is twelve ounces. Most people buy the biggie Coke which has 32 ounces. Wendy's sells a triple-decker burger and Hardees has a monster burger. People were tested and if they had smaller portions, they stopped eating sooner.
>
> Case 2 – A bagel today has 210 more calories than a bagel 20 years ago. The large fry has twice as many fries as a small and a lot more fat. A

cheeseburger today has 590 calories, which is 257 more calories than a cheeseburger 20 years ago. Today two large pizza slices have 850 calories and 20 years ago two pizza slices had 500 calories. The more food put in front of people the more they eat.

Students had an opportunity to explore portion distortion through measuring foods and determining the number of servings in each portion that might typically be consumed by the average American. The food examples were French fries (small and large), a pre-packed brownie, cookie, and muffin, a bagel from a bakery, a biscuit from a fast food restaurant, and a large drink from a fast food restaurant. Students worked in small groups to complete the tasks and make the portion conversions. Students in Case 1 demonstrated a 70% accuracy rate in their responses and students in Case 2 demonstrated an 87% accuracy rate in their calculations. The students later used what they learned and other resources related to portion size and serving sizes to complete an individual assignment, which required them to look at objects on a table and match the objects to the appropriate serving of food. A lot of lively discussion was held related to which object matched each food; however, the accuracy rate of this assignment varied greatly. Less than 10% of students in each case were able to accurately identify a food serving match for each object presented. The reading required students to make comparisons that they may not have had time to process or evaluate. These students are also not yet accustomed to

conducting their own research to find information, which will help them answer the question at hand. Lack of time was also a factor in both cases.

The final task for both groups required the use of stations in a technology lab. Three of the four stations required the use of computers. These stations allowed students an opportunity to create the most efficient rocket fuel, search and create meal selections from their favorite restaurant, and research a different ethnic cuisine. While the students at these stations completed the assignments, the students at station four, which involved only texts, seemed to be the most engaged. The students at station four were the most focused, least off task, and produced the most thorough work. Students who were able to participate in this station demonstrated evidence that would suggest conceptual understandings related to vegetarian meal planning and options. Students asked questions related to complete proteins, students researched different types of vegetarians and selected an option to explore, some students expressed opinions that indicated they did not understand this choice in eating and assumed the challenge to see if they could create nutritionally balanced meals without meat.

The quantitative data gathered and analyzed indicate that CORI had no effect on student conceptual knowledge gains in Case 2, but in Case 1 the students post-test scores were significantly higher than their pre-test scores. Quantitative analyses of the concept data also suggested that concept scores were not influenced by gender or ethnicity. However, qualitative data collected from classroom observations and student artifacts suggest that students were

beginning to develop conceptual understandings of the nutrition unit by actively applying the new information in an authentic setting and using reading materials to help discover and apply new concepts being learned. While significant statistical gains were made in one case as a result of the CORI unit, classroom observation, and teacher and student feedback suggest students experienced success in constructing new conceptual understandings in nutrition education. Ms. Smith noted that students who had not engaged in classroom tasks previously were actively involved in the inquiry process and asking questions when demonstrated they were engaged in the lesson and making personal connections with the new material.

Research Question #2

To what extent can students apply a health skill (analyzing influences) when CORI is used to teach nutrition education?

Quantitative measures included a pre and post questionnaire measuring students' abilities to accurately apply the analyzing influences health skill using the various scenarios provided in the six skill-related items on the questionnaires. The internal consistency for the skill questionnaire computed using Cronbach's alpha (computed with SPSS) is .703 (item N=6). Student pre and posttest mean scores and standard deviations are provided in Table 9. There was a very slight increase in the posttest skill mean scores.

Table 9: Skill Score Descriptive Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Case 1	Pre Skill Score	3.39	36	1.809	.302
	Post Skill Score	3.67	36	1.414	.236
Case 2	Pre Skill Score	2.96	27	2.028	.390
	Post Skill Score	3.33	27	1.519	.292

A paired-samples *t* test was calculated to compare the significance of the difference between the mean skill pretest score to the mean posttest skill score for both Cases 1 and 2. The Case 1 mean skill pretest score was 3.39 (sd=1.809) and the mean skill posttest was 3.67 (sd=1.414). No significant difference from pretest to posttest was found ($t(35)=-.896$, $p>.05$). The Case 2 mean skill pretest score was 2.96 and the mean skill posttest score was 3.33. No significant difference from the pretest to posttest was found ($t(26)=-.961$, $p>.05$). Table 10 provides the mean score differences, standard deviation, confidence levels, *t* value and 2-tailed significance level. No significant differences were observed between the pre and posttest. The data suggests the CORI unit did not make a significant impact on improving students' skill application on the post questionnaire.

Table 10: Skill Score Paired Samples *t* test

		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Case 1	Pre Skill Score - Post Skill Score	-.278	1.861	.310	-.907	.352	-.896	35	.377
Case 2	Pre Skill Score- Post Skill Score	-.370	2.003	.385	-1.163	.422	-.961	26	.345

A 2x2 mixed design ANOVA was calculated to examine the effects of gender (male and female) and time (pretest and posttest) on student skill scores. Means and standard deviations for males and females across time are shown in Table 11. Case 2 males had the highest gain percentage increase of 15% and Case 1 males had the lowest gain percentage increase of 7%.

Table 11: Skill Score Descriptive Statistics For Gender

		Gender	Mean	Std. Deviation	N
Case 1	Pre Skill Score	Female	3.47	2.100	15
		Male	3.33	1.623	21
		Total	3.30	1.809	36
	Post Skill Score	Female	3.80	1.568	25
		Male	3.57	1.326	38
		Total	3.67	1.414	36
Case 2	Pre Skill Score	Female	3.20	1.814	10
		Male	2.82	2.186	17
		Total	2.96	2.028	27
	Post Skill Score	Female	3.50	1.509	10
		Male	3.24	1.562	17
		Total	3.33	1.519	27

No significant effects or interactions were found in Case 1 or Case 2. The time x gender interaction, ($F(1, 34) = .022$, $p>.05$), effect for gender ($F(1,34) = .158$, $p>.05$), and effect for time ($F(1,34) = .802$, $p>.05$) in Case 1 were all non significant. The time x gender interaction, ($F(1, 25) = .019$, $p>.05$), effect for gender ($F(1,25) = .285$, $p>.05$), and effect for time ($F(1,25) = .765$, $p>.05$) in Case 2 were all non significant. Students' skill questionnaire scores in both cases were not influenced by the CORI unit or gender.

A 2x4 mixed design ANOVA was calculated to examine the effects of ethnicity (White, African American, Hispanic, and Multi-Racial) and time (pretest and posttest) on student skill scores in Case 1. African American students in Case 1 experienced the greatest gains with a gain in the mean skill score of 0.63,

which equates to a 23% change increase following the CORI unit. Hispanic students in Case 1 experienced decreases in mean skill scores by 1.0, which equates to a -20% change decrease following the CORI unit. A 2x3 mixed design ANOVA was calculated to examine the effects of ethnicity (White, African American, and Hispanic) and time (pretest and posttest) on student skill scores in Case 2. African American students experienced the greatest mean skill scores with a gain of 1.11, which equates to a 58% change increase following the CORI unit. Means and standard deviations for ethnicities across time are shown in Table 12.

Table 12: Skill Score Descriptive Statistics for Ethnicity

		Race	Mean	Std. Deviation	N
Case 1	Pre Concept Score	White	3.64	1.866	22
		African American	2.73	1.679	11
		Hispanic	5.00	.000	2
		Multi-Racial	2.00		1
		Total	3.39	1.809	36
Case 1	Post Concept Score	White	3.95	1.463	22
		African American	3.36	.809	11
		Hispanic	4.00	1.414	2
		Multi-Racial	2.00		1
		Total	3.72	1.301	36
Case 2	Pre Concept Score	White	3.35	1.869	17
		African American	1.89	1.900	9
		Hispanic	6.00		1
		Total	2.96	2.028	27
Case 2	Post Concept Score	White	3.41	1.661	17
		African American	3.00	1.225	9
		Hispanic	5.00		1
		Total	10.52	1.519	27

No significant effects or interactions were found in Case 1 or Case 2. The time x ethnicity interaction, ($F(3, 32) = .449$, $p>.05$), effect for ethnicity ($F(3,32) =1.793$, $p>.05$), and effect for time ($F(3,32) = .001$, $p>.05$) in Case 1 were all non significant. The time x gender interaction, ($F(2, 24) = 1.060$, $p>.05$), effect for ethnicity ($F(2,24) = .2.819$, $p>.05$), and effect for time ($F(2,24) = .006$, $p>.05$) in Case 2 were all non significant. Students' skill questionnaire scores in both cases were not influenced by the CORI unit or ethnicity.

While the scores between the pre and post skill questionnaire surveys are not statistically significant, qualitative findings provided earlier in this chapter offer a contradiction to the impact of the CORI unit and student skill development. Through analysis of student verbal comments and questions, whole group discussions, and examination of student products, such as the meal design and the portion activity, it appeared that students were able to identify and analyze examples of external influence on food choice and consumption patterns. What follows are some examples from the qualitative data to support this assertion.

Day three was the first attempt to process internal and external influences on eating behaviors and food choices. I asked for the students' attention while I read a commonly favored children's book to them, *Green Eggs and Ham,* by Dr. Seus. As I read, I noticed no off task behavior and they were suddenly like kindergarteners during circle reading again. All eyes were on the book and if I did not move the book while reading so everyone could see the pictures, students made their concerns known. It was interesting to see the students'

interest in a book that many had probably read many times before. After I finished reading the book, I asked the students, “Why did the main character finally try green eggs and ham after he adamantly told Sam that he did not like these foods in many different ways?” Students responded with, “Sam pressured him,” “Sam made it sound interesting,” “He got tired of saying no.” I asked, “Are these are reasons why we eat as well?” and students generally agreed.

I asked students to brainstorm what influences our decisions related to food choices. Students responded with, “I have to eat what my mama cooks,” I eat what I like,” “school food.” I asked students if our culture, the media, families, and friends could influence what we eat. Students added to the discussion, “sometimes the cereal box has something cool,” “my friend eats special things,” “religion makes some people eat fish,” “I am an athlete,” “I eat what my friend eats when I go out to eat with her family.” They were beginning to think about external influences on eating behaviors. Their assignment for the next two days was to record how many and what types of food advertisements they witnessed when watching television. Some student indicated they were not allowed to watch television, so I asked them to look for billboards, signs, and ads in magazines or newspapers that relate to food.

Day four focused on snacks, using food facts labels, and ingredients labels to help when selecting healthy food and beverage choices. This type of influence is based on what science tells us about food and nutrients. Students seemed to not understand initially that science can influence our eating

behaviors. The last day of class Janice who had not said much during the course of the unit, mentioned the following as she was turning in her questionnaire and survey: “I don’t know if I learned anything or not but I read all the food labels now, I am like a freak reading these things now.” It is not known from her comment how she made her decisions based on the concepts we learned; however, what is apparent is her ability to recognize that science can provide knowledge by helping us understand what nutrients are necessary for positive health. We can use this knowledge to read food labels and influence our choices based on our understandings of balanced nutrition.

Day five began with an analysis of their data collection related to food commercials and advertisements. Most students did not bring any written notes and no work related to this topic was found in the student files; however, several students had obviously been monitoring food advertisements. Students who shared their findings reported observing the following in advertisements “colorful,” “loud,” “exciting,” “fun,” “looks good,” “makes me hungry,” “they are everywhere,” “they are on windows,” “fast,” “music,” “they show kids.” I asked the students, “Do you remember what the food looked like?”, and most students said the food looked good. I asked, “Did you see a lot or a little food displayed in the ads?” Students responded by saying, it was always a lot of food in the commercial or in the picture, “and it all looks good.”

I asked the students if they had ever traveled outside of the United States and if so what did the food look like in other countries. Some students reported:

“the food looked weird,” “it tasted funny,” “it was cooked differently,” “they eat different things,” and “I ate McDonalds.” I asked the students if the portions were as big as they are here in the United States. Most students reported that the portions were smaller and some students could not remember. I asked students to think about how the plate size might determine how much we eat and explained to students that plate sizes have gotten bigger over the last 30 years. I asked if anyone had plates too big for their cabinets and in both classes, more than one student reported keeping plates somewhere other than the kitchen cabinet (because the houses were built during a period when dinner plates sizes were generally under 12 inches in diameter). Students talked about plate sizes in restaurants being larger than their plates at home and not being able to eat everything on their plates. One student observed that “cereal bowls are huge.” I added that, some cereal bowls are now 32-ounce bowls, which used to be the typical size of a serving bowl. John mentioned that, “when my mom doesn’t put enough on my plate I am get mad because it means I am going to be hungry in a minute.” I asked if we think we need a full plate regardless of the size of the plate. Kayla said that she wants “…a full plate even if I don’t eat it all.” Kendrick mentions, “I eat the whole box of candy and sometimes I feel sick and my mouth burns but I eat it anyway because I don’t want to throw it away.” Students were beginning to personalize how our culture has influenced our eating habits, especially how much we eat, and the size of the portions we eat.

Students were given time to read The Ever Increasing Portion, Profit, and Promotion, Skewed Hunger Mechanisms an excerpt from the book*, Fats, Sugars, and Empty Calories*. Students were asked to look for influences on our eating habits, why, and how we can respond to these influences in a healthy manner. At the conclusion of their reading, I asked students how they could address some of these influences and some of their responses were: “eat one-half and save the rest for later,” “split it with your friends,” “eat it all if you are hungry and play later,” “ask for a little bit less,” “only take what you want,” “eat what you want not what everyone else is eating,” “ignore the messages or just tell yourself they are selling you something for money,” “look for healthy messages,” “use what you know instead.” These are examples that students are beginning to think about various influences on food choices and different ways to respond in a positive way to these influences. There is no evidence to suggest that knowledge of how to address influences and the ability to recognize influences immediately changed their behavior; however, recognizing the influence and using material from the reading to develop their answers demonstrated the students were interacting with the skill on a level deeper than just recall. They were thinking through the application of the skill in an authentic manner.

There is no statistically significant evidence to suggest that students skill acquisition and application were affected by the CORI unit. There was also less instructional time devoted specifically to developing and applying the health skill. Students in both cases did not have previous experience in this class with

analyzing internal and external influences so this was a new skill. It takes many different opportunities to practice with guiding feedback in order to effectively build and apply this skill, and not enough time was devoted to this aspect of the unit. Students were required to conduct observations outside of the classroom and many students did not bring information back to class. Those students who did not complete the observation assignment contributed less to the discussions and may not have processed this skill as well as those who activity participated in the given assignment. Limited participant numbers, limited classroom time, lack of sufficient opportunities to practice, and limited number of items on the assessment contributed to lack of positive gains in skill acquisition and application.

Research Question #3

In what ways does the use of CORI in nutrition education engage students?

Students expressed interest in CORI activities through selecting strongly disagree, disagree, agree, or strongly agree in reaction to affirmative statements related to the CORI nutrition unit. Tables 13 (Case 1) and 14 (Case 2), present student agreement and disagreement frequencies with each survey item and the differences between their responses before and after the CORI nutrition unit. Strongly disagree and disagree were combined to provide the disagreement percentage and agree and strongly agree responses were combined to provide the agreement percentage to each survey item.

Table 13: Case 1 Student Task Interest Frequency of Agreement Comparisons

Survey Item	Frequency of Agreement With Statement				Difference Between Agreement Frequencies
	Pre Test		Posttest		
	Disagree (SD+D)	Agree (SA+A)	Disagree (SD+D)	Agree (SA+A)	
I like class experiments.	11.2%	88.9%	27.8%	72.2%	-16.7%
I like questions asked by the teacher.	58.3%	41.7%	44.4%	55.6%	+13.9%
I like the questions asked by my classmates.	61.1%	38.9%	41.7%	58.3%	+19.4%
I like small group activities.	13.9%	86.1%	25%	75%	-11.1%
I like small group discussions.	52.7%	47.2%	36.1%	63.9%	+16.7%
I like whole class discussions.	55.6%	44.4%	41.7%	58.3%	+13.9%
I like group presentations	47.2%	52.8%	36.1%	63.9%	+11.1%
I like designing the meal.	41.7%	58.3	16.7%	83.3%	+25%
I like using technology to perform tasks in class.	36.1%	63.9%	36.1%	63.9%	-

Table 14: Case 2 Student Task Interest Frequency of Agreement Comparisons

Survey Item	Frequency of Agreement With Statement				Difference Between Agreement Frequencies
	Pre Test		Posttest		
	Disagree (SD+D)	Agree (SA+A)	Disagree (SD+D)	Agree (SA+A)	
I like class experiments.	7.4%	92.6%	25.9%	74.1%	-18.5%
I like questions asked by the teacher.	66.7	33.3%	55.6%	44.4%	+11.1%
I like the questions asked by my classmates.	51.9%	48.1%	33.3%	66.6%	+18.6%
I like small group activities.	11.1%	88.9%	22.2%	77.8%	-11.1%
I like small group discussions.	29.6%	70.4%	37.0%	63.0%	-7.4%
I like whole class discussions.	37%	63%	37.0%	63.0%	-
I like group presentations	25.9%	74.1%	40.7%	59.3%	-14.8%
I like designing the meal.	22.2%	77.8%	22.2%	77.8%	-
I like using technology to perform tasks in class.	37.0%	63.0%	23.1%	76.9%	+13.9%

Quantitatively speaking, there was a 16% decrease in Case 1 and an 18.5% decrease in Case 2 in the percentage of students who report liking experiments. This may be due to the fact that the only true experiment (scientifically speaking) that was to be conducted was not allowed, due to fire codes. The other tasks, which involved problem solving, and investigation skills

were stimulating tasks but not experiments; therefore the limited participation on what most students consider to be experiments may have resulted in the decrease in post CORI experiment agreement. Agreement gains were observed in both inquiry-based statements. There was an increase of 13.9 % (Case 1) and 11.1% (Case 2) in favor of questions asked by the teacher and an increase of 19.4% (Case 1) and 18.6% (Case 2) in favor of questions asked by classmates. Questioning and inquiry are key components of the CORI framework. Empowering the students to ask the questions and find the answers seemed to engage the students based on observational data, which may be the reason for the increase in the agreement with inquiry-based items. While there was a decrease of 11.1% in the number of students who report liking small group activities in both cases, ¾ of the students in both cases indicate they still like small group work post CORI.

An increase in the number of students who enjoy small group and whole group discussion increased in Case 1; however, students in Case 2 report a decrease in their interest of small group discussion by 7.4% and no change in their reported interest in whole class discussion following the CORI nutrition unit. Ms. Smith also made several comments throughout the study related to her surprise by certain students' actions. She noted several specific students who typically do not engage in small group or whole class discussions were participating which was a positive sign. One of these students even offered inaccurate information, which was carefully corrected more than once, yet it did

not appear to inhibit future contributions. Ms Smith commented that this was a positive change for these young men. Participation in class discussions and observations of small group dialogue support this finding as well.

Almost ¾ of the students report liking the meal design project. This was a 6.4% increase from the pre CORI interest survey. Seventeen students (27%) included meal design as one of their top three favorite class activities. This experience allowed students to apply the new concepts learned through an authentic real world task. One student noted in the open-ended response question, “I like the designing the meals because I can use this every day.” The authenticity and student created projects based on new concepts learned support evidence of constructivist theory in action and the purpose of CORI.

Students were given an opportunity to express their likes and dislikes for various class activities before and after the CORI nutrition unit. Students were asked to respond to a 17-item survey, which measured students’ agreement with affirmative statements regarding class activities and their interest in reading, which will be discussed below in presenting findings related to Research Question #4. Nine of these questions specifically measured their personal preference for the types of activities used in the CORI nutrition unit and eight questions measured reading interest. The last question of the survey asked students to list their top three favorite class activities and explain why. No students offered an explanation to their answers in the pre test and 55 answers were accompanied by an explanation on the posttest.

All open ended responses to the top three favorite activities are presented in Tables 15 and 16. Student responses suggest, prior to CORI, they liked group work, class discussion, reading, technology, and group presentations. After experiencing the CORI unit, students offered examples of more specific activities in which they participated during the CORI unit such as, finding facts, designing meals, designing vegetarian meals, profile activity, food sort activity, portion activity, finding calories in foods, and energy drinks which were coded and grouped to more general categories for a more accurate comparison between the pre and post statements. It appears as if students still favor activities such as group work and class discussion; however, there was a considerable increase in the number of students who cite hands-on activities. The number of students who specifically list reading as their favorite class activity decreased on the post test; however, many of the activities which were listed and coded as experiments, group discussion, and hands-on activities required reading so while this was not specifically listed as a favorite activity, the preference for the other activities increased and reading was a critical component in successfully completing each activity.

Table 15: Case 1 Student Interest Survey Results – List Top Three Favorite Class Activities (Pre and Post CORI)

Student Responses	Pre	Post	Gain or Loss
Class discussion	7	2	-5
Group discussion	1	5	+4
Experiments	2	8	+6
Group work (group projects, team time, small group activities)	9	6	-3
Teacher Lecture	3	1	-2
Pair/Partner work	0	0	-
Individual work	1	1	-
Hands-on activities	1	18	+17
Asking questions	-	1	+1
Reading	12	5	-7
Technology (computer games, computer research)	18	9	-11
Group presentations (health presentations)	6	2	-4
Like to find new ways to do things	0	0	-
Activities unrelated to health education	2	6	+4

Table 16: Case 2 Student Interest Survey Results – List Top Three Favorite Class Activities (Pre and Post CORI)

Student Responses	Pre	Post	Gain or Loss
Class discussion	6	4	-2
Group discussion	0	2	+2
Experiments	4	10	+6
Group work (group projects, team time, small group activities)	8	9	-1
Teacher Lecture	3	0	-3
Pair/Partner work	0	1	+1
Individual work	0	0	-
Hands-on activities	0	16	+16
Asking questions	0	0	-
Reading	5	7	+2
Technology (computer games, computer research)	11	8	-3
Group presentations (health presentations)	7	3	-4
Like to find new ways to do things	0	1	+1
Activities unrelated to health education	3	12	+9

The posttest explanations offered evidence to demonstrate why students liked certain activities during the CORI unit. There are student responses that provide evidence for student engagement during each component of the CORI framework. The phases in CORI are not always fixed nor are they always linear; however, for the purposes of this summary, they will appear in a numerically sequential order. Student explanations of their favorite class activity from the interest survey offers evidence to support students were engaged during each of the CORI phases. Examples of student explanations are provided below:

CORI Phase One - intended to capture students' attention and their curiosity is piqued. Real world interactions, teacher involvement, and social collaboration are evident during this phase.

Case 1

I like class discussions because the teacher is involved. I like group discussions because I learn easiest that way. The small group discussion because it was only a small group.

Case 2

I like class experiments because they are fun. Class experiments because I can do different things. Experiments – it helps if I get a hands on experience. I like hearing what other people think.

CORI Phase Two - involves students' search and retrieval of information. During this phase, students are taught where to look for information and how to access and utilize it once it is discovered.

Case 1

I like getting computer time because it gives a sense of freedom. Finding answers in text because it is challenging. I like finding answers to the questions about slices of bread because I like reading and math.

Case 2

I like figuring out the patient's question about weight because I like a challenge and using math. I like finding answers to the food questions. I like working on the project because I can find my own answer.

CORI Phase Three - comprehend and integrate, enables students to activate prior knowledge, make connections with the text, and make inferences related to the text.

Case 1

Food sort because we got to see how nutritious things were. Going around the room and figuring out calories in food was cool. The profile activity because we got to find out people's nutritional problems. When we had to find the calories in things and how big they were because we learned about popular foods. I also like the blast off game we did since we could tell how much food we need and how healthy it is. Designing meals because it helped me in my daily life.

Case 2

Designing meals because it's your own idea. Food diary because we were in partners. I liked when we saw what was in an energy drink because

now I know more about them. Designing a meal because it was fun to interact with classmates. The foods we learned because I am trying to watch my sugar intake. When we designed a vegetarian meal because it was hard to do since I am not a vegetarian. When we looked at the food labels because I loved doing that it was cool. The planning meals because it was cool to know vegetarian's diet. When we tried to order foods from least to greatest nutrients because you had to think about what could be in the food.

CORI Phase Four -involves communicating information to others. In this phase, students are encouraged to share their understandings of the new information gained or the products or conclusions made during the lesson.

Case 1

Group presentations because I like telling the class what we did. Group or whole class discussions because it is nice to hear someone else's opinion. Presentations because you can compare your information.

Case 2

Designing meals because I can show my ideas. The small discussion because it is fun to talk to your friends about what you learned. I like being the presenter.

The post CORI open-ended question received 55 explanations for their favorite activities when compared to the pre CORI survey, when no explanations were offered. This could be due to currency in experiencing the activities, lack of

understanding what was being asked, or copying examples listed in the affirmative statements in the survey table. The additional explanation in the post CORI responses presented earlier in this chapter helps the reader to understand not only what aspects of the CORI unit interested the students but also why.

While there was little overall difference (gain or loss) in most student interest statements, the class activity which gained the most interest in both cases was the group titled hands-on activities. Seventeen students in Case 1 and 16 students in Case 2 indicated this was their favorite activity after experiencing the CORI unit. Only one student in Case 1 reported hands-on activities as one of his/her favorite classroom activities on the pre-CORI unit survey. No students in Case 2 reported hands-on activities as one of their three favorite class activities on the pre-CORI survey. Given the interactive nature and application based model of the CORI framework, it is clear that this impacted student interest and engagement.

Research Question #4

What interests students about reading informational and narrative texts provided in a CORI health class?

Student interest in the reading component of the CORI nutrition unit was quantified through the use of a pre and post interest surveys with eight items specifically measuring reading activities. Tables 17 and 18 provide student disagreement and agreement frequency totals for each reading interest survey item before and after the delivery of a CORI nutrition unit. Results from both

cases offer little substantive data to make conclusions about student interest in reading the texts provided in the CORI class. When a slight increase of 13.8% was observed in Case 1 for enjoyment of informational texts, a decrease of 7.5% was found in Case 2 and vice versa for narrative texts. There was a 13.9% decrease of enjoyment of narrative texts in Case 1 while there was a 3.7% increase in enjoyment of informational texts Case 2. Increases were found in both cases for the item that asked students if they liked finding answers to questions in books/texts (2.8% for Case 1 and 18.6% in Case 2). Students in Case 2 had more time to read and process their findings in the whole group and they had more reading selections because it was a much smaller class than Case 1. This may have contributed to the difference in responses to this item but this is only speculation. The greatest change was found in Case 2 for the item that measured whether students would read more about something that interests them in class. There was a 25.9% decrease in agreement after the CORI unit for students in Case 2 and a 5.5% decrease in agreement for students in Case 1. While students appeared to be interested in the tasks and reading assignments in class it is evident that no intrinsic motivation was developed as a result of the CORI unit during this study. It is unknown as to why students disagreed with these statements more on the posttest given the positive statements related to reading offered from the open-ended question and the student actions, comments, and thorough student work created in class. Therefore, no valid

quantitative conclusions can be made about students' interests in informational and narrative texts provided in a CORI class.

Table 17: Case 1 Student Reading Interest Frequency of Agreement Comparisons

Survey Item	Frequency of Agreement With Statement				Difference Between Agreement Frequencies
	Pre Test		Posttest		
	Disagree (SD+D)	Agree (SA+A)	Disagree (SD+D)	Agree (SA+A)	
I enjoy reading informational texts.	69.4%	30.6%	55.6%	44.4%	+13.8%
I enjoy reading narrative texts.	36.1%	63.9%	50.0%	50.0%	-13.9%
I read to learn new information	50.0%	50.0%	47.2%	52.8%	+2.8%
I like finding answers to questions in books/texts.	63.9%	36.1%	55.6%	44.4%	+8.3%
If I am reading about an interesting topic, I sometimes lose track of time	36.1%	63.9%	50.0%	50.0%	-13.9%
I might read more about something that interests me in class.	30.6%	69.4%	36.1%	63.9%	-5.5%
If a book is interesting to me, I do not care how hard it is to read.	41.7%	58.3%	44.4%	55.6%	-2.7%
I like to talk to my friends about what I am reading.	75%	25%	72.2%	27.8%	+2.8%

Table 18: Case 2 Student Reading Interest Frequency of Agreement Comparisons

Survey Item	Frequency of Agreement With Statement				Difference Between Agreement Frequencies
	Pre Test		Posttest		
	Disagree (SD+D)	Agree (SA+A)	Disagree (SD+D)	Agree (SA+A)	
I enjoy reading informational texts.	44.4%	55.6%	51.9%	48.1%	-7.5%
I enjoy reading narrative texts.	37.0%	63.0%	33.3%	66.7%	+3.7%
I read to learn new information	55.6%	44.4%	37.0%	63%	+18.6%
I like finding answers to questions in books/texts.	63.0%	37.0%	66.7%	33.3%	-3.7%
If I am reading about an interesting topic, I sometimes lose track of time	14.8%	85.2%	14.8%	85.2%	-
I might read more about something that interests me in class.	18.5%	81.5%	44.4%	55.6%	-25.9%
If a book is interesting to me, I do not care how hard it is to read.	33.3%	66.7%	25.9%	74.1%	+7.4%
I like to talk to my friends about what I am reading.	63.0%	37.0%	63.0	37.0%	-

Qualitative findings from analyzing student artifacts and their discussion responses suggest students were engaged in the process of using texts to find answers and solve problems. Students were able to successfully develop balanced vegetarian meals based on their findings from texts even though they experienced very little direct instruction related to the vegetarian diet. Students were able to use food ingredient labels to estimate and rank the nutritional value in various snack items. Students were able to connect what can be nebulous concepts such as calories and energy consumption and expenditure to real world concepts such as automotive fuels and physical science concepts. Students took great pride in presenting their concept map findings which were created from using information found in various texts. Students even used their findings to relate to other students' presentations. For example when given the opportunity for free reading at the end of class in Case 2, Terrance presented a problem in a rather simplistic children's book, *Six Dinner Sid*, Carla offered advice for his character from her text called, *Eat This Not That*. Candice offered interesting facts related to sneaky snacks and their calorie content which she found in *The Complete Idiots Guide to Total Nutrition* and Tonya offered a suggestion from her book *The Low-Fat Fast Food Guide: How to Eat Right When You're Eating Out*. Ms. Smith indicated a level of surprise that students were following each other's presentations and adding to it. She said that students were usually so anxious to present their own work, and they rarely ever contributed to other students' presentations. Students were not only making

conceptual connections to their own findings, they were demonstrating that they could transfer the information learned to other scenarios.

Other Observations

A theme surfaced when analyzing the qualitative data that does not specifically address any of the research questions. Students demonstrated an increased sense of empowerment as the CORI unit. Students asked and answered questions with greater confidence and detail as we concluded the unit as compared to the beginning of the unit. At the beginning of the unit students asked questions such as how do we get energy, what does an energy drink do, and what foods are healthy. By the third day, the students were thinking in a deeper manner about the content and asking questions such as, why is the milk group the only group that uses one food to describe it? Students started to share personal stories more freely and answer each other's questions when they had not done so previously. Students were able to share personal connections to the content such as the energy and automotive fuel comparisons, or traveling experiences abroad and the observations about food in other cultures. Students seemed to enjoy playing the role of the "expert" when allowed and encouraged to share their personal stories which connected with the new content. Instead of waiting for teacher feedback during group presentations, classmates would offer critiques and questions. For example when presenting a balanced diet students questioned one another's use of combination foods and classification of food items such as ice cream. Students were able to formulate answers using their

work and the materials available so they could justify their answers which appeared to give them more confidence in their responses. Mrs. Smith indicated that several students were generally uninterested and not regularly engaged in class activities yet during this unit they completed the tasks, asked questions, and offered to deliver presentations which was surprising. Some of these students would stay after class sometimes to talk about something discussed earlier in class. These also took pride in their tasks and often wanted to be the first to finish and present. This was a welcomed outcome, which contributed to student engagement and conceptual understanding, yet it was also unique in the sense of increased student empowerment in the classroom.

Summary

The purpose of this chapter has been to present data collected that provides evidence of student response to a CORI unit. While quantitative evidence indicates a significant gain in concept knowledge for Case 1 students after participating in a CORI nutrition unit, the same can not be said for students in Case 2. No statistical significance in gains were found for student skill application after participating in a CORI nutrition education unit. No statistically significant differences were found between gender or ethnicity in either concept or skill scores when comparing pre and post questionnaires for both cases.

However, the qualitative data suggest students were engaged during the CORI phases of the nutrition education unit as demonstrated by on-task behaviors, questions asked and questions answered by students, and products

created as a result of various hands-on tasks. Quantitative data indicate increases in students' interest in informational texts and using texts to find new information; however, quantitative data suggest there is no change after a CORI nutrition unit in students' self-reported persistence even though a text is difficult to read. Very slight gains in Case 1 and no gains in Case 2 were observed in agreement statements related to talking with friends about what one is reading and liking the process of finding answers to questions in books; although, qualitative open-ended responses indicated that students liked to work in small groups. Observational data support students' abilities to answer questions by reading texts and comprehending meaning from the texts. This was made evident through student work and through the questions and answers given by students during small group and whole class discussions.

Ms. Smith and I noticed students were quietly engaged and exhibited more on-task behaviors during the search and retrieval activities. Ms Smith was quite surprised during one of the reading assignments, which required students to find an example of an influence on eating behavior. Students could select any book or text in the classroom, including their reading packets, to find examples of influences. All students selected books from the book bin, which I provided that included both children's book and informational books. Some students hurriedly read to themselves while others gathered in small groups and one student read the book aloud. Ms. Smith could not believe that every student in both classes

was actively engaged in the reading process during this activity. Guthrie, Alao, Y Rinehardt (1997), assert that

> The self-directed aspect of CORI fits nicely in a middle school environment. Researchers have found that early adolescents have a desire for increasing autonomy (Anders & Pritchard, 1993). Middle school students want to make their own decisions. CORI provides opportunities for this autonomy. …By providing opportunities for self-directed activities, CORI provided opportunities for self-expression. Students use their own interests as a basis for developing their questions and communicating their findings to each other. (p. 443)

Additional data supported student interest and focus during the self-selected reading task. The following comments were given in response to the open-ended question related to their favorite activity on student interest survey. These comments suggest that student autonomy, and reading to answers were among their favorite class activities:

- I like getting computer time because it gives a sense of freedom.
- I like finding new ways to do things.
- Computer answer look up and finding answers in books because we found some awesome facts.
- Finding answers in books because it is challenging.

- I like finding answers to the questions because I like reading and math.
- I like working on the projects because I am creative.
- I like reading more.
- I like reading interesting books.
- I like the reading – it was o.k..
- I like finding answers in the text because it is challenging to me.
- I like designing meals because I can show my ideas.

These quotes offer specific examples of evidence that students connected to the autonomy of the reading assignments and the challenge of finding and creating their own answers and products. There was a sense of empowerment and ownership over the learning process during the self-selected reading activities throughout the CORI unit. Although quantitative data do not suggest that after participating in a CORI unit students will significantly increase their concept and skill application, Ms. Smith and qualitative data indicate a high level of engagement in the reading process and task productivity which encourages further inquiry into extended use of CORI and additional measures used to assess nutrition concept and skill attainment.

CHAPTER V

DISCUSSION & CONCLUSIONS

Study Summary

This investigation examined two classes of sixth-grade health students' responses to the integration of Concept-Oriented Reading Instruction (CORI) and nutrition education. A six-day nutrition unit that relied heavily on inquiry, reading, and performance-based tasks was implemented to help students develop conceptual knowledge in nutrition and to improve their abilities to analyze influences on eating behaviors and habits. The key nutritional concepts addressed through this study were energy and nutrients, balance between energy consumption and energy expenditure, MyPyramid and nutritional balance, meal planning, interpreting food labels to make health enhancing choices, and appropriate portion sizes.

I did not compare student responses in a CORI classroom to responses in a control or comparison classroom. My intention was to measure student responses including conceptual knowledge gains, skill application, engagement, and interest in tasks and texts when using a CORI nutrition unit. This investigation offers case-specific insight based on student responses to CORI nutrition instruction offered to two different classes. While it is a descriptive and

informative study, the need for extended research in this field of literacy and health integration is an important conclusion.

This study was completed within the framework of constructivism, a psychological theory of learning, which asserts that students must interact with new concepts in both the physical and the social world in order to create meaning and understanding (Fosnot, 1996). A significant assumption of constructivism is that each of us constructs our own understandings based on our prior experiences and knowledge. Given, this assumption, there is no shared reality or concrete concept that everyone interprets in exactly the same manner and for which everyone establishes the same meaning. This theory was used to ground this study because the original interpretative design of the CORI nutrition education unit was based on constructivism, and constructivism is foundational to my personal way of thinking about learning and teaching. Several hands-on learning strategies were offered throughout this unit, which allowed students to interact with the new material and each other. Students were encouraged to use and share prior knowledge and experiences when interacting with the stimulating tasks and interesting texts.

Findings & Conclusions

Concept Attainment

The results of this study suggest that the sixth-grade students in these two cases demonstrated active engagement in the learning process and increased conceptual knowledge when teaching nutrition through a CORI framework.

Student work completed during this unit demonstrated accuracy in concept attainment and application. Engagement was demonstrated through the types of questions students asked of me and of each other. Not only did students ask questions of each other, they were also able to answer each other's questions regularly. These questions asked and answered by the students provide evidence that they are personalizing the new concepts and creating meaning based on their personal experiences and prior understandings. Growth in conceptual knowledge was documented through a pre and post concept questionnaire, student artifacts, and classroom observations. Consistent with CORI literature (Guthrie, J.T., Van Meter, P., McCann, A.D., Wigfield, A., Bennett, L., Poundstone, C.C., Rice, M.E., Faibisch, F.M., Hunt, B., & Mitchell, A.M., 1996), observations from this CORI study about nutrition suggest the following classroom contexts promote student engagement in the learning process:

a) *Observation and personalization by encouraging students to generate their own questions based on real world observations and experiences.* Field notes indicate students consistently asked questions in an effort to make personal connections with the new concepts presented throughout the CORI unit. Students asked questions of me and of each other during cooperative learning tasks and inquiry-based group discussions, which reflect engagement with the topic and the task.

b) *Search and retrieval by supporting student autonomy through self-directed reading and product development.* Student artifacts reveal students' ability to find and accurately apply information when completing assigned tasks, both collaboratively and individually. Field notes indicate students' eagerness and interest to share their findings with each other and to answer one another's questions. Students frequently expanded upon each other's answers and questions.

c) *Comprehend and integrate - by providing opportunities to create links between concepts in the classroom and real world circumstances.* Observations documented in field notes and reviews of student artifacts were used to conclude that students were able to read, comprehend and integrate new concepts to create products, which required real world application and analysis. Students were able to connect new content to personal experience and understanding. All items on the concept questionnaire required students to formally apply new information in a real world setting and statistical significance was found in the increase of mean scores when a paired samples *t* test was conducted ($t(62)=-3.735$, $p<.001$) for Case 1;however, no statistical significance was found in Case 2. The pre and post assessments in this study did not affect students' grades and it is unclear if this affected their motivation to perform well on these assessments. I am also unfamiliar with student testing behavior and patterns in these classes, which can also affect student performance when

comparing pre and post concept test scores. Factors such as measurement error are of interest in this study. The wording on the instrument and the food items used may not have been culturally relevant to the students. The instrument needs expanded testing with a larger population, more items to measure each construct, and a focus group to determine the appropriateness of the food examples given would help to reduce systematic measurement error in future studies. A larger study over an extended period of time would help to determine if statistical significance would be achieved in concept attainment following a CORI unit. Students reported activities such as the meal design project, group presentations, food sort activity, portion examination, and client profiles, as their favorite activities on the Post CORI survey. All of these activities promote comprehension and integration of conceptual knowledge.

d) *Communicating to others - by allowing for student collaboration with a special emphasis on social construction of meaning and utilizing communities of learners.* Group work, group discussion, and group presentations account for one-third of the activities students' listed as their favorite activities on the post CORI survey. Student artifacts, student presentations, and class discussions reflect active involvement of the students in the learning process and growth due to shared experiences.

Previous nutrition studies have primarily measured concept knowledge gain and attitudinal changes (Lytle, 1995).

Skill Acquisition

Few, if any studies, have addressed skill acquisition and application within the context of nutrition education. Social norms and cultural tendencies play a critical role in children and adolescents' food selection and eating habits (Lin, Frazao, & Guthrie, 1999). Given the significant impact of external influences, I chose to focus on examining students' abilities to apply the analyzing internal and external influences health skill on eating behaviors and food choices. There were six items on the pre and post questionnaires that measured the analyzing influences skill application. No significant differences were found when comparing pre and post mean test scores after calculating a paired samples *t* test ($t(62) = -1.32$, $p>.05$). However, field notes and student artifacts indicated that students did can effectively apply the analyzing influences health skill, yet consistency in application and transfer of application is still unknown. Future research to determine a more reliable assessment of this skill is needed.

Student Interest and Reading Motivation

It is doubtful that curriculum, regardless of the framework, offered over only a six-day period could impact student reading motivation. Given this assumption, I chose to measure student response to informational and narrative texts used during the CORI nutrition unit. Observational data revealed student engagement with the texts. Ms. Smith was noticeably surprised when all students in both classes were engaged in reading a text at various times throughout the study. Student interest in finding answers to questions in texts

was observed yet these observations conflict with student interest survey data with a slight increase of 8.3% in Case 1 and a decrease of 3.7% in Case 2 of students agreeing that they like finding answers to questions in texts. Student work reflected the ability to glean information from texts and classroom dialogue recorded in field notes indicated several students' ability to make slight inferences from texts when transferring concepts read to real life situations.

Discussion

The CORI framework supports the autonomy of learners in the classroom; however, this autonomy is not without teacher guidance and direction. An emphasis is placed on the conceptually significant issues, various avenues for information discovery (i.e. computer search for information, choice in selection of reading material to create answers, choice in approach to tasks assigned). Students have the ability to select reading material for learning although on occasions options are limited. Students are encouraged to inquire and respond to the inquiries of others. Concept-oriented reading instruction also utilizes collaboration among students in the learning process. Numerous studies have been conducted to suggest various forms of cooperative learning promote positive group interdependence, increase student achievement, and enhance the productivity and enjoyment of learning (Johnson, Johnson, & Stanne, 1989; and Almasi, 1995). Qualitative results from this study indicate that real world interaction, collaboration, stimulating tasks, and interesting texts promote active student engagement in the learning process. The types of questions students

asked, the answers students formed, and the connections students made between the new concepts and prior learning offer qualitative evidence that students were engaged in the learning process and made personal connections with the instructional material. However, replication is needed to verify these results in greater detail qualitatively and quantitatively. Unlike previous CORI research (Guthrie, Anderson, Alao, & Rinehardt, 1999), this study offers qualitative evidence to support that CORI increases conceptual learning or skill acquisition. However, based on the qualitative findings, it is suggested that teachers in the field of health education reconsider traditional text-based instruction which has previously been isolated from hands-on learning experiences and promote greater inquiry in the classroom. The student participants in this study were initially not comfortable asking questions and answering questions of each other and especially not comfortable with pulling material from various sources to create a response or support their opinions. As the class progressed over the six-day period, students demonstrated a noticeable difference in their comfort levels of asking questions, responding to each other, and creating answers based on their findings. This rich information gives promise for similar approaches in the classroom and encouragement to proceed not only in practice but in future research as well.

One of the major findings from Lytle's (1994) review of nutrition education programs in the US was that many innovative nutrition education programs are being developed and delivered; however, nothing can be said about the

effectiveness of the programs to improve children's eating behaviors because of limited outcome evaluation. Continued focus on formative evaluations, refinement of the framework and supporting curricula and instruments and eventually a summative evaluation of nutrition-based CORI would add to the needs of the field. Qualitative research by Lytle (1993) also suggests that children and adolescents learn much more from their families and others about what to eat than through formal education related to nutrition. Cultural influences on eating patterns and choices are strong. Teaching students the ability to analyze both internal and external influences on eating behaviors and offering ample opportunities to practice and measure these skills is a continued need for study and evaluation in this field.

Research by Kotz and Story (1994) indicates that 564 food advertisements are shown over 52.5 hours of Saturday morning television programming, and over 50% of the foods advertised would fit into the fats, oils, and sweets category of MyPyramid, and no advertisements of fruits and vegetables were observed. Food companies have been very effective in applying social-marketing techniques and increasing exposure to selected messages. Only allowing six days of instruction devoted specifically to nutrition education places a great challenge to educators. If nutrition education stands a chance of competing with corporate-media messaging and product promotion more time must be allocated to instruction in this area. Further exploration of

CORI and the benefits of integrated instruction will be necessary in order to encourage increased quality and quantity of health education offered in schools.

Limitations of This Study

There are limitations of this study, which suggest directions for future investigations. First, the sample used in this study was from one school and involved only students in Grade 6. Seeking permission from school districts, administrators, teachers, parental consent, and student assent is a significant challenge to conducting large scale studies in public school classrooms. However, this research is necessary to the field to study the effects of real classroom instruction on real students and future studies need to expand across multiple grade levels, multiple teachers, schools, and districts. Time is a limiting factor when conducting research in public school classrooms. High-stakes assessments, limited time devoted to subjects such as health and physical education, and curriculum standards that are broad in scope limit the amount of time a teacher and a research can devote to a content area such as nutrition education. It is important to continue to analyze the necessary dosage of nutrition education that is needed for long-term impact. Finding the crucial balance between enough instruction to build deep conceptual knowledge, build and practice health skills, while avoiding a reduction in other content areas and attrition among teachers implementing the curriculum is essential for future research. The time devoted in this study to skill building and application with significant feedback was inadequate. In order to impact student skill acquisition,

multiple opportunities to practice, assess, and revise skill application is needed. I collected data only from students and the occurrences in the classroom.

Future research should measure teacher (health and reading) perceptions about all the aspects of this CORI unit and an even deeper analysis of student perceptions through interviews and focus groups would be well worth the investment of time in this area. Research findings indicate the need to refine both the instrumentation and the curriculum used. Many issues remain unclear; for instance, long-term impact, task-transfer abilities (near and far), appropriate amount of instruction needed for a significant impact on both concept and skill attainment, if this type of instruction enhances reading comprehension or any other literacy skills over time. There is also a need to replicate Concept-Oriented Reading Instruction using a variety of health concepts. Further investigation into the time factor and appropriate dosage, integration with other high-stake assessment content areas such as reading, measuring teacher and student perceptions, instrumentation refinement, and addressing concept and skill transfer are all areas that are worthy of future research in the field of school-based nutrition education. It is also necessary to specifically examine students with special needs and limited English proficiency responses' to this unit in future studies. Answers to these questions, and insight into the challenges previously mentioned will help teachers, curriculum developers, researchers, and other health professionals offer the appropriate nutrition education to meet both the needs of the schools and the students they serve.

Implications for Future Areas of Research

Little research has been conducted on the integration of nutrition education with other subject areas, using a school-based education approach (Contento, & Balch, 1995). Continued study of the integration with other content areas can offer insight, which may lend support to the integration of health messages and health skills with content areas in states that require high-stakes testing due to current time constraints in public school classrooms. Development of valid and reliable nutrition education evaluation instruments is also needed. Evaluation and comparison of short-term and long-term effects of nutrition education using CORI compared to traditional nutrition education approaches would offer insight to the potential effectiveness of using this instructional framework for teaching health content and skills. Long-term utilization of CORI during health instruction across a variety of concepts would allow the researcher to examine affects on reading motivation, deeper conceptual knowledge development, and reading comprehension skills. Further examination is needed to determine the extent to which CORI instruction increases transfer of both strategy use and conceptual knowledge. Previous research in nutrition education has primarily measured attitude change. While attitudes do affect behavior initially, benefit would be gained if future research focused on conceptual knowledge and skill acquisition, because appropriate skill application is necessary in order for one to act upon values, attitudes, and nutrition knowledge (Lytle, 1995).

Teacher training and adaptation of instruction becomes another issue to address and measure. The current reality in schools is that classroom teachers at the elementary levels and secondary teachers teaching out of field are often delivering nutrition education instruction. Teachers are very important gatekeepers for nutrition education and the method of delivery they select for nutrition education. This predicament requires researchers and curriculum developers to not only focus on creating developmentally-appropriate and evidence-based integrated curricula and instructional resources but also resources that are user friendly to teachers teaching without experience in content areas such as nutrition education. Another focus can and should be adequate preparation and professional development of teachers in using new teaching methods such as CORI so this integrated instructional practice can be evaluated on a larger scale.

Any further discussion of needs in the future of nutrition education would be inadequate if large-scale evaluation was not recommended. The challenges of delivering and measuring various instructional strategies provide great opportunities to teachers and researchers in the field of nutrition education to explore frameworks such as CORI at all age levels, in all ethnic groups, and with students of all socio-economic status. By measuring and improving the method of instructional delivery we can enhance the possibility of purposeful and sustainable nutrition education programs as a part of comprehensive school

health programs which contribute to the overall health and academic success of students.

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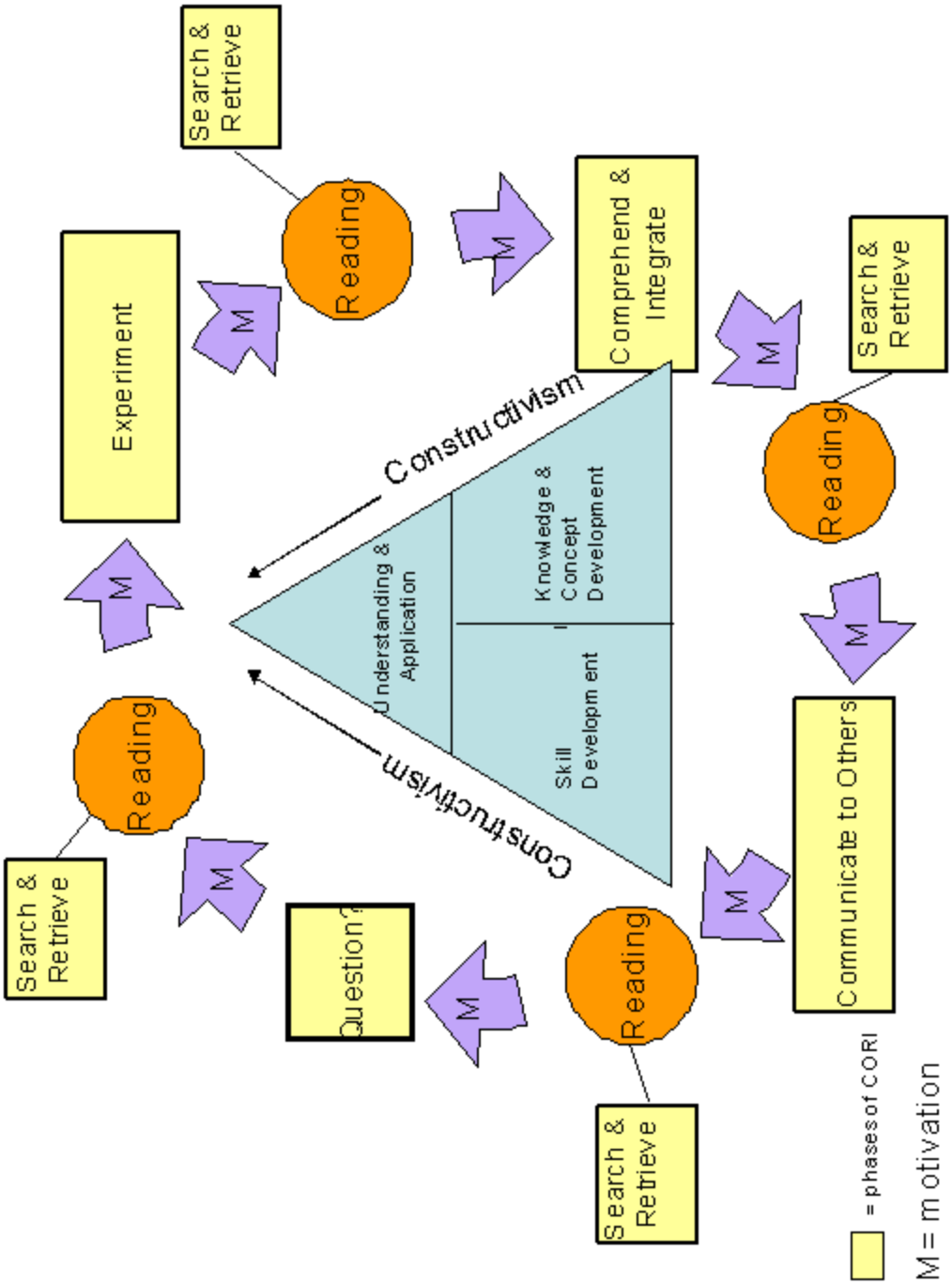
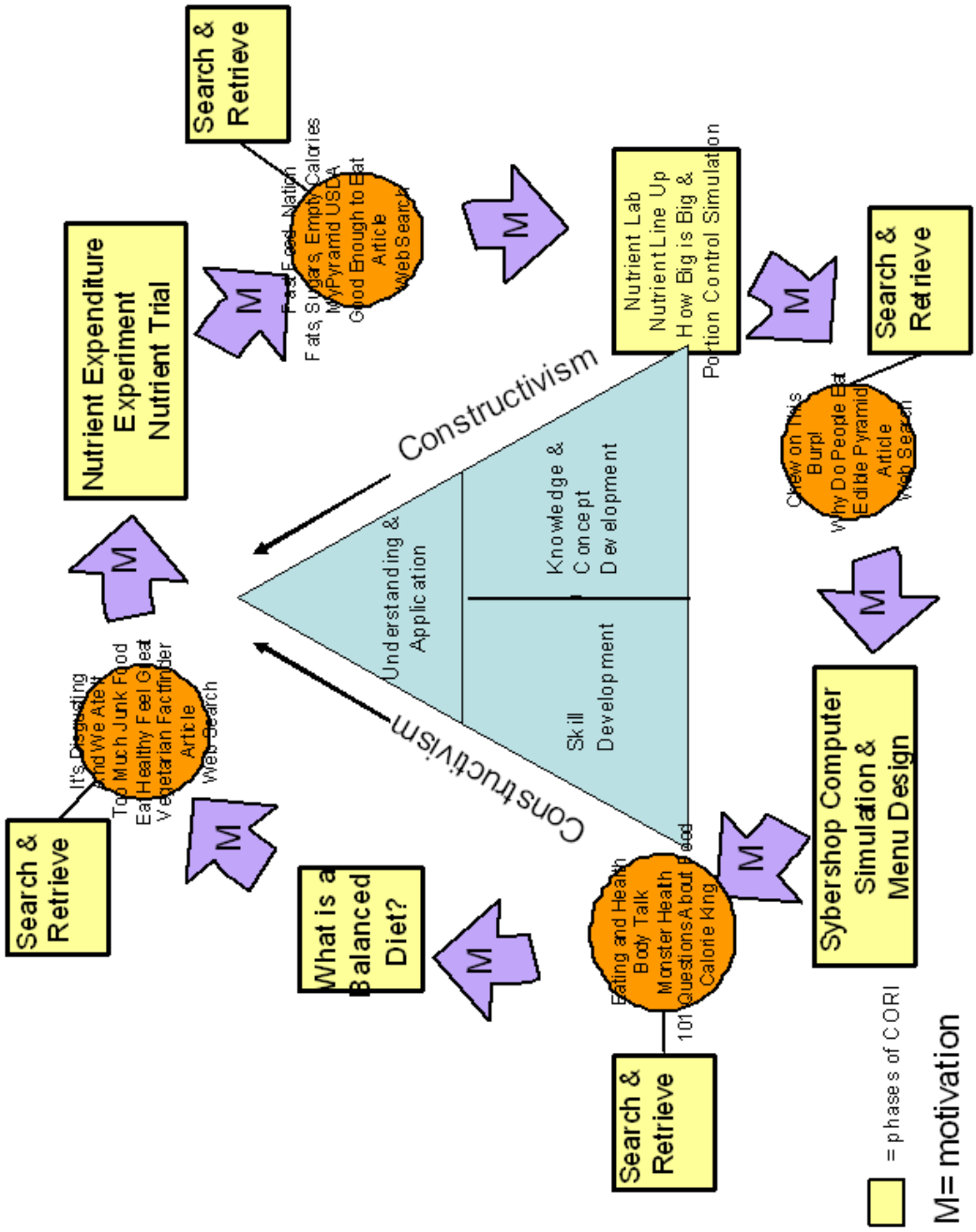
Nutrition Education Example- Using Concept-Oriented Reading Instruction

CORI Phase	A. Reading Strategy Instruction	B. Inquiry based instruction in health education	C. Motivational Support	D. Reading-Health Integration
Observe and Personalize	**Activate Background Knowledge** Read stories or folktales related to expending energy and consuming energy	**Observing** Observe food offerings in the cafeteria at breakfast and lunch and daily activity patterns of children at your school Observe animals eating and activity patterns	**Initiating Interest** Notice patterns in food consumption and energy expenditure by people of varying ages	**Relating** Make connections between the stories and recent observations related to food consumption patterns and physical activity.
	Questioning Ask multiple questions about why living things need energy and how it is acquired. Ask multiple questions about how living things use energy.	**Designing Experiment** Pose hypothesis about types of food and levels of energy that various foods provide. Pose hypothesis about imbalances in energy in the body.	**Student Choices** Write 3 multiple, varied questions; post 3 favorite for class discussion	**Compare and Contrast** Notice differences between story lines and observations
Search and Retrieve	**Searching** Gather information from multiple sources related to energy consumption and expenditure	**Collecting Data** Energy Burning Experiment: The burning of a marshmallow and an almond Energy Burning Experiment 2: utilize specific formulas to measure caloric expenditure during various activities	**Extending Nutrition Interest** Focus attention to new or interesting information from scientific investigation related to nutrition and physical activity	**Connecting Interests** Identify questions that can be answered by reading, observation or experimentation, or both
Comprehend & Integrate	**Summarizing** Express gist of informational texts; write summaries for several books.	**Representing Data** Chart the information from observation and experimentation	**Interesting Texts** Students take ownership of ideas learned; show mastery of knowledge related to personal questions.	**Contrasting Domain Learning** Distinguish text and health avenues to learn about nutrition and physical activity
	Organize Graphically Develop a concept map of energy consumption and expenditure	**Organize Information** Small groups create posters or Public Service Announcements related to healthy eating and physical activity	**Collaborating** In small groups, students exchange ideas and expertise in efficient energy consumption and expenditure.	**Combining Conceptual Learning** Merge results from Energy Experiment with books into concept map
Communicate to Others	**Communicating to Others** Team teaching to audience. Re: Concept map on energy consumption and expenditure	**Communicating to Others** Team teaching to audience, e.g. Posters or Public Service Announcements	**Coordinating Motivational Support** Students display choices, collaboration, and competence	**Coordinating Reading & Health** Chart trail of curiosities and learning about nutrition and physical activity

Concept-Oriented Reading Instruction Cycle Grounded in Constructivism



Concept-Oriented Reading Instruction in Nutrition Education Grounded in Constructivism



Wake County Schools IRB Approval Letter

WAKE COUNTY
PUBLIC SCHOOL SYSTEM

EVALUATION AND RESEARCH
3600 WAKE FOREST ROAD
RALEIGH, NORTH CAROLINA 27609
PHONE: 919.850.1863
FAX: 919.850.1861

September 28, 2007

Michele Wallant
1105 Hayley Ct
Greenville
NC 27834

cc: Robert Smith, Principal
Durant Middle School
10401 Durant Road
Raleigh, NC 27614

RE: **Project No. 617**

Dear Michele Wallen

Your request to conduct research entitled "Concept Oriented Reading Focusing on Nutrition Education" in Wake County Schools has been approved.

Please provide a copy of this approval letter to the participating teacher when soliciting their participation. Although this letter constitutes our office's approval of your study, it does not in any way obligate any school to participate; it is up to them to make that decision. If there are questions about this constraint, please call me at 850-8878.

Please provide us with a copy of the IRB from the University of North Carolina at Greensboro, when you obtain it. You can send it to me or fax it at my attention to (919) 850-1861.

I look forward to working with you and learning the results of your study. Please remember to send me a summary of your findings once your study is completed.

Sincerely,

Anne-Sylvie M Boykin
Wake County Public Schools
Evaluation and Research Department
3600 Wake Forest Road
Raleigh, NC 27609

ASM Boykin

WEBSITE: WWW.WCPSS.NET

Parental Consent for Using Research Data

Dear Parent/Guardian,

I am a PH.D student at UNC-G. I want to learn more about using interesting texts and real world learning tasks to teach reading comprehension and nutrition education. I plan to teach lessons that encourage students to explore the role of food in the human body and factors that affect decisions made about food choices. I will use experiments, independent reading, and group discussion to measure their knowledge gains. Students will be asked to complete a questionnaire about nutrition education and a survey related to their interest in the classroom activities. The goal of this research is to study the effects of combining reading and nutrition education. If this is found as a successful method of instruction, it can be offered as an example for other teachers. Creating student interest in reading and nutrition activities can benefit the students by giving them the knowledge and skills to make healthy food choices. It can also serve as a benefit to society because it enhances the knowledge and skill level of young people allowing them to make healthy choices and serve as role models for others.

As part of this research project, your child will participate in 5 one-hour lessons over the course of one week. This study is for educational research purposes only. The survey and questionnaires **will not** affect your child's grade in health education. I am requesting permission from you to allow your child to participate in the nutrition lessons and to use your child's questionnaire and survey answers in my research study. No names will used on any student work. All student work will be stored in a locked file, in my office on the East Carolina University campus, to which only I will have access. All data will be shredded and destroyed within three years. Consent forms will be kept on file, as required by law, for three years following the close of the study. There are no known risks for being involved in this study. Please understand that your permission is voluntary and you may withdraw your permission at any time. If you should decide not to provide consent for your child to participate in this study, an alternate activity will be provided.

The University of North Carolina at Greensboro Institutional Review Board, which ensures that research involving people follows federal regulations, has approved the research and this consent form. If you have any questions about the rights of your child as a research participant, please contact Mr. Eric Allen at (336) 256-1482. Questions regarding the research itself will be answered by Michele Wallen by calling 252-737-1535 or wallenm@ecu.edu .

Please return the form on the following page. Thank you for your interest in my educational research study.

Sincerely,
Michele Wallen, MPH

As the parent or guardian of _____,
(write your child's name)

- ☐ **I grant my permission for my child to participate in the reading and nutrition lessons and for Mrs. Wallen to use my child's data in her educational research project regarding reading and nutrition education. I voluntarily consent to Mrs. Wallen using any of the data gathered about my student in her study. I fully understand that the data will not affect my child's grade in health education and will be kept completely confidential by using numbers and not names on student work. The data collected will be used only for the purposes of her research study.**

- ☐ **I do NOT grant my permission for my child to participate in the nutrition lessons or the data collection for Mrs. Wallen's research study.**

Signature of Parent/Guardian:_____Date:_____

Children's Assent Form

Dear Student,

I am doing a study to try to learn how to create effective and interesting reading and nutrition classroom activities. I am asking you to help because I do not know very much about whether students your age are interested in reading, nutrition, and classroom experiments.

If you agree to be in my study, you will participate in some activities related to nutrition education and I will ask you to complete a questionnaire about nutrition and a survey about your interests in classroom activities. I want to know if we can teach healthy food choices while teaching reading strategies and conducting experiments with food in class.

You can ask questions about this study at any time. Also, if you decide at any time not to finish, you do not have to complete the questionnaire and your response to the healthy food choice question will not be included as a part of the study. This is not a test and it cannot affect your grade in any way.

Signing this paper means that you have read this or had it read to you and that you want to be in my study. If you do not want to be in the study, do not sign the paper. Remember, being in the study is up to you, and no one will be mad if you do not sign the paper or even if you change your mind later.

Sincerely,
Michele Wallen

Signature of Participant _____ Date _____

Signature of Investigator_____ Date _____

CORI Alignment with State Standards Matrix

Standard Course of Study Objectives for Grade 6		Day 1 Nutrients & Balance	Day 2 Nutritional Balance & MyPyramid	Day 3 Food Labels & Beverages & Analyzing Influences (AI)	Day 4 Meal Design & Analyzing Influences	Day 5 Portion Size and Analyzing Influences	Day 6 Stations – Computer lab
Healthful Living							
4.01	Define common terms of food labels and terms used in advertising food.				✓		✓
4.04	Compare and contrast different food options, including ethnic and vegetarian choices using My Pyramid.					✓	
4.06	Predict short term and long-term benefits of healthy eating.		✓				
4.07	Differentiate between nutritious and non-nutritious beverages.				✓	✓	
4.08	Identify food high in fiber, including whole grains, fruits, and vegetables.		✓	✓	✓	✓	
4.09	Analyze the relationships between food consumption, physical activity levels, and body weight		✓	✓			

Standard Course of Study Objectives for Grade 6		Day 1 Nutrients & Balance	Day 2 Nutritional Balance & MyPyramid	Day 3 Food Labels & Beverages & Analyzing Influences (AI)	Day 4 Meal Design & Analyzing Influences	Day 5 Portion Size and Analyzing Influences	Day 6 Stations – Computer lab
Language Arts							
1.03	Interact appropriately in group settings by: • listening attentively. • showing empathy. contributing relevant comments, connecting personal experiences to content. • monitoring own understanding of the discussion and seeking clarification when needed.	✓	✓	✓	✓	✓	✓
2.01	Explore informational materials that are read, heard, and/or viewed by: • monitoring comprehension for understanding of what is read, heard and/or viewed. • studying the characteristics of informational works. • restating and summarizing information. • determining the	✓	✓	✓	✓	✓	✓

Standard Course of Study Objectives for Grade 6		Day 1 Nutrients & Balance	Day 2 Nutritional Balance & MyPyramid	Day 3 Food Labels & Beverages & Analyzing Influences (AI)	Day 4 Meal Design & Analyzing Influences	Day 5 Portion Size and Analyzing Influences	Day 6 Stations – Computer lab
	importance and accuracy of information. • making connections between works, self and related topics/information. • comparing and/or contrasting information. • drawing inferences and/or conclusions. • generating questions.						
2.02	Use multiple sources of print and non-print information in designing and developing informational materials through: • exploring a variety of sources from which information may be attained (e.g. books, Internet, electronic databases, CD-ROM). • distinguishing between primary		✓				✓

Standard Course of Study Objectives for Grade 6		Day 1 Nutrients & Balance	Day 2 Nutritional Balance & MyPyramid	Day 3 Food Labels & Beverages & Analyzing Influences (AI)	Day 4 Meal Design & Analyzing Influences	Day 5 Portion Size and Analyzing Influences	Day 6 Stations – Computer lab
	and secondary sources. • analyzing the effects of the presentation and/or the accuracy of information.						
5.01	Increase fluency, comprehension, and insight through a meaningful and comprehensive literacy program by: • Using effective reading strategies to match type of text. • Reading self selected literature and other materials of individual interest. • Reading literature and other materials selected by the teacher. • Discussion literature in teacher-student conferences and small group discussions. • Taking an active role in whole class seminars.	✓	✓	✓	✓	✓	✓

Standard Course of Study Objectives for Grade 6	Day 1 Nutrients & Balance	Day 2 Nutritional Balance & MyPyramid	Day 3 Food Labels & Beverages & Analyzing Influences (AI)	Day 4 Meal Design & Analyzing Influences	Day 5 Portion Size and Analyzing Influences	Day 6 Stations – Computer lab
• Discussing and analyzing the effects on texts of such literary devices as figurative language, dialogue, flashback and sarcasm. • Interpreting text by explaining elements such as plot, theme, point of view, characterization, mood, and style. • Investigating examples of distortion and stereotypes. • Recognizing underlying messages in order to identify themes(s) within and across works. • Extending understanding by creating products for different purposes, different audiences and within various contexts. • Exploring						

Standard Course of Study Objectives for Grade 6		Day 1 Nutrients & Balance	Day 2 Nutritional Balance & MyPyramid	Day 3 Food Labels & Beverages & Analyzing Influences (AI)	Day 4 Meal Design & Analyzing Influences	Day 5 Portion Size and Analyzing Influences	Day 6 Stations – Computer lab
	relationships between and among characters, ideas, concepts and/or experiences.						

CORI Nutrition Unit Tasks & Texts

	Concepts & Questions	Stimulating Tasks	Interesting Texts
Day 1	Overview of nutrients: carbohydrate, fat, and protein Importance of balance between the nutrients Importance of calcium and fiber What is energy? How do humans receive energy? Each nutrient is important. Why -	Nutrient Debate – I am an alien and just after landing on this planet close to Ms. Smith's classroom, I decided I am hungry. What should I eat and why? Each small group is assigned a nutrient to research. They are asked to create concept maps during their reading, which will help to explain to me why I should eat this nutrient, offer recommendations for nutritious sources of this nutrient and tell me where I might find these foods. They can also report interesting facts found in the texts. Once all groups have presented their case I must decide which group made the most convincing argument and the whole class processes the importance of each nutrient in a balanced diet.	Nutrient Reading Packets included the following articles, book excerpts, and pamphlets: Dietary Fiber: An Essential part of a healthy diet (www.mayo clinic.com/health/fiber/NU00033 accessed on 4/26/2007) Fiber: Start Roughing It (Harvard School of Public Health) Fiber (American Heart Association) The Fiber Lifestyle (www.clevelandclinc.org/health/health-info/docus/3800/3850.asp?index=12269 accessed on 2/19/2007) Learning About Fats (http://www.kidshealth.org/kid/nutrition/food/fat.html accessed on 2/22/2007) Fats (UWSP University Health Service) Revealing Trans Fat (US Food and Drug Administration - FDA Consumer Magazine September-October 2003) Know Your Fats (American Heart Association) Harvard School of Public Health (2007) *Fats & Cholesterol.* (www.nlm.nih.gov/medlineplus/ency/article/002468.htm accessed on 2/19/2007) American Heart Association. (2008). *Learning About Proteins.* (www.kidshealth.org/kid/nutrition/food/protein.html accessed on 1/22/2007) Harvard School of Public Health (2007). *Protein in diet.* (http://www.nlm.nih.gov/medlineplus/ency/article/002467.htm accessed on 2/19/2007) Dolson, L. (2007). *Protein: How much do you need?* The New York Times Company *The Benefits of Protein* http://webmd.com/fitness-exercise/guide/benefits-protein accessed on 2/19/2007) American Diabetes Association. (2004). *All About Carbohydrate Counting – Toolkit No. 10.* Carbohydrates (Harvard School of Public Health) What is a carbohydrate? (http://life.familyeducation.com/nutrition-and-diet/foods/48628.html accessed on 2/19/2007)

	Concepts & Questions	Stimulating Tasks	Interesting Texts
			Jegtvig, S. (2007). What is a carbohydrate anyway? *The New York Times Company.* Center for Food Safety and Applied Nutrition (2006). *Tools for identifying calcium in food and achieving a diet with variety and balance.* US Department of Agriculture. Arlington, VA.
	How is energy measured in foods-calories? Calories consumed vs. calories burned Excess calories always stored as fat Calories per gram of each nutrient: 1 gm Carbohydrate – 4 calories,1 gm Protein - 4 calories, 1 gm Fat – 9 calories Fat contains more than twice the amount of calories in protein and carbohydrates. Carbohydrates are the easiest nutrient for the body to process and use for energy.	Experiment Set Up – 3 foods (1 gm nut, 1gm rice, 1 gm olive oil) - 3 flasks water and thermometer Q: If I were to burn each food, which food type would release the most energy per gram? (not actually ignite the foods – due to a safety hazard of working in a mobile unit – fire hazard)	Libal, A. (2006). *Fats, Sugars, and Empty Calories: The fast food habit (*Energy is the key: An introduction to calories). Mason Crest Publishers Inc. Broomall, PA p., 25-31.
	What is an energy drink? What do they do and how do they do it? Would you recommend an energy drink to your friend – why or why not?	Corey is a member of the school's basketball team. There is an important game after school and he is feeling really tired. A good friend offers him and energy drink and says it will help him during the game. Should Corey drink it – why or why not? Students create a KWL chart for energy drinks to help answer our question.	Mason, M. The Energy Drink Buzz Is Unmistakable. The Health Impact Unknown. NY Times.com October 12, 2006. (http://www.nytimes.com/2006/12/12/health/12cons.html accessed on 2/15/08) Zelman, K.M. (October, 2006). What's the Buzz About Energy Drinks? (http://www.webmd.com/diet/guide/whats-the-buzz-about-energy-drinks accessed on 2/15/08).
Day 2	Energy Expenditure and Energy Consumption Patterns and Effects	Each small group is assigned a patient profile. Each client has a question that needs to be resolved. Basic information	National Science Foundation. (2007). *Patient Profiles.* Arlington: VA. National Science Foundation. (2007). *Energy Balance.*

	Concepts & Questions	Stimulating Tasks	Interesting Texts
	Creating a balance Introduction to MyPyramid	related to the client's height, weight, daily activities are listed and the client's questions and goals are given. The groups are to use the readings and the formulas provided to provide answers to their patient. (Appendix J) Each student computes a personal metabolic rate using a formula provided. They also assess their average physical activity levels and approximate calories expended. Compare and contrast to the MyPyramid personalized recommendations prepare by teacher for each student	*Reference Manual*. Arlington: VA. Nutrition for kids: Guidelines for a healthy diet (www.mayoclinic.com/health/nutrition-for-kids/NU00606 accessed on 4/26/2007) *MyPyramid Steps to a Healthier You* Personal Reference Guide – created for each student using formula based calculation on www.mypyramid.gov
Day 3	Review Food Groups & Recommendations Why do we eat the foods we eat? (analyze internal and external influences related to eating – culture, family, availability, science, media, personal preference, tastes, familiarity) Vegetarian Diets – reasons why, different types, planning for complete proteins	Meal Design Project – using food cards available, work in pairs to create a breakfast, lunch, dinner, and snack that you would eat and which meets the MyPyramid recommendations on your personal reference guide. Individual volunteer presentations - share by categorizing in whole class pyramid and class visually assesses cumulative balance at the end of presentations. What is a vegetarian diet? What are some reasons some people follow a vegetarian diet. Create a complete protein for a vegetarian diet.	*MyPyramid Steps to a Healthier You* Personal Reference Guide – created for each student using formula based calculation on www.mypyramid.gov Geisel (Seuss), T. (1960). *Green Eggs and Ham*. Random House, Inc.: New York. Messina, V. & Messina, M. (1996). Vegetarian Nutrition for Teenagers- Chapter 11 –*The Vegetarian Way: Total Health For You and Your Family*. Three Rivers Press, New York pp203-211
Day 4	Differentiating between nutrient dense and low nutrient foods	Reading Food Labels: Snack Line Up – each small group is given a bag of different snack	US Dietary Association. (2005). Use The Nutrition Facts Label To Eat Healthier. Washington, D.C.

	Concepts & Questions	Stimulating Tasks	Interesting Texts
	How are food labels organized, what information can be found, what are some common terms which represent sugar and fat? What are the consequences of a diet rich in sugar and fat and low in fiber and calcium?	items and asked to order snacks according to the following contents: calories, fat, protein, carbohydrate, and fiber. They can only view the ingredients labels provided to inform their hypotheses. Once their estimations are complete, they read the labels to determine the accuracy of the hypotheses. Groups share findings and surprises as whole class. Beverage Selection: Each group is given a white board and a beverage container with a food facts label. They have to decide if they would recommend this drink to someone else and why or why not. They present their answers to the class. Beverages are ranked by calorie at the conclusion of the activity. Cereal Analysis: Using 15 cereal boxes provided – students review cereal to determine if it is –high fiber, low sugar, low sodium, and no trans or saturated fat.	Kids Health. (July 2003). Figuring Out Food Labels. http://kidshealth.org/kid/stay_healthy/food/labels.html accessed on 2/10/08). Food labels from various snacks, beverages, and cereals
Day 5	Portion Sizes Analyzing the culture's (culture is defined by community, family, media, school, restaurants, grocery stores) influence on how much food we eat. How do plate and bowl sizes, food offerings at restaurants, food packaging, food prices, family norms, choices available, affect what we eat and how	Cereal Activity- clear glass bowl – one box of Trix® cereal Ask a student volunteer to come to the front of the room and pour the amount of cereal he/she typically eats at one time. Ask class if they would eat more or less. Use another bowl (same size) to pour an exact serving according to the label – discuss the differences. Portion Comparisons	Libal, A. (2006). *Fats, Sugars, and Empty Calories: The fast food habit.* Mason Crest Publishers Inc. Broomall, PA, p.72-81 (An American Stereotype, The Ever-Increasing Portion, Profit and Promotion, Skewed Hunger Mechanisms)

Pre/Post CORI Concept & Skill Questionnaire

1. The BEST way for most people to get the nutrition they need in order to stay healthy is to

   A. eat mostly foods that have few calories
   B. eat foods from each food group
   C. drink a glass of water with every meal
   D. take vitamins every day

2. Which information is included on the "Nutrition Facts" panel of a food label?

   A. How much fat is in the food
   B. How much of every ingredient is in the food
   C. Why the food is good for you
   D. What the government thinks of the food

Use the following dinner menu to answer question 3

DINNER

- Broiled fish
- Rice
- Whole wheat roll
- Carrots
- Iced tea
- Peaches

3. This meal was LACKING foods that --
   A. provide dietary fiber
   B. build and repair cells and tissues
   C. build strong bones and teeth. supply the body with energy

4. Taking in more calories than the body uses through physical activity causes weight gain MAINLY because --

   A. calories must be converted to fat in order to be used by the body
   B. the body stores the extra calories as fat
   C. physical activity causes increased appetite
   D. calories make the body retain water

Jon wrote down what he ate for lunch each day for one week. Use the following food log to answer questions

MONDAY

- 1 apple
- 1 cup of yogurt
- 1 cup of skim milk

TUESDAY

- 1 bag of potato chips
- 1 soft drink
- 1 hamburger on wheat roll
- 1 slice of tomato

WEDNESDAY

- 1 slice of cheese pizza
- 1 cup of skim milk
- 1/2 cup of peaches

THURSDAY

- 1 orange
- 1/2 cup of yogurt
- 1 cup of grape drink

FRIDAY

- 1 turkey hot dog
- 1 wheat roll
- 1 cup of skim milk
- 1 apple

5. Which of these foods should Jon have added to his lunch on Tuesday to help develop strong bones and teeth and not increase fat intake?

    A. 1 milk shake
    B. 1 slice of cheddar cheese
    C. 1 cup of skim milk
    D. 1/2 cup of ice cream

6. Jon's lunch was the MOST nutritionally balanced on --

   A. Monday
   B. Wednesday
   C. Thursday
   D. Friday

7. Which of these has the MOST calories?

   A. One gram of protein
   B. One gram of carbohydrates
   C. One gram of fat
   D. One gram of sugar

8. Which source of calories does the body use MOST EFFICIENTLY as energy?

   A. Protein
   B. Carbohydrates
   C. Fats
   D. Fiber

9. Which of these is NOT a problem associated with sugared soft drinks?

   A. Consuming too many of these drinks can lead to obesity.
   B. Consuming these drinks can contribute to tooth decay.
   C. These drinks are used as a substitute for more nutritious foods.
   D. These drinks contribute to high levels of blood cholesterol.

10. One serving of meat is about the size of a:

    A. soda can.
    B. softball.
    C. deck of playing cards.
    D. quarter.

11. Which of the following when found on food labels, indicate the presence of sugars?

    A. Ascorbic acid, calcium sorbate, sodium sorbate
    B. Aspartame, saccharin
    C. Fructose, maltose, sucrose
    D. Cellulose, pectin, guar gum

12. Jenny wants to cook a healthy dinner for her family. Using the menu below, choose the foods for the lowest fat to create the healthiest meal. You must choose one food from each category. For each food you choose, explain why that food is a healthier choice than the others in the category.

Menu			
Category	**Options**	Which food do you recommend	Why
Entrée	Fried Chicken Roasted Chicken		
Grain Product	Pasta in Cream Sauce Steamed Rice Buttered Rice		
Vegetable	Broccoli and Cheese Sauce Steamed Broccoli		
Soup	Chicken Noodle Soup Cream of Mushroom Soup		
Green Salad with Dressing	Italian Dressing Low Fat Ranch Dressing Lemon Juice Blue Cheese Dressing		
Beverage	1% Milk Water Soda Diet Soda Coffee		

[redacted] **Milk** A

Serving Size 8 fl oz (240mL)
Servings Per Container 2

Amount Per Serving

Calories 150	Calories from Fat 70
	% Daily Value*
Total Fat 8g	12%
Saturated Fat 5g	25%
Cholesterol 35mg	12%
Sodium 125mg	5%
Total Carbohydrate 12g	4%
Dietary Fiber 0g	0%
Sugars 11g	
Protein 8g	

Vitamin A 6% • Vitamin C 4%
Calcium 30% • Iron 0% • Vitamin D 25%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

[redacted] **Milk** B

Serving Size 8 fl oz (240mL)
Servings Per Container 2

Amount Per Serving

Calories 80	Calories from Fat 0
	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Cholesterol less than 5mg	1%
Sodium 130mg	5%
Total Carbohydrate 12g	4%
Dietary Fiber 0g	0%
Sugars 11g	
Protein 8g	

Vitamin A 8% • Vitamin C 4%
Calcium 30% • Iron 0% • Vitamin D 25%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

13. Using the food labels above -which is the healthier selection Milk A or Milk B? Why?
14. Selena, who is trying to reduce her cholesterol level, is going to a family dinner at her aunt's house. Her aunt always makes a rich double cheesecake and feels insulted when someone doesn't eat it. Which of the following would be the best thing for Selena to say or do so as not to hurt her aunt's feelings?

    A. Eat the cheesecake, but drink lots of water to help remove the cholesterol from her system
    B. Eat the cheesecake, but go for a walk afterwards to help remove the cholesterol from her system
    C. Explain her medical condition to her aunt and have a small taste of cheesecake
    D. Make up an excuse and not go to the family dinner

15. Selecting foods based on their nutritional value is an example of selecting foods because of:
    a) marketing.
    b) peer pressure.
    c) legal reasons.
    d) health reasons.

16. Pedro seldom eats fresh fish because he has difficulty finding fresh fish in his area. The fact that Pedro seldom eats fresh fish is based on:
    a) lack of money.
    b) his dislike of fish.
    c) geographic limitations.
    d) concern over food safety

17. Sally can't wait to try the new bubble gum flavored ice cream she saw advertised during a television show. Although she rarely eats dairy products because of health restrictions, Sally purchases the ice cream the next time she is in the grocery store. Which if the following is true about Sally's food choice in this case?
    a) Cost is more important than her health.
    b) Marketing affected her choice more than her health.
    c) Peer pressure affected her food choice.
    d) Sally makes all of her food choices based on concern for her health.

18. Because of a lengthy history of cancer in his family, Joe decides to include foods in his daily diet that research suggests lower an individual's risk for developing cancer. Which of the following factors most influenced Joe's food choices in this case?
    a) Age and environment
    b) Media and culture
    c) Health and science
    d) Mood and culture

19. Jeff is selective about the food he eats. His family has always encouraged him to try different foods, but he refuses to try anything new. Which of the following factors is most likely influencing Jeff's decision not to try new foods?
    a) Curiosity
    b) Personal likes and dislikes
    c) Peer pressure
    d) Family pressure

Questionnaire Items Measuring Conceptual Nutrition Knowledge Alignment With CORI Nutrition Lessons

Selected Response Assessment Questions:		Day 1 Nutrients & Energy Consumption and Expenditure	Day 2 Nutritional Balance & MyPyramid	Day 3 Food & Beverage Labels &	Day 4 Meal Design	Day 5 Portion Control	Day 6 Technology Stations – Meal Planning
1.	The BEST way for most people to get the nutrition they need in order to stay healthy is to:	✓	✓		✓		✓
2.	Which of the information is included on the "Nutrition Facts" panel of a food label?			✓	✓	✓	✓
3.	Using the menu provided, this meal was LACKING foods that:	✓			✓		✓
4.	Taking in more calories than the body uses through physical activity causes weight gain MAINLY because	✓					
5.	Use the following food log: Which of these foods should Jon have added to his lunch on Tuesday to help develop strong bones and teeth and not increase fat intake?	✓			✓		✓
6.	Use the following food log: Jon's lunch was the MOST nutritionally balanced on which day?	✓	✓		✓		✓
7.	Which of these has the MOST calories?	✓		✓	✓	✓	✓

Selected Response Assessment Questions:		Day 1 Nutrients & Energy Consumption and Expenditure	Day 2 Nutritional Balance & MyPyramid	Day 3 Food & Beverage Labels &	Day 4 Meal Design	Day 5 Portion Control	Day 6 Technology Stations – Meal Planning
8.	Which source of calories does the body use MOST EFFICIENTLY as energy?	✓					
9.	Which of these is NOT a problem associated with sugared soft drinks?		✓	✓			
10.	One serving of meat is about the size of a:					✓	
11.	Which of the following when found on food labels, indicate the presence of sugars?			✓	✓		✓
12.	Using the menu below, choose the foods for the lowest fat, healthiest meal. This item has 6 different responses, which were coded as separate items in SPSS.	✓	✓	✓	✓		✓
13	Using the food labels above - which is the healthier selection Milk A or Milk B? Why?	✓	✓	✓	✓		✓

Questionnaire Items Measuring Students' Ability to Apply the Analyzing Influences Health Skill Alignment With CORI Nutrition Lessons

Selected Response Assessment Questions:		Day 1 Nutrients & Energy Consumption and Expenditure	Day 2 Nutritional Balance & MyPyramid	Day 3 Food & Beverage Labels & Analyzing Influences	Day 4 Meal Design & Analyzing Influences	Day 5 Portion Size and Analyzing Influences	Day 6 Technology Stations – Analyzing Influences
14.	Selena, who is trying to reduce her cholesterol level, is going to a family dinner at her aunt's house. Her aunt always makes a rich double cheesecake and feels insulted when someone does not eat it. Which of the following would be the best thing for Selena to say or do so as not to hurt her aunt's feelings?	✓	✓		✓	✓	✓
15.	Selecting foods based on their nutritional value is an example of selecting foods because of:	✓		✓	✓		✓
16	Pedro seldom eats fresh fish because he has difficulty finding fresh fish in his area. The fact that Pedro seldom eats fresh fish is based on:			✓	✓	✓	✓
17.	Sally cannot wait to try the new bubble gum flavored ice cream she saw advertised during a television show. Although she rarely eats dairy products because of health restrictions, Sally purchases the ice cream			✓	✓	✓	✓

Selected Response Assessment Questions:		Day 1 Nutrients & Energy Consumption and Expenditure	Day 2 Nutritional Balance & MyPyramid	Day 3 Food & Beverage Labels & Analyzing Influences	Day 4 Meal Design & Analyzing Influences	Day 5 Portion Size and Analyzing Influences	Day 6 Technology Stations – Analyzing Influences
	the next time she is in the grocery store. Which if the following is true about Sally's food choice in this case?						
18.	Because of a lengthy history of cancer in his family, Joe decides to include foods in his daily diet that research suggests lower an individual's risk for developing cancer. Which of the following factors most influenced Joe's food choices in this case?			✓	✓	✓	✓
19.	Jeff is selective about the food he eats. His family has always encouraged him to try different foods, but he refuses to try anything new. Which of the following factors is most likely influencing Jeff's decision not to try new foods?			✓	✓	✓	✓

Pre CORI Student Interest Survey

Class Activities	Strongly Disagree	Disagree	Agree	Strongly Agree
I enjoy reading non-fiction texts (brochures, information from the web, textbook material).				
I enjoy reading fictional texts.				
I like experiments.				
I like it when the teacher asks questions of us in class.				
I like it when my classmates ask questions about what we are studying.				
I like finding answers to questions in books/texts.				
I like the small group activities in class.				
I like small group discussions.				
I like whole class discussions.				
I like group presentations.				
I like designing meals.				
I like using computer programs for learning.				
I might read more about something that interests me in class.				
I read to learn new information.				
If I am reading about an interesting topic, I sometimes lose track of time.				
If a book is interesting, I do not care how hard it is to read.				
I like to talk to my friends about what I am reading.				

List your top 3 favorite class activities and explain why.

1.

2.

3.

Post CORI Student Interest Survey

Class Activities	Strongly Agree	Disagree	Agree	Strongly Agree
I enjoyed reading the information texts (brochures, information from the Internet, textbook material).				
I enjoyed reading the narrative texts (trade books, stories).				
I liked the class experiments (burning calories, nutrient content, balanced meal).				
I liked the questions asked by the teacher.				
I liked the questions asked by my classmates.				
I liked finding answers to the questions in books/texts.				
I liked the small group activities (food sort, portion sizes, and patient notes).				
I liked the small group discussions.				
I liked the whole class discussions.				
I liked the group presentations.				
I liked designing the meal.				
I liked the computer activities.				
I might read more about something that interests me in class.				
I read to learn new information.				
If I am reading about an interesting topic, I sometimes lose track of time.				
If a book is interesting, I do not care how hard it is to read.				
I like to talk to my friends about what I am reading.				

List your top 3 favorite class activities and explain why.

1.

2.

3.

Patient Profile Task Example

Jerome's Patient File

Why am I gaining weight?

I've gained more than 20 pounds this summer! I can't figure out why. I don't eat that much. Lots of my friends eat five or six different things at one meal, but I only have one or two foods. I keep busy with my computer hobbies and visiting my friends. And I usually walk to my friends' homes. What's going on? I must have a gland problem.

Official Patient Record — Confidential

Patient name Jerome J.

Age 13 **(years)** 8 **(months)** **Sex** _____ **female** X **male**

Height 62 **(in.)** **Weight** 134 **(lbs.)** 2 **(oz.)**

Referring physician Dr. Washington

Referral information:

Jerome was referred to the clinic by the family physician, Dr. Washington. Dr. Washington noted that Jerome weighed 110 pounds at the end of the school year. She is quite concerned about Jerome's weight gain and requested that the clinic staff evaluate Jerome's energy balance.

Initial clinic visit:

Dr. Chu met with Jerome and his mother on August 11. He asked Jerome to keep track of his food consumption and physical activities for the next week and record a typical day on our Food and Physical Activity forms. He asked Jerome to return the forms to clinic staff for evaluation before his next appointment.

Master 3.8
(page 1 of 2)

Jerome's Patient File

Patient Name Jerome J.

Food Diary

Meal and Food	Carbohydrates (g)	Fat (g)	Protein (g)
Breakfast			
2% milk (8 fluid oz.)	11.4	4.5	7.9
Sugar Smacks cereal	63.1	1.4	4.7
Breakfast total	**74.5**	**5.9**	**12.6**
Lunch			
Meat and cheese pizza (4 slices)	79.5	27.8	40.5
Lunch total	**79.5**	**27.8**	**40.5**
Dinner			
Fast food double hamburger	42.9	27.9	29.9
Super-size French fries	77.0	29.0	9.0
Cola drink (12 fluid oz.)	36.9	0.0	0.0
Dinner total	**156.8**	**56.9**	**38.9**
Snacks			
Cola drink (12 fluid oz.)	36.9	0.0	0.0
Popcorn, with oil & salt (5 cups)	31.5	15.5	4.9
Butter (1 tsp.)	0.0	3.8	0.0
Snack total	**68.4**	**19.3**	**4.9**

Physical Activity Diary

Intensity Level and Activity	Hours	Intensity Level and Activity	Hours
Resting		**Light**	
sleeping	10.0	doing household chores	0.5
Very light		walking the dog	1.0
watching television	4.0	walking to friends' homes	0.5
playing computer games	3.0	**Moderate**	
browsing Internet	2.0	(none)	0.0
eating and bathing	3.0	**Heavy**	
		(none)	0.0

Master 3.8
(page 2 of 2)

Patient Notes

Team: _____ Date: _____

ENERGY BALANCE CLINIC

PATIENT NOTES

Patient's name _____

Patient's question _____

Summary of Analysis

Total calories consumed (E_{in}):

Total calories used (E_{out}):

Explanation

How would you answer the patient's question? Explain.

What is the appropriate energy balance for the patient? Should the patient be gaining weight, losing weight, or maintaining the same weight? Explain.

Recommendations

What recommendations do you have for the patient about his/her food consumption and physical activities?

Why would following the above recommendations lead to the appropriate energy balance for the patient?

Calculating $Energy_{in}$ and $Energy_{out}$

Name: _____ Date: _____

Place the appropriate numbers in the calculator boxes and then calculate your patient's total $Energy_{in}$ and total $Energy_{out}$.

Daily Energy Intake Calculator

	Grams		calories/gram		Total
Total Carbohydrates		X		=	
Total Fat		X		=	
Total Protein		X		=	

Calculate Total calories _____ $Energy_{in}$

Daily Activity Calculator

	Hours		calories/hour		Total
Resting		X		=	
Very Light		X		=	
Light		X		=	
Moderate		X		=	
Heavy		X		=	

Calculate Total calories _____ $Energy_{out}$

Master 3.2

Energy Balance Reference Manual

Energy Balance Reference Manual
Table of Contents

Section 1: Sources of Energy (Food)

The human body uses food as a source of energy and for raw materials to maintain the body and produce new body tissues. The major nutrients in food are carbohydrates, fats, and proteins. The energy from these nutrients is represented as E_{in}.

E_{in} = energy from food consumed

Carbohydrates are the major source of energy for the body.

1 g carbohydrate = 4 calories

Fats are important for energy storage.

1 g fat = 9 calories

Proteins are used to build new body tissues, but they also can be energy sources.

1 g protein = 4 calories

Section 2: Uses of Energy

Basal Metabolic Rate

Basal metabolic rate, or BMR, represents the energy used to carry out necessary body activities such as breathing, regulating body temperature, and maintaining a heart beat. The majority of daily energy output, 60 to 70 percent, is used for these activities.

BMR varies among individuals:

- Age: younger people have higher BMR
- Growth: children and pregnant women have higher BMR
- Height: tall, thin people have higher BMR
- Body composition: people with more lean tissue have higher BMR

BMR varies across time for an individual:

- Fever: fever increases BMR
- Stress: phyical stress increases BMR
- Temperature: hot and cold weather raises BMR
- Fasting: drastic dieting lowers BMR

Physical Activities

For most people, physical activities account for about 20 to 30 percent of the body's total energy output. The number of calories used for an activity varies with a person's age, weight, and gender. The total number of calories used for an activity depends on the intensity level and duration of the activity.

Activity Level	Calories/Hour
Resting sleeping, lying quietly	60
Very Light watching television, eating	85
Light walking, doing household chores	140
Moderate bicycling, dancing (practice)	285
Heavy swimming (practice), playing basketball, walking fast (5 mph)	400

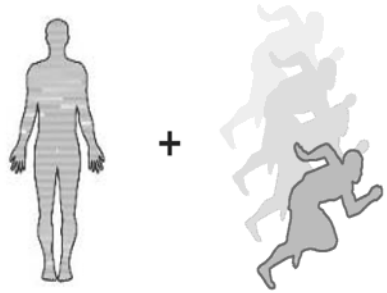
Master 3.10 (page 1 of 3)

Energy Balance Reference Manual

Energy Output

The energy used for basal metabolic rate and physical activities is represented by E_{out}.

E_{out} = energy used for BMR + energy used for activities



Growth and Stored Energy

In addition to BMR and physical activities, the bodies of growing children, adolescents, and teenagers use energy to produce new body tissues such as bone, muscle, and blood. This energy is represented by E_{growth}.

E_{growth} = energy used to produce new body tissues

Young people's bodies also store energy in the form of fat as a normal part of development. This stored energy, represented by E_{stored}, may be used later for growth. It takes 3,500 calories to make 1 pound of stored fat.

E_{stored} = energy stored as fat

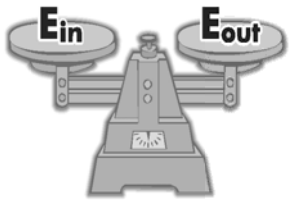
Section 3: Energy Balance

The Energy Balance Equation

$E_{in} = E_{out}$

The energy balance equation shows the relationship between energy input (E_{in}) and energy output (E_{out}). Energy balance is determined over long periods of time (months or years), not over short periods of time (days).

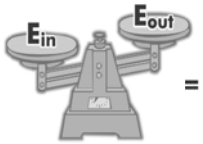
Energy input and output are expressed in calories.



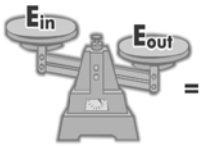
Adults

Adults who, over time, consume the same number of calories in food that they expend in BMR and physical activities are in energy balance: $E_{in} = E_{out}$. They maintain a constant body weight.

Adults who consistently consume more calories than they expend are in positive energy balance: $E_{in} > E_{out}$. They gain weight.



= **excess energy stored as fat**



= **weight loss**

Adults who consistently expend more calories than they consume are in negative energy balance: $E_{in} < E_{out}$. They lose weight.

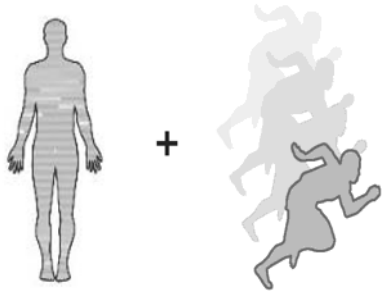
Master 3.10 (page 2 of 3)

Energy Balance Reference Manual

Energy Output

The energy used for basal metabolic rate and physical activities is represented by E_{out}.

E_{out} = energy used for BMR + energy used for activities



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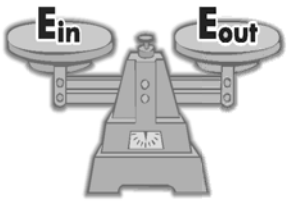
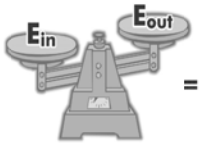


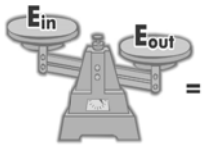
Adults

Adults who, over time, consume the same number of calories in food that they expend in BMR and physical activities are in energy balance: $E_{in} = E_{out}$. They maintain a constant body weight.

Adults who consistently consume more calories than they expend are in positive energy balance: $E_{in} > E_{out}$. They gain weight.



= **excess energy stored as fat**



= **weight loss**

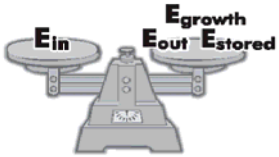
Adults who consistently expend more calories than they consume are in negative energy balance: $E_{in} < E_{out}$. They lose weight.

Master 3.10 (page 2 of 3)

Energy Balance Reference Manual

Children and Adolescents

To grow properly and maintain a healthy state, children, adolescents, and teenagers must be in positive energy balance: $E_{in} > E_{out}$. They need to consume more calories than needed for BMR and physical activities (E_{out}). The extra calories they consume are used for increasing the amount of important body tissues such as bone, muscle, and blood (E_{growth}). Extra calories may also be stored as fat (E_{stored}).



For healthy children and adolescents, the energy balance equation is $E_{in} = E_{out} + E_{growth} + E_{stored}$.

Weight Gain in Adolescents

Adolescence is a time of rapid growth and development. Extra energy is required and weight is gained. Normal weight gain varies with age, gender, weight, and height.

A 12-year-old girl is expected to gain 8 to 13 pounds over the next year. Normal average weight gain is 10 pounds.

A 12-year-old boy is expected to gain 8 to 15 pounds over the next year. Normal average weight gain is 11 pounds.

A 13-year-old girl is expected to gain 7 to 11 pounds over the next year. Normal average weight gain is 7 pounds.

A 13-year-old boy is expected to gain 9 to 14 pounds over the next year. Normal average weight gain is 12 pounds.

Growth occurs in spurts. Young teens and pre-teens may gain several pounds in one month and none at all the next month. This is normal. Nutritionists consider weight gain over longer periods of time to evaluate whether the amount of weight gain is too little or too much.

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Food Sort Matrix

	FOOD							
Protein								
Carbohydrate								
Fat								
Calories								
Fiber								
Sodium								
Cholesterol								

most → 8=least

Example

	Egg	Snickers Bar	Lettuce	Broccoli	Corn	Bread	Cereal
Vitamin B	4	7	2	1	6	5	3

How Big is BIG?

Facts needed for this activity:
1 ounce = 28 grams
1 tsp. fat = 4 grams
1 regular slice of bread weighs about 1 ounce and contains about 70 calories
Each ounce of soft drink contains about 1 teaspoon of sugar

Calories per ounce of food selected:
Brownie: 115 calories per ounce
Soft Drink: 13 calories per ounce
Muffin, blueberry: 79 calories per ounce
Bagel: 78 calories per ounce
Cookie, chocolate chip: 138 calories per ounce
Biscuit: 103 calories per ounce
McDonald's French fries: small, 210 calories, 10 grams of fat
super-size, 610 calories, 29 grams of fat

Foods:

Brownie

Where was it purchased or brand? _____-

Weight of brownie in ounces = _____

Calories in this brownie (weight in ounces times calories per ounce) = _____

Soft Drink

Where was the BIG cup purchased? _____

Number of cans of regular canned soft drink that will fill the BIG cup? _____

Number of ounces in BIG cup: _____

Calories of soft drink in BIG cup: _____

Teaspoons of sugar in BIG cup full of drink: _____

Muffin

Where was muffin purchased or brand? _____

Weight of muffin in ounces: _____

Calories in this muffin: _____

Number of slices of bread this muffin is equal to: _____

Bagel

Where was bagel purchased or brand? _____

Weight of bagel in ounces: _____

Calories in this bagel: _____

Number of slices of bread this bagel is equal to: _____

Biscuit

Where was biscuit purchased or brand? _____

Weight of biscuit in ounces: _____

Calories in this biscuit: _____

Number of slices of bread this biscuit is equal to: _____

Cookie

Where was cookie purchased or brand? _____

Weight of cookie in ounces: _____

Calories in this cookie: _____

Number of slices of bread this cookie is equal to: _____

French Fries

	Small Portion	Super-Size Portion
Where purchased/brand?	_____	_____
Weight of this portion, oz.:	_____	_____
Calories in this serving:	_____	_____
Number of fries in this portion:	_____	_____

How many small portions are in Super-Size Portion: _____

Source: Byte N2 Nutrition, North Carolina Cooperative Extension Service, Summer 2001

Serving Size Comparisons

- 1 cup green salad
- 1 baked potato
- 6 baby carrots
- 3 ounces grilled fish
- 1 ounce chocolate
- 1 ½ ounce cheese
- 1 cup cereal
- 2 Tbsp dressing
- 1 tsp butter
- 1 cup milk
- 1 pancake
- ½ fresh fruit

CD	Pancake
7 cotton balls	Fresh Fruit
1 stamp	1 tsp butter
1 ping pong ball	2 Tbsp dressing
1 box of dental floss	1 ounce chocolate
1 checkbook	3 ounces grilled fish
1 – 9-Volt Battery	1 ½ ounce cheese
½ cup	6 baby carrots
1 tennis ball	1 cup cereal
1 tennis ball	1 cup green salad
1 baseball	1 cup milk
1 computer mouse	1 baked potato

STATION TASKS

Station 1 - Culture:
Select a cuisine that you do not know much about (examples include but are not limited to Mexican, Latin, Ethiopian, Thai, Indian, French, Japanese). Research foods and meals commonly eaten in this culture and find out how they are prepared. Create a dinner menu that you think you might enjoy trying:

Station 2 - Blast Off:
www.mypyramid.gov/kids
List the types of fuel you found to be the most efficient in your journey.

Station 3 - Eating Out:
www.thedailyplate.com
Enter the restaurant you eat at most often in the search box. Review the menu selections and use your MyPyramid recommendations to create a healthy meal (breakfast, lunch, or dinner). If you have time, visit search menus from different restaurants and create a variety of meal plans for each.

Station 4 – A. Meal Planning – Vegetarian Options:
Use the search engine and the Vegetarian books to help you design a meal plan (breakfast, lunch, dinner, and snacks) using only vegetarian options. Make sure to include foods that you would eat in this plan. Use the food cards, the pyramid, and your MyPyramid recommendations to make sure the meals are balanced.

Station 4 – B. Meal Planning – Food Cards
Create a healthy menu using the food cards. Your menu should consist of breakfast, lunch, dinner, and snack options. The menu should include foods and beverages that you enjoy. Use the cards, pyramid, and your MyPyramid recommendations to guide you in your meal selections. If you have time, create several meal plans.

Breakfast:

Lunch:

Dinner:

Snack:

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