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Comparing second grade students' creative and content knowledge performance on figural transformation activities introduced in a standard or enhanced manner with nutrition content knowledge taught through factual or fantasy reading

Angela Naomi Webb
University of Northern Iowa

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COMPARING SECOND GRADE STUDENTS' CREATIVE AND CONTENT
KNOWLEDGE PERFORMANCE ON FIGURAL TRANSFORMATION ACTIVITIES
INTRODUCED IN A STANDARD OR ENHANCED MANNER WITH NUTRITION
CONTENT KNOWLEDGE TAUGHT THROUGH
FACTUAL OR FANTASY READINGS

An Abstract of a Dissertation

Submitted

in Partial Fulfillment

of the Requirements for the Degree

Doctor of Education

Approved:

Dr. Audrey C. Rule
Committee Chair

Dr. Michael J. Licap
Dean of the Graduate College

Angela Naomi Webb

University of Northern Iowa

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ABSTRACT

Creativity and problem solving are skills students need for success in the 21st century. With the increasing pressures of achieving higher student scores in emphasized content areas, teachers' instruction in science, social studies, music and art has been reduced to provide additional time for teaching reading and mathematics. These lost instructional areas often allowed students to express themselves creatively. Therefore, educators need to find a way to incorporate creativity into content areas like reading and mathematics.

This 16 week repeated measures study examined second grade students' academic and creative performance on figural transformation drawings during an extended reading-science-creativity integrated unit. A figural transformation is a drawing made to change a given simple geometric shape or squiggle into a recognizable picture, in this case, to convey nutrition ideas gleaned from the readings. Students were instructed in a new creativity skill each week, working under two weekly- alternating conditions, fiction and nonfiction nutrition readings, and two biweekly-alternating conditions, standard and enhanced lesson introductions, was examined. Research participants included 19 mixed-ability second grade students in an intact classroom attending a rural elementary school in a Midwestern state.

Mean individual student scores for each creative trait or for nutrition content incorporated into the figural transformations for the eight weeks under each condition were compared through paired t-tests. The results of nonfiction and fiction reading conditions showed that students demonstrated more creative strengths, greater fluency of

ideas, but no difference in nutrition knowledge during the weeks of the fiction condition. Regarding the standard and enhanced lesson introduction conditions, students demonstrated more creative strengths, fluency of ideas, and nutrition content knowledge during lessons with enhanced introductions.

Students also responded to surveys in which they rated perceived level of creativity, enjoyment of book, and enjoyment of making the figural transformations. Student-reported book enjoyment was significantly higher for fiction, with a medium effect size. Other compared survey responses were not statistically significant for both fiction and nonfiction condition comparisons and standard and enhanced lesson introduction comparisons. Students' perception of creativity and enjoyment of making the figural transformations remained high throughout the study, showing the efficacy of this approach.

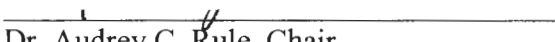
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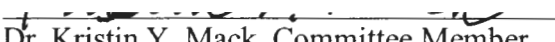
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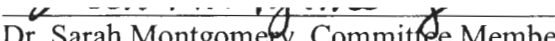
Submitted in Partial Fulfillment
of the Requirements for the Degree


Doctor of Education

Approved:


Dr. Audrey C. Rule, Chair


Dr. Kristin Y. Mack, Committee Member


Dr. Sarah Montgomery, Committee Member


Dr. Stephanie R. Logan, Committee Member


Dr. Sarah M. Vander Zanden, Committee
Member

Angela Naomi Webb

University of Northern Iowa

May 2013

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CHAPTER 1

INTRODUCTION

The United States is currently lagging behind other countries in the fields of mathematics and science (Robelen, 2012), but this situation has not always existed. Until the era of the launch of Sputnik satellites launched by the Soviet Union, the United States stood at the forefront of medical research, electronics, and automobile design (Barrow, Concannon, & Wissehr, 2011). After Sputnik, the predominating political viewpoint in America regarding curriculum changed. Curriculum needed to be reorganized to promote a rapid increase of knowledge to compete with the scientific achievements of other nations (Sand, Davis, Lammel, & Stone, 1960). For low socio-economic schools, the 1960's brought a decrease in teacher flexibility over instructional content, resulting in the use of scripted reading curricula (Commeyras, 2007).

In 1983, the U.S. Department of Education report, "A Nation at Risk," brought to light concerns that 13% of 17 year olds were illiterate, SAT scores were dropping, and numerous college students needed remedial support (U.S. Department of Education, 2008). A reaction to this information brought legislation designed to make educators more accountable for student achievement including the No Child Left Behind Act of 2001 (No Child Left Behind [NCLB], 2002), which focuses on using mandatory standardized testing to show students' reading and mathematics achievements. This accountability pressures educators into teaching to the curriculum covered by the tests, leaving little to no room for experimentation, and sometimes cutting non-test subjects, like science, altogether (Barrow et al., 2011).

In response to NCLB, the 21st Century skills movement incorporates the reality of a rapidly changing world, emphasizing skills beyond memorization, such as global awareness, financial literacy, critical thinking, technology skills, and life and career skills (Johnson, 2009). The “21st Century” skills for the areas of innovation and creativity focus on brainstorming, creating new and worthwhile ideas, viewing failure as an opportunity to learn, and implementing innovations to make useful contributions within the field (Piiro, 2011). These additional skill areas are difficult to address when educators feel that they cannot stray from the mandated curriculum. To develop globally competitive innovation skills, students need to be taught risk-taking, tolerance for ambiguity, and openness to new experiences (Piiro, 2011).

The research project presented here attempted to model ways a teacher may integrate creative thinking skills and content knowledge about nutrition into the academic area of reading, while still maintaining the required literacy curriculum. This investigation examined the impact of the teaching environment (through the teacher’s lesson introduction only) on creative production and the effects of reading factual or fantasy texts on both creativity and knowledge retention. Figural transformations were used to assess both content knowledge and creativity. In the next section, the researcher’s personal interest in the topic is examined.

Researcher’s Personal Interest in the Topic

The researcher, a current second grade teacher, was interested in how creativity skills can be fostered within the constraints of the current reading and mathematics emphasis, particularly regarding integration into reading content areas. Art and music

classes offer students a chance to explore their creative side, but if students are not being allowed to take these classes, it is extremely important for elementary educators to find new ways to integrate creativity with required subjects.

School administrators are under considerable pressure to raise student mathematics and reading scores. These demands cause some administrators to be reactionary in seeking immediate solutions instead of focusing on larger problems and their implications; leading to rash decisions (Davis, 2006). Some administrators are making the decision to remove students from art and music classes to receive extra instruction in reading and mathematics. They may even go as far as to bribe students by telling them that if they do well in the remedial courses, then they may return to their “fun” classes of art and music. Several schools in Washington are forcing students who fail the state standardized test to relinquish their only elective course to take remedial math or reading instead (Beveridge, 2010).

Environment also plays an important role in motivating students. There is some evidence, mostly correlational, to suggest that implementation of a creative environment results in students performing better or generating more creative ideas. More experimental work needs to be conducted to better define how this might be accomplished. The current investigation explored the effects of the environment on student creativity through the lesson introduction only. Every two weeks the manner in which the lesson was introduced was switched from basic directions to a more elaborate introduction. Regardless of the two weeks in which each lesson occurred, the teacher’s tone remained positive. During the standard weeks, the directions were given in the

manner of typical positive classroom teacher. During the enhanced weeks, the directions encouraged creative production according to the suggested ideas gleaned from a review of the literature. Changes in students' creative production over time also were examined.

The researcher was interested in nutrition because of the rising rates of child and adult obesity. The Partnership for 21st Century Skills identified knowledge of healthy nutrition as necessary for students to become globally competitive in the 21st century. On a personal level, the researcher has struggled with weight-related issues and wanted to help students understand the importance of maintaining a nutritious diet. In the next section, the statement of the problem and the research questions are addressed.

Statement of the Problem and Research Questions

An important inquiry area in the current school climate is how to teach creatively, while still preparing students to pass the standardized testing requirements in reading and mathematics (Longo, 2010). The impact of the creative environment and ongoing creative skill training is also poorly understood. Therefore, the following research questions were investigated in this dissertation study:

1. Do fantasy and factual readings produce different levels of creativity, content knowledge of nutrition, and student enjoyment of work?
2. Does introducing a lesson to invoke a creative student mindset produce higher creativity outputs on the figural transformations and affect student enjoyment of work?
3. How can educators use figural transformation drawings to assess content knowledge while simultaneously encouraging creativity?

4. What growth of various creativity skills do students evidence?

Relevant Terms Defined

This part of the dissertation examines terms significant to the study. It is imperative to have a clear understanding of the definitions to avoid misunderstanding and to aid in comprehension of the problems and research.

1. *Construal Level Theory*: “Different dimensions of psychological distance – spatial, temporal, social, and hypotheticality – correspond to different ways in which objects or events can be removed from the self here and now, and farther removed objects are construed at a higher (more abstract) level.” (Stephan, Liberman, & Trope, 2010, p. 5). The concrete or abstract level of mental processing has an effect on creativity or other behaviors.
2. *Creative Environment*: “Stimulation offered by a child’s physical environment.” (Plucker & Callahan, 2007, p. 307).
3. *Fantasy* (2012): “A creation of the imaginative faculty whether expressed or merely conceived.” Fantasy in children’s books includes fairy tales, cartoon characters, and animals that speak.
4. *Factual* (2012): “Of or pertaining to facts; concerning facts.” Factual children’s books are generally nonfiction texts containing true information.
5. *Repeated Measures Research Design*: “Participants in a single group participate in all experimental treatments with each group becoming its own control.” (Creswell, 2002, p. 338).

6. *Creativity*: “The ability to generate ideas, products, or solutions that are considered novel and useful for a given problem, situation, or context.” (Plucker & Callahan, 2007, p. 140).
7. *Transformation*: “Alter, change, make over, or renovate.” (Piiro, 2011, p. 135). A figural transformation is a new image produced by adding lines and shading to a given simple figure or squiggly line. Figural transformations are often analyzed for use of creative skills.
8. *Divergent Thinking*: “A process individuals use to find a variety of possible solutions or products.” (Saracho, 2012, p. 121).
9. *Convergent Thinking*: “A process individuals use to identify one correct solution using deductive reasoning.” (Saracho, 2012, p. 121).

Now that important terms have been defined, the next chapter provides recent professional literature related to the topic, building a theoretical background for the investigation. Chapter 3 presents the design of the study. Chapter 4 presents the analysis of the data of the study with brief discussion and interpretation, while Chapter 5 gives conclusions and recommendations.

CHAPTER 2

LITERATURE REVIEW

This chapter presents the theoretical background for the study. This review of previous work examines the prior published work for each of the areas addressed by the research questions. The section called “Issues and Repercussions Related to No Child Left Behind Legislation” reviews the past and current political debate related to educational legislation that is heavily influencing the way teachers prepare students under school policies that prioritize instructional approaches and content being taught. This provides a background for the school setting in which the current study took place. The section titled “General Theories of Creativity” explores past and current theories regarding creative production, providing the framework for understanding the evolution of the teaching of creativity.

The theory relevant to the use of creative transformations, the main activity in this study for practicing creative thinking skills, is examined next in the section called “Transformations in Creativity.” This topic is of primary importance, because the students demonstrated their creative growth through the figural transformations they devise. This section also forms a theoretical foundation for two of the questions the current study answered: Does introducing the lesson to invoke a creative student mindset produce higher creativity output on the figural transformations and affect student enjoyment of work and how can educators use figural transformation drawings to assess content knowledge while simultaneously encouraging creativity?

The section entitled “Construal Level Theory” provides the theoretical framework for one of the main questions the current study answered: Do fantasy and factual readings produce different levels of creativity, content knowledge of nutrition, and student enjoyment of work? This relatively new psychological theory has some evidence for its effects on human thinking and behavior. The current study examined this theory in relation to creative production. The next part titled “The Environment’s Effect on Creativity” considers the classroom teaching environment’s role in developing the creativity of young students. The research supports answering one of the study’s questions: Does introducing the lesson to invoke a creative student mindset produce higher creativity output on the figural transformations and affect student enjoyment of work?

An additional section titled “Importance of Nutrition” describes reasons why students should be taught nutrition concepts. This health content is integrated into the study lessons to improve student knowledge of healthy lifestyles. The end of the chapter includes a “Summary” section summarizing the important information.

Issues and Repercussions Related to No Child Left Behind Legislation

In 1965, Congress enacted the Elementary and Secondary Act of 1965, as part of Lyndon B. Johnson’s “War on Poverty.” Johnson believed that every child deserved equal access to education. The Elementary and Secondary Act of 1965 provided a special source of funding (Title 1). The funds were allocated for resources to meet the needs of educationally deprived children. The underlying idea was that children from low-income homes required more educational services than children from middle or high income

homes. Title 1 funding provided 1 billion dollars a year to be distributed among schools that had a high enrollment of low-income children. In 1968, the Act was amended with Title VII. The result was the Bilingual Education Act that offered federal aid to local schools for addressing the needs of children with limited English-speaking ability (Scott, 2011).

Shortly after, Congress commissioned the Coleman Report to gauge the extent of educational inequality. James Coleman, a Johns Hopkins professor, studied 600,000 students at 4,000 schools. His report concluded children's early years at home had a considerable impact on academic performance in school. He also noted an achievement gap between African American and Caucasian students, regardless of teacher preparation, teacher salary, and delivered curriculum. The Center for Educational Policy Research was developed for further research. In 1972, reports surfaced that indicated Title 1 was becoming a pull-out program in which students left the classroom with an unqualified aide for their services. This led to the reauthorization of 1978, in which funding was specifically set aside for a whole school program that would improve quality of instruction. The years in between 1978 and 1994 were discussed in the introduction section of this dissertation. In 1994, the Act was once again reauthorized to include a standards-based system implemented by each state. Title 1 students would be measured by the same standards as everyone else. The idea was that there should be some measure of the effectiveness of the resources being used (Hanna, 2005). The standards-based measure was the first real emphasis on accountability, and it eventually led to the development of the No Child Left Behind Act.

The No Child Left Behind Act was developed to ensure that all children have a fair and equal opportunity to receive a high-quality education. Children were expected to demonstrate proficiency on challenging state academic assessments. The intent of this legislation was to close the achievement gap between historically low-performing and high-achieving students, to require teachers to be highly qualified in the areas in which they teach, and to involve parents in monitoring the quality of the schools their children attend (No Child Left Behind [NCLB], 2002).

Federal legislation indicated that for schools not making adequate yearly growth as measured by standardized assessments, federal funding must be directed toward teacher professional development with students being given the option to transfer to other schools. If the school failed five years in a row, major corrective action was mandated including: replacing staff, changing curriculum, or extending the school day (Webley, 2012).

One repercussion from No Child Left Behind Act was the pressure administrators and educators face to report high test scores has caused some schools to resort to cheating to meet the standards. For example, the Texas Education Agency had to suspend state accreditation for the Houston School District in 2009 after reports surfaced that answers had been changed on the state test (Dessoiff, 2011). Some teachers have resorted to teaching test-taking strategies, rather than focusing on instructing students in academic content. Classroom time often has been reallocated from subjects that are not tested to content areas that are assessed, such as reading and math (Phelps, 2011).

Not only has classroom time been cut from subjects outside of reading and mathematics, resources for social studies, art, and music have been cut (Dee & Jacob, 2010). Fine arts and music programs have been eliminated entirely in some school districts (Conrad, 2006). The school in which the current study took place is part of a school district that has emphasized literacy and mathematics, while downplaying science, social studies, and art education in the primary grades. The current study integrates nutrition and healthy lifestyle science content information through reading instruction centered on read-aloud books and incorporates reading comprehension assessment through creative figural transformations to satisfy district literacy goals while introducing science content and creativity instruction. In the next section, general theories of creativity are examined to provide a foundation for the analysis of the creative aspects of the exercises used in the current study.

General Theories of Creativity

Graham Wallas's Contribution

Graham Wallas was a social psychologist who developed a four-stage profile for the creative process in the early twentieth century. The first stage was *preparation*, which included acquiring background knowledge and conducting specific research related to the problem. The second stage was *incubation*. Incubation involved generation of new ideas without consciously focusing on the problem. Some people develop good ideas while they are in the relaxed state of rest during a vacation or involved in repetitive motions such as jogging, swimming, or bowling. *Illumination* was the third stage in which an effective idea occurred as a flash of insight or the answer to the creative problem arrived

suddenly. *Verification* was the final stage. During this stage, the person returned to logic for evaluating, criticizing, and elaborating a solution (Douglas, 1977).

These general stages of Wallas's creative process are still recognized in problem-solving situations. Because of the repeated measures design of the current study, students were able to anticipate working on a figural transformations activity after reading each weekly book. The nutrition content knowledge gained through listening to the read-aloud provided background knowledge. Incubation occurred as they listened to the story and imagined how new ideas might be applied to the figures or they mentally noted interesting aspects for later use. While working on the figural transformations page, students experienced illumination of ways to apply their new ideas. Verification occurred as students reviewed and shared their solutions, scoring their work for creative aspects. In the next section, another more contemporary creative theorist is introduced. His idea concerning generating a large set of ideas from which to choose was utilized during one condition of the current study.

Michael Michalko's Contribution

Michalko believed that generating a large pool of possibilities and then choosing the most effective ideas from those was key to producing the best creative ideas. People have utilized multiple strategies to become more creative and inventive (Michalko, 2001). Michalko suggested that all people are able to develop these two important creative skills: (1) "seeing what no one else is seeing," and (2) "thinking what no one else is thinking." (Michalko, 2001, p. 8). To define all of the sub-skills necessary to support

the main ideas of these two categories, he examined how creative geniuses have solved problems in the past.

To be able to “see what no one else is seeing,” people need to practice two strategies. The first strategy is “knowing how to see,” which involves taking a new perspective that no one else has taken. When people are presented with a problem, they typically respond by trying to solve the problem with something that has worked in the past, leading the thinker astray into conventional approaches. Creative people try to identify new questions and problems. The second strategy is “making your thoughts visible” through diagrams, maps, and drawings. People should examine the problem in a visual or spatial form, rather than always using mathematical or verbal lines of reasoning.

“Thinking what no one else is thinking,” requires people to do seven key things (Michalko, 2001, p. 10). The first strategy is thinking fluently. Inventors often brainstorm several ideas, generating as many bad ideas as good ones. “Making novel combinations” is the second strategy. Creative geniuses often combine and recombine ideas, thoughts, and images. The third strategy is “connecting the unconnected,” which means forcing relationships among unrelated things. Leonardo da Vinci accomplished this when he forced the relationship between the sound of a bell and a stone hitting water to discover the nature of sound travel: both produce waves that move outward from a point. “Looking at the other side” is the fourth strategy, in which people pair opposites, suspending their original thoughts to make novel combinations. “Looking in other worlds” is the fifth strategy. People who do this develop analogies and metaphors for how objects or events from different domains are really alike. The sixth strategy is

“finding what you are not looking for.” When people get unanticipated results, they often disregard them. Finding something interesting in the current results may generate a new question or finding. “Awakening the collaborative spirit” is the seventh and last strategy. People who work together can generate more ideas to solve more problems.

Several of Michalko’s ideas were applied to the current investigation. Students in this study were asked to take figures and make them into something related to nutrition and the content they had learned through the factual or fantasy readers. They were encouraged to create new or unique ideas that other students had not considered. This approach aligns with what Michalko referred to as “seeing what no one else is seeing.” The concept of drawing the figural transformations was a way of “making your thoughts visible.”

In the next section, Mihaly Csikszentmihalyi’s contribution to the field of creativity is examined to shed light on some affective aspects of creativity. He investigated more of *how people are creative*, rather than Michalko’s approach of describing *how to become* creative.

Mihaly Csikszentmihalyi

Csikszentmihalyi conducted videotaped interviews of ninety-one exceptional individuals between 1990 and 1995 (Csikszentmihalyi, 1997). Respondents were selected on the basis of these characteristics: (1) they had made a difference to a major domain of culture; (2) they were currently active in the domain in which they had made a difference; and (3) they had generally reached 60 years of age. He used this information to illustrate

what creative people are like, how the creative process works, and what situations encourage or discourage original ideas.

Csikszentmihalyi found that the characteristics of creative individuals fit within ten main themes. The first theme was the ability to have a lot of physical energy, but also to be quiet and at rest. The primary principle was this energy is under their control, not being guided by external factors like clocks or schedules. When students were completing the figural transformations in the current study, the classroom environment was peaceful and calm. Although there was a time limit, students did not feel pressured to rush during the ten minutes. The second theme was that creative people are smart, yet naïve. Being too smart can result in people becoming complacent and never questioning or generating new ideas. Creativity requires a mix of divergent thinking to generate numerous ideas, and convergent thinking to choose the good ideas from the less effective ones. In the current study, during the enhanced lesson introductions, the teacher encouraged students to brainstorm several ideas for their figural transformations before beginning work. Students had access to paper to list their ideas before they began drawing. Responsibility and irresponsibility comprised the third theme. Creative people need to have a playfully light attitude, yet still maintain responsible traits like endurance and perseverance. Engaging in imagination and fantasy, yet having a stable sense of reality, is the fourth theme. People who are able to imagine a world that is different from our own can create new perspectives and solutions. Creative people tend to be both extroverted and introverted, which was the fifth theme. Some people prefer to work on their ideas in solitude (introverted), but later exchange ideas with others (extroverted). To

accommodate the needs of introverted and extroverted students, the teacher allowed quiet time for working on figural transformations and allow time for group discussions to exchange ideas.

The sixth theme was the ability to be humble and proud at the same time.

Individuals who are creative are often thinking of their next project, instead of relishing the success of their past work. Social roles of masculinity and femininity often do not apply to creative individuals, making the seventh theme being able to escape the rigid role of gender stereotyping. Because the current study's topic was nutrition, the teacher pointed out parts in the readings in which men and women escaped from normal gender roles. For example, one of the readers has a section in which a man cooks in the kitchen, a nontraditional gender role.

Csikszentmihalyi's eighth theme was being rebellious and independent. It is impossible to be creative without understanding the basic domain of a culture, so highly creative individuals must have a sense of tradition. They understand how the culture operates, but still are willing to escape from its typical constraints. Most creative people are passionate and objective about their work, so that was the ninth theme. Creative individuals rarely feel satisfied with their work; yet, their passion allows them to continue modifying it even during a difficult standstill. The last theme was having the traits of openness and sensitivity. Products that were made often exposed a side of the artist that was private, or the artists spent a considerable amount of time on the project, so they became emotionally invested in their work, feeling devastated when it was not valued. In this study, the teacher encouraged students to be open and sensitive when viewing their

own work and the work of other students. In the next section, Carol Dweck's important work on mindset is examined and applied to the current study. She took the different approach of examining what goes on inside the creative person's mind.

Carol Dweck's Contribution

Dweck suggested that people are able to choose the mindset in which they operate (Dweck, 2006). One mindset viewed people as having fixed traits, causing those who adhere to this mindset to show success by proving they are smart or talented. The other mindset regarded people as having changing qualities. In this mindset, people stretched themselves to learn and acquire new attributes. People with a fixed mindset often want reassurance that they are right, whereas people with a changing mindset want to know how they can improve their learning. One of the exercises she recommended was not labeling children as "artistic" or "smart." She suggested that people find a growth-mindset way to compliment them, such as praising them for their determination. Educators need to recognize their own type of mindset. Fixed mindset teachers often label certain children as "less intelligent" when their performance is not reaching their expectation, reinforcing a non-growth mindset. Students and their teachers need to develop risk-taking, growth-oriented mindsets to best expand their creative abilities.

In this study, students were encouraged to have a non-fixed mindset when discussing their creative abilities. The teacher was cautious not to label the student as "artistic" or "smart." The teacher instead complimented students in the areas of risk-taking, having a positive attitude, developing original ideas, having unusual perspectives, and for their determination to not give up when the task seemed complicated. In the next

section, the contribution of another important researcher in positive psychology, Kay Redfield Jamison, who investigated positive affective traits, was examined.

Kay Redfield Jamison's Contribution

Kay Redfield Jamison is a professor of psychiatry at the John Hopkins University School of Medicine. She has written several books on how the mind works and operates, including *An unquiet mind: A memoir of moods and madness* (1997) and *Exuberance: The passion for life* (2004). Jamison's work suggested that exuberance was necessary for growth of new ideas (Jamison, 2004). Exuberant people demonstrate enthusiasm to find new opportunities and to expel the energy necessary to exploit them. Jamison believed that people who were exuberant perceived the world and acted upon it differently than people who were less lively. Exuberance causes joy, and joy widens one's view of the world, expanding imaginative thought. Enthusiastic teachers can help foster exuberant students. In this study, the teacher encouraged students to be positive when they felt that the task was too demanding or challenging during the weeks of an enhanced environment and to exhibit any enthusiasm they felt. The study was designed two-week-alternation of an environment of neutral with an enhanced environment to answer the research question: "Does introducing the lesson to invoke a creative student mindset produce higher creativity output on the figural transformations and affect student enjoyment of work?" In the following section, transformations in creativity and their importance to creativity are examined, as a transformation activity was chosen as a creative and content knowledge assessment for the current study.

Transformations in Creativity

J.P. Guilford

J.P. Guilford was a psychologist who developed tests for selecting pilots and other military personnel during World War II. He originated the Structure of the Intellect Model, which classified human thinking into mental content, product, and process (Guilford, 1967). “Content” referred to the different kinds of information used, such as visual (from the senses or imaging), auditory (from the senses or imaging), symbolic (words and symbols that convey meaning), semantic (meanings associated with words), and behavioral (information about the mental states and behavior of observed individuals). “Products” were the different categories of output as a result of processing content. Product consisted of units (symbolic, behavioral, or visual), classes (organizing into meaningful groups), relations (sense relationships between pairs of units), systems (relationships among more than two units), implications (given information, one might expect other information to be true), and transformations (ability to understand changes in information). “Process” included cognition (ability to perceive various items), memory (ability to store and retrieve information), divergent production (ability to access memory), convergent (searching memory for one correct answer), and evaluation (making judgments about information; Guilford, 1977).

Figural transformations involve taking an image or object and mentally changing its spatial orientation to recognize or create a new image. This operation includes making new shapes by adding lines, shapes, or shading. In the current study, students made figural transformations after hearing the information presented in a fantasy or factual

book reading. They were instructed on how to make their work more creative each week by doing things like adding emotional expressiveness, adding details, breaking boundaries, etc. Students accessed nutrition content information by hearing the material from the readings (auditory), and expressing their ideas through the figural transformations (visual). The figural transformations allowed students the opportunity to symbolize the way they felt about nutrition (symbolic). They accessed meaning of words (semantic) when they depicted the nutrition content through the transformations.

Observations (behavioral) were collected through the student attitude survey and a daily log completed by the teacher. The product that was used was the figural transformations (transformation). The process was shown through the figural transformations and corresponding rubrics. These drawings showed how much information the students retained (memory), how they perceived nutrition (cognition), which students generated several ideas (divergent thinking), and which students only repeated information given to them, focusing on one idea (convergent thinking). In the next section, the work of E. Paul Torrance who employed figural transformation in his world-renown Torrance Test of Creative Thinking (Torrance, 1972; Torrance, Ball, & Safter, 2008) is examined. He used Guilford's ideas when developing the idea of figural transformations.

E. Paul Torrance

Torrance first expressed his interest in creativity in 1937. He observed that a lot of students were being sent to boarding schools because of their offbeat ideas that local teachers would not tolerate. Several of these students went on to become successful in other fields. He began to see a connection between creative potential and students who

were labeled as “troubled.” He became a high school teacher and worked with many creative students, increasing his knowledge and interest in this group.

Later, Torrance developed the Torrance Tests of Creative Thinking (Torrance, 1972) which has two separate forms: a verbal (written) test and a figural or drawing test. The verbal form of the test includes five different activities: Ask and Guess, Product Improvement, Unusual Uses, Unusual Questions, and Just Suppose. The activities focused mostly on viewing pictures or objects and writing responses. The figural form of the test included three different activities: Picture Construction, Incomplete Figures, and Repeated Figures. In these activities, students were given a time limit of ten minutes for each part. His initial scoring system for the tests was based on four divergent thinking factors: fluency (number of relevant responses), flexibility (number of ideas from different categories), originality (ideas not mentioned by most participants), and elaboration (number of details used to extend a response). Abstractness of titles and resistance to premature closure were later added, along with other creative strengths (Hebert, Millar, & Silvian, 2002). The figural transformation activities used in the current study are similar to the sorts of figural transformations used in the Torrance figural assessment; however, none are identical to those on the test. These figural transformations allowed students the opportunity to integrate nutrition ideas from a reading lesson with creative thinking skills.

The following section introduces a recent psychology theory that may influence a person’s creativity, among other mental operations and behaviors. An aspect of this theory was tested in the current study.

Construal Level Theory

Construal Level Theory of social psychology suggests that distance in some aspect, such as temporal distance, the perceived proximity of an event in time, changes how people respond to future events by altering their mental constructs of those events. This theory describes the extent to which human thinking is abstract or concrete as a result of the perceived distance from the stimulus in time, space, culture, or probability. Construal level theory has been applied to mental processing and decision-making in several studies that are described in the following paragraphs.

The greater the temporal, spatial, cultural, or probabilistic distance, the more likely the events are going to be represented as abstract (high-level construals), instead of more concrete (low-level construals) details about the event. In one study of the theory, participants imagined doing certain activities such as: reading a science fiction book or taking an exam. Participants were then asked to describe these activities as being done the next day or the next year. An example of a high-level construal (abstract) response would be “broadening my horizons,” whereas a low-level (concrete) construal response would be “flipping pages.” The results indicated that participants used more high-level (abstract) descriptions in the distant future condition compared with more low-level (concrete) descriptions in the near future condition (Förster, Friedman, & Liberman, 2004).

Another study (Liberman & Trope, 2006) of construal level theory involved 32 New York University psychology students as subjects. Students were randomly assigned to near or distant future conditions. The study tested the hypothesis that distant future

activities are construed on a higher level compared with near future activities. Each participant answered two questionnaires. The first questionnaire was open-ended and asked participants to imagine engaging in activities either tomorrow or the next year. The second questionnaire presented many activities, each followed by two restatements. Results were examined by two judges, and frequencies of high- and low-level restatements were compiled. As predicted, distant future activities were construed on a higher level compared with near future activities.

An additional study (Liberman & Trope, 2006) investigated the effects of feasibility and desirability of outcomes on near future and distant future decisions of 192 psychology and business students at Tel Aviv University. Participants imagined themselves in three decision situations either in near future or distant future and were asked what they would decide. The three decision-making scenarios were: attending a guest lecture, installing a word processor, and receiving tickets for a show. Responses were rated with a ten point scale, ranging from 1 (highly unlikely) to 10 (highly likely). For the distant future, students preferred options with outcomes that may be unfeasible, but highly desirable. For the near future, students preferred options with outcomes that are less desirable, but highly feasible.

Liberman and Trope's study (2006) predicted students would view desirability considerations as more important and feasibility as less important in distant future conditions. The setup was similar to the second study, only using 116 psychology students from Tel Aviv. The same scenarios of a guest lecture, word processor, and tickets to a show were used. However, this study added needing new furniture for a living

room. Another ten point scale was used, which measured importance. The results indicated desirability conditions are more prominent in thinking about distant activities.

Another investigation (Liberman & Trope, 2006) examined time-dependent effects of desirability and feasibility. Students were asked to choose between four assignments ranging from easy to hard, and interesting to uninteresting. Difficulty in assignment was the feasibility consideration. Interest level was the desirability consideration. The prediction was that the effect of interest, relative to difficulty, would be greater in choosing among distant future assignments. Participants were 48 nursing school students from Tel Aviv, Israel. Results showed that students sacrificed interest for the sake of ease in near future assignments. In the distant future assignments, student sacrificed ease for interest.

Finally, Liberman and Trope's (2006) study examined time planning of activities in the near and distant future. The study included 127 university students from Tel Aviv, Israel. Students were given a questionnaire which asked about the following activities: studying, attending classes, participating in cultural events, sports and exercise, going out with friends for social activities, watching television, reading books unrelated to studying, spending time with family, and accomplishing paid work. They answered using a nine-point scale the extent to which they would like to spend more time doing these activities. Results indicated that the time it takes to engage in an activity is more prominent in near future plans. Desirability concerns are more prominent in distant future plans (Liberman & Trope, 2006).

Construal Level Theory has also been applied to four studies in creative production, hypothesizing that participants thinking at an abstract level would tend to generate categories of ideas and therefore greater numbers of ideas that were potentially more original. Several studies (Stephan et al., 2010; Subbotsky, Hystead, & Jones, 2010) have produced positive results supporting this idea. One study (Subbotsky et al., 2010) is particularly important to the current study because it shows the potential for engagement in fantasy of affecting one's level of creativity. The age level was similar to the age level of the current study. Subbotsky et al., (2010) examined the probability of events actually happening (hypotheticality) and distance with students who were between 4-8 years of age. The results indicated that when students were exposed to magical film content (distal), they performed more creatively than when they were exposed to real film content (proximal).

The ideas of the latter study are closely connected to the experiment in the current investigation. The current study was conducted with students who are in part of the same age range, between 7-8 years old. The content was similar in that fantasy versus factual content was used to prime the students before they engaged in the creative work. However, instead of film content, reading content was used. In the next section, the environment's effect on creativity is examined as it pertains to another research question presented.

The Environment's Effect on Creativity

Cropley, Cropley, Kaufman and Runco (2010) supported the notion that through changing the teaching environment by (1) asking open-ended questions, (2) tolerating

ambiguity, (3) modeling creative thinking and behavior, (4) encouraging experimentation and persistence, and (5) praising children who provide unexpected answers, educators can encourage creativity. The authors used teacher observations and supporting literature to develop these key ideas.

The current investigator conducted an experiment to test one aspect of the creative environment: the teacher's verbal introduction to the lesson. In the current study, the teacher alternated the directions to the lesson every two weeks. During the standard weeks, the teacher gave basic directions in a positive manner. During the enhanced weeks, the teacher delivered the directions with specific references to creativity skills and mindsets according to ideas suggested by researchers in the professional literature.

Piirto suggested that educators build a climate that allows for opposing viewpoints, ask open-ended questions with no right answers and do not feel threatened when a student has a viewpoint different from their own (Piirto, 2011). The environment plays an important role in how creativity is fostered and developed.

Other studies have examined the type of creative learning experiences necessary for creativity. One study suggested that educators can increase creativity by (1) asking questions, (2) making connections, (3) imagining what might be, (4) exploring options, and (5) reflecting critically (Craft, Cremin, Burnard, & Chappell, 2007).

Some researchers believe that creativity can become a habit. Claxton, Edwards, and Scale-Constantinou (2006) developed the acronym CREATE. Curiosity is the first habit. Educators can foster curiosity by encouraging students to ask questions. Resilience is the second habit. This includes resilience when students become discouraged or find

creative thinking especially challenging. It also includes resilience to the reaction of other people may viewing their ideas as weird or strange. Experimenting is the third habit. Educators should encourage students to play with materials and ideas. Attentiveness is the fourth habit. Teachers can assist students in fostering attentiveness by helping them hold their attention for longer projects. Thoughtfulness is the fifth habit. Thoughtfulness occurs when people are taught to trust their gut instincts. Environment setting is the last habit. Creative people surround themselves in environments that are conducive to thinking creatively. Creative people often surround themselves with other people who are creative or who are supportive of creativity.

In the next section, the importance of nutrition education, the academic focus of the books used in the current experiment, is examined to explain why this topic was chosen.

Importance of Nutrition

Childhood obesity is becoming a global pandemic, which is why prompt action needs to be initiated. The Eurodiab study was established in 1988 as a European Community Concerted Action initiative. The research was carried out through a network of 44 centers and involved identifying newly diagnosed children with Type 1 diabetes in geographically well-defined regions in Europe. The affected population included over 30 million children. The study projected that by the year 2020 the annual incidence of type 1 diabetes would double overall among European children under the age of five (Hurley, 2010). According to the Center for Disease Control, in 2009-2010, among U.S. children

aged 2-19 years old, 12 million were considered obese when taking into account height and weight (Ogden, Carroll, Kit, & Flegal, 2012).

Childhood obesity can lead to hypertension, dyslipidaemia, chronic inflammation, increased blood clotting tendency, endothelial dysfunction and other diseases. Obesity can also lead to psychosocial conditions that include poor self-esteem, depression and eating disorders. It can lead to pulmonary conditions like sleep apnea, asthma and exercise intolerance. In the endocrine system, obesity can lead to type 2 diabetes, precocious puberty, polycystic ovary system (females) and hypogonadism (boys). These are just a few of a list of many health conditions that can occur from childhood obesity (Ebbeling, 2002). Childhood obesity is a dangerous and growing trend. Educators will need to incorporate health topics into content curriculum.

Proper nutrition is also important for student performance in school. The Partnership for 21st Century Skills is an organization that advocates for preparing students for a global economy. The organization emphasizes critical thinking, problem solving, communication, collaboration, creativity, and innovation. The essential skills that students need to compete in the workplace are found in the Framework for Learning. The six essential elements emphasized in the Framework for Learning are: core subjects, 21st century content, learning and thinking skills, information and communications technology, life skills, and 21st century assessments. Part of the 21st century content they recommend is health and wellness awareness. This includes understanding preventive physical and mental health actions, proper diet and nutrition, exercise, and interpreting basic health information (Partnership for 21st Century Thinking Skills, 2011).

In addition, children often form opinions at a young age about their bodies. In a study of 97 girls, researchers interviewed the children at age five and then age eight regarding the areas of body satisfaction (desire for thinness and appearance satisfaction), self-esteem, peer influences, and media influences. In addition, body mass calculations were collected. Results indicated that girls desired to be thin at both times the interviews were completed, which suggests that girls desired to be thin at younger ages than previously suggested (Dohnt & Tiggemann, 2006). The benefits of promoting healthy food choices at school can lead to healthy eating outside of school (Bell & Swinburn, 2004).

Summary

In summary, creativity is a skill necessary for the 21st century. With increasing cuts in music and art school programs, students need opportunities to learn, practice, and develop creative skills. Educators need ways to integrate creativity into other content areas and ways to assess creativity and content knowledge. This study design allowed for creativity to be taught in conjunction with the standard reading curriculum. It also gave educators a chance to assess content knowledge creatively.

This study examined the impact of the creative environment. During the standard weeks, a typical positive set of directions was given. During the enhanced weeks, the teacher provided the directions with more specific comments to encourage creativity.

This study investigated if the Construal Level Theory had any connections with the creativity demonstrated by the students. Students had the opportunity to show creativity after reading both factual (probabilistically proximal) and fantasy

(probabilistically distal) readings. This study determined if similar results to those already published were found to support the Construal Level Theory.

Nutrition content was of primary importance in education considering the projections of obesity and other health related illnesses due to obesity and poor nutrition. It was also an area that has been defined as an essential skill necessary for students to learn to become globally competitive in the 21st century workplace. This study allowed students to learn nutrition content in a creative way, integrated with the reading curriculum.

CHAPTER 3

METHOD

In this repeated measures research study, student learning of nutrition concepts and creative performance was evaluated every week through completion of a figural transformation exercises. As defined previously, in a repeated measures design, all participants from a single group participate in all experimental treatments with each group becoming its own control (Creswell, 2002). The figural transformation drawings were evaluated for the nutrition content they contained and for creative traits. Each week the teacher introduced a different creativity skill to build student expertise in this area. Several variables were manipulated during the study to determine their effects on students' learning of nutrition concepts and of creative thinking skills.

The following research questions were addressed by this study:

1. Do fantasy and factual readings produce different levels of creativity, content knowledge of nutrition, and student enjoyment of work?
2. Does introducing the lesson to invoke a creative student mindset produce higher creativity outputs on the figural transformations and affect student enjoyment of work?
3. How can educators use figural transformation drawings to assess content knowledge while simultaneously encouraging creativity?
4. What growth of various creativity skills do students evidence?

The specific types of data collected and how this information was analyzed are discussed in this chapter.

Participants

Nineteen second grade students (11 female, 8 male; 1 African-American, 0 Hispanic, 1 Asian-American, 0 Native American, and 17 Euro-American) with an age range of 7-9 years participated in the study. These elementary students attended a low socio-economic (57% receiving free or reduced-cost lunches) elementary school in Iowa, USA.

This research project was approved by the University of Northern Iowa's Human Subjects Review Committee (ID # 12-003) and the participating school district's administration official. All students and their parents or guardians gave written permission for their data to be included in this study.

Research Design

This study was a repeated measures research design in which one intact classroom of second grade students alternated between conditions every week or every two weeks for a semester to determine the effect of environment (through directions only) and reading of factual or fantasy books on creative production and retention of nutrition knowledge. The population was chosen out of convenience to the researcher, but represented a diverse, interesting, intact population of students from a low socio-economic setting. Table 1 shows the script that was used to introduce the lessons under each condition of lesson introduction with supporting research. Table 2 shows only the exact scripts. Table 3 shows the design of the research study that was used. Table 4 shows the rationale for how major elements of the study design support investigation of

the research questions. Table 5 shows the rationale for major components of the study design. Table 6 shows the research questions aligned with the data collected.

One main hypothesis that was tested was whether student creativity on a figural transformation activity following the read-aloud would be greater when the book contained fantasy characters as opposed to nonfiction/ informational texts. This effect was predicted by Construal Level Theory. This premise was tested during the 16-week study by alternating the type of read-aloud book (fantasy versus nonfiction) every week. Table 7 shows the fantasy books and themes, while Table 8 presents the nonfiction books and nutrition/health facts addressed. The nutrition fact themes were not limited to only the five listed, instead, the table shows examples of what responses might appear on the figural transformations.

Rationale for Literature Selection

Part of the Construal Level Theory addresses the differences in mental processing that occur when one is exposed to reality or make-belief. According to this theory, fantasy books cause the student to engage in more abstract thinking, therefore allowing the student to think in categories and to generate many ideas for each category, evidencing more creativity; whereas nonfiction engages the reader in concrete ideas that are not as creative. The fiction books were selected on the basis that they were entirely fictional and contained fantasy characters or situations with no realistic parallels. The nonfiction books were not leveled readers; instead they were books that were chosen to be developmentally appropriate as read-aloud books for second grade students. Two local libraries were visited, and assistance was provided from three librarians in locating age-

appropriate books addressing nutritional concepts. A collection of 40 books were compiled and brought to an outside reviewer. The researcher and the outside reviewer examined the literature for alignment with the chosen endpoints (fantasy versus realistic) of Construal Level Theory. Because the literature was delivered via read-aloud by the teacher, the levels of the books could form a wider range than literature being read individually by students. The researcher and the outside reviewer read the books to choose those that were developmentally appropriate and conformed to either the fantasy category or the nonfiction category. Books that were judged to be in the middle area of this range were not used in the study. The researcher has over four years experience of teaching second grade literacy lessons.

The other hypothesis that was examined was whether a portion of the classroom environment – the manner in which the teacher introduces the lesson – would have an effect on student creativity. The teacher altered the directions during the standard and enhanced weeks to manipulate this independent variable of type of lesson introduction. Both sets of directions were delivered in a positive manner, with the difference being that the teacher introduction of the enhanced weeks contained more specific comments to promote creativity. This changed every two weeks, as was indicated in Table 1. The exact script that was used is presented in Table 2.

Table 1.

Teacher Script for Enhanced and Standard Lesson Introduction Conditions

Idea and Source from the Professional Literature	Enhanced introduction	Standard introduction
Gaining/ holding attention (Claxton et al., 2007)	Put on your creative thinking caps! We are going to complete another fun figural transformation activity in which you can show your creative ideas! I am so excited!	Good morning girls and boys! Today we will think back to what we read and we will fill out our figural transformations.
Asking open-ended questions and curiosity (Claxton et al., 2006; Craft et al., 2007; Cropley et al., 2010; Piirto, 2011)	How can you ___ [add more details? break boundaries? etc.]? How could you change this shape? What creative skills will you use?	Remember to try to draw something in every box and also make a title for your drawing in your best handwriting.
Modeling creative thinking and behavior (Cropley et al., 2010)	Saying how you would try to think of something that is different than what others might do- taking a little time to consider several ideas before choosing one. [Look at the lightning shape. I wonder how I could make it look like something else from the story and not the first thing it looks like.]	Remember to try to draw something in every box and also make a title for your drawing in your best handwriting.
Encouraging experimentation, exploring/ reflecting on options, imagination, resilience, and persistence (Claxton et al., 2006; Craft et al., 2007; Cropley et al., 2010; Piirto, 2011)	It's okay to play with ideas or change your mind. Imagine a few different ideas for what you might change the shape to and choose the most unusual. Don't give up! Remember some of the best thinkers problem solve. Don't be afraid to do something really different.	Remember to try to draw something in every box and also make a title for your drawing in your best handwriting.
Praising children who provide unexpected answers (Cropley, et al., 2010)	Recognizing specific creative ideas or work of students from last time.	Remember to try to draw something in every box and also make a title for your drawing in your best handwriting.
Making connections (Craft et al., 2007)	What from the story could you make this shape into?	Remember to try to draw something in every box and also make a title for your drawing in your best handwriting.
Tolerating ambiguity and gut instincts (Claxton et al., 2007; Cropley, et al., 2010)	If you aren't sure exactly what you are going to make, go ahead and make a start and be confident that you will get ideas.	Remember to try to draw something in every box and also make a title for your drawing in your best handwriting.

Table 2.

Lesson Introduction Scripts

Standard Introduction	Enhanced Introduction
<p>Good morning girls and boys! Today we will think back to what we read and we will fill out our figural transformations. Remember to try to draw something in every box and also make a title for your drawing in your best handwriting.</p>	<p>Put on your creative thinking caps! We are going to complete another fun figural transformation activity in which you can show your creative ideas! I am so excited!</p> <p>How can you ___ [add more details? break boundaries? etc.]? How could you change this shape? What creative skills will you use? Look at the lightning shape. I wonder how I could make it look like something else from the story and not the first thing it looks like. It's okay to play with ideas or change your mind. Imagine a few different ideas for what you might change the shape to and choose the most unusual. Don't give up! Remember some of the best thinkers problem solve. Don't be afraid to do something really different. Recognizing specific creative ideas or work of students from last time) What from the story could you make this shape into? If you aren't sure exactly what you are going to make, go ahead and make a start and be confident that you will get ideas.</p>

Table 3.

Design of the Research Study

Week #	Date	Lesson Introduction	Construal Level Theory	Creative Skill Taught
1	Aug 24	Standard	Factual Reading	Elaboration: More colors and more details
2	Aug 31		Fantasy Reading	Effective title – descriptive words, higher vocabulary, abstract
3	Sept 7	Enhanced	Factual Reading	Originality – Making something no one else does
4	Sept 14		Fantasy Reading	Storytelling Articulateness – show what happens before or after
5	Sept 21	Standard	Factual Reading	Emotional Expressiveness- put in faces or callouts
6	Sept 28		Fantasy Reading	Breaking boundaries- turning upside down, drawing outside box
7	Oct 5	Enhanced	Factual Reading	Movement with motion lines or action words
8	Oct 12		Fantasy Reading	Humor – pun, impossible situation, silly
9	Oct 19	Standard	Factual Reading	Sound – sound lines or noise words or talking bubbles
10	Oct 26		Fantasy Reading	Three-dimensionality – shading, see front and side
11	Nov 2	Enhanced	Factual Reading	Resistance to premature closure – closing the shape
12	Nov 9		Fantasy Reading	Internal visualization- showing what is inside something
13	Nov 16	Standard	Factual Reading	Word play in the title – rhyming or alliteration
14	Nov 30		Fantasy Reading	Sensory impact – sharpness or fuzziness
15	Dec 7	Enhanced	Factual Reading	Unusual visualization – showing the underside or changing the scale
16	Dec 14		Fantasy Reading	Wisdom or insight – having message or moral to the story of the picture
Make-up	Dec 21	Make-up (as needed)	Make-up (as needed)	Make-up (as needed)

Table 4.

Rationale for Major Components Aligned With Research Questions

Component	Research Question Addressed
Repeated measures	4. What growth of various creativity skills do students evidence? 1. Do fantasy and factual readings produce different levels of creativity, content knowledge of nutrition, and student enjoyment of work?
Using a new book for each lesson	1. Do fantasy and factual readings produce different levels of creativity, content knowledge of nutrition, and student enjoyment of work?
Weekly data from the entire class (those who have given permission to participate)	4. What growth of various creativity skills do students evidence?
Alternating fantasy and factual presentation of nutrition content	1. Do fantasy and factual readings produce different levels of creativity, content knowledge of nutrition, and student enjoyment of work?
Student oral explanations of their work (as needed)	3. How can educators use figural transformation drawings to assess content knowledge while simultaneously encouraging creativity? 1. Do fantasy and factual readings produce different levels of creativity, content knowledge of nutrition, and student enjoyment of work?
Weekly researcher's log of students' comments about work	2. Does introducing the lesson to invoke a creative student mindset produce higher creativity output on the figural transformations and affect student enjoyment of work?
Student self-rating of creativity	1. Do fantasy and factual readings produce different levels of creativity, content knowledge of nutrition, and student enjoyment of work? 2. Does introducing the lesson to invoke a creative student mindset produce higher creativity output on the figural transformations and affect student enjoyment of work?
Student rating of enjoyment of book	1. Do fantasy and factual readings produce different levels of creativity, content knowledge of nutrition, and student enjoyment of work?
Student rating of enjoyment of creative process	2. Does introducing the lesson to invoke a creative student mindset produce higher creativity output on the figural transformations and affect student enjoyment of work?
Using a rubric to score creative components of figural transformations	All research questions
Using a rubric to score nutrition content knowledge shown in the figural transformations	3. How can educators use figural transformation drawings to assess content knowledge while simultaneously encouraging creativity? 1. Do fantasy and factual readings produce different levels of creativity, content knowledge of nutrition, and student enjoyment of work?

Table 5.

Rationale for Major Components of the Study Design

Component	Rationale
Repeated measures	Tracing of growth in creativity skills; Differentiate student performance on fantasy and factual topics.
Using a new book for each lesson and identifying five facts to be emphasized from the book	Identifying the knowledge that students should retain from listening to the read-aloud of the book. Evidence of this knowledge will be sought in the student figural transformations.
Weekly data from the entire class (those who have given permission to participate)	All students receive the same stimulus and information. The entire class always participates to keep the number of participants, and therefore data points, reasonably large.
Alternating fantasy and factual presentation of nutrition content	Determine if fantasy or factual presentation mode affects students' creativity levels to determine if Construal Level Theory is supported.
Student oral explanations of their work (as needed)	Increase accuracy of scoring of creative and academic content in student work.
Weekly researcher's log of students' comments about work	Capturing student ideas about the classroom environment related to creativity and nutrition ideas related to fact or fantasy variables.
Student self-rating of creativity	Determine if students' confidence levels in creativity increase, decrease, or remain unchanged depending on the book type or the environment.
Student rating of enjoyment of book	Determine if students' levels of enjoyment increase, decrease, or remain unchanged depending on the book type.
Student rating of enjoyment of creative process	Determine if students' levels of enjoyment increase, decrease, or remain unchanged depending on the book type or the environment.
Using a rubric to score creative components of figural transformations	Determine what creative traits students exhibited in their figural transformations.
Using a rubric to score nutrition content knowledge shown in the figural transformations	Determine amount of nutrition information demonstrated by students in their drawings.
Student attitude surveys	Determine whether enjoyment and self-perception of creativity are related to the variables in the study.
All students listen to the same read-aloud/same time	Controlled variable
Same instructor and time for all conditions	Controlled variable

Table 6.

Data Collection Aligned with Research Questions

Research Question	Data Collection
1. Do fantasy and factual readings produce different levels of creativity, content knowledge of nutrition, and student enjoyment of work?	Creativity scores from the rubric Student enjoyment of book from attitude survey Student enjoyment of figural transformations from attitude survey Student perception of creativity from attitude survey Figural transformations Nutrition scores from the rubric Weekly researcher log
2. Does introducing the lesson to invoke a creative student mindset produce higher creativity output on the figural transformations and affect student enjoyment of work?	Creativity scores Students enjoyment of figural transformations from attitude survey Student enjoyment of book from attitude survey Student enjoyment of figural transformations from attitude survey Student perception of creativity from attitude survey
3. How can educators use figural transformation drawings to assess content knowledge while simultaneously encouraging creativity?	Nutrition scores from the rubric Figural transformations Weekly researcher log
4. What growth of various creativity skills do students evidence?	Creativity scores from the rubric Students perception of creativity from attitude survey Weekly researcher log

Table 7.

Fantasy Books Used in the Study and Major Themes

Book Title	Nutrition Themes
The King's Taster (Oppel, Johnson & Fancher, 2009)	The role of a food taster Eating good food that your parents want you to eat. Don't fill up on junk food. Ethnic food can be delicious. Try a little bit of a new food and you may learn to like it.
Princess Picky (Priceman, 2002)	Negative consequences of not eating vegetables. The value of eating nutritiously: tall, eyesight, strong, shiny hair, energy. Nutritious vegetables: carrot, pea, spinach, broccoli, beets, peppers, turnip. Be open to changing eating habits. People who care want you to eat well.
Harry Hungry (Salerno, 2009)	Recognizing when you are hungry – growling stomach. Recognizing when you have eaten enough – full. Overeating makes you tired. Overeating can make you sick. The limits on what a person can really consume- not a school.
Rabbit Food (Gretz, 1999)	Influence of others on your eating habits and preferences. Making food into something creative is enjoyable. Everyone has different tastes. You don't know if you will like something until you try it. Healthy food gives you the energy to be active and have fun.
Burger Boy (Durant, 2005)	"You are what you eat" because the nutrition in food builds your body. Seeing food can make you feel hungry. Fruits and vegetables can help you stay healthy. Meats come from animals. Animals sometimes eat the same foods as humans.
Cloudy With a Chance of Meatballs (Barrett, 1978)	Food does not fall from the sky. Consistency of food items: eggs, pancakes, frankfurters, and milk. Some foods are solid. Other foods are liquid. Food can make us sick. Food gets rotten and old.
Jack and the Beanstalk (Kellogg, 1991)	Food can grow in the ground. Bean plants sprout and grow. Food can come from animals. People do not eat people. Some people do not have food to eat.
There Was An Old Lady Who Swallowed a Fly (Taback, 1997)	In some cultures, it seems silly to eat a fly or a spider. Overeating has consequences. People can gain weight from eating too much. We have limits on what we can fit in our mouths and swallow. If we eat harmful things, we can die.

Table 8.

Nonfiction Books Used in the Study and Important Concepts Presented

Book Title	Nutrition Concept
Movers & Shapers (Macnair, 2004)	Skeleton is made up of bones of all shapes and sizes. Joints prevent wear and tear. The skull protects the brain, eyes, ears, and tongue. Facial muscles help you communicate without using words. Vertebra forms the spine or backbone.
The Nervous System (Stille, 1997)	The brain can think and store all of our memories. The brain is located in the head and is protected by thick skull bones. Spinal cord and brain make up the central nervous system. Motor nerves in the spinal cord send messages from the brain. Injuries to the neck can cause paralysis.
Vitamins and Minerals (Kalbacken, 1998)	Nutrients are parts of food you need to stay strong and healthy. Vitamins are found in carrots, sweet potatoes, brown breads, beans, strawberries, and green vegetables. Minerals help people stay healthy. People get calcium from drinking milk. Nutrition labels show vitamins and minerals.
Food and Nutrition (Sohn & Bair, 2011)	The heart pumps blood which moves through the blood vessels. The circulatory system includes the heart, blood vessels, and blood. Carbohydrates are found in bread, pasta, and potatoes. Water is necessary for survival. The digestive system turns food into fuel.
The Food Pyramid (Kalbacken, 1998)	The grains group is made up of bread, cereal, rice, pasta, and other grains. The fruits group is made up of apples, oranges, and other fruits. The vegetables group is made up of carrots, broccoli, lettuce, and other vegetables. The fats, oils, and sweets group should be consumed in little quantities. It is important to have a balance of the groups found in meals.
The Sense of Taste (Weiss, 2009)	Our sense of taste allows us to enjoy or dislike foods. Our mouth is responsible for eating, drinking, and swallowing. Foods can have a pleasant and unpleasant smell. Foods can be bitter, sweet, sour, and salty. The tiny bumps on the tongue sense taste.
Muscles (Simon, 1998)	Muscles contract and relax. The biceps and triceps bend or straighten the arm and turn it around. The largest and strongest skeletal muscles in the body are the legs. Muscles need food and oxygen in order to work properly. Stretching and warming up muscles before activities can prevent injuries.
The Body in Action: Moving (Powell, 2004)	The spine keeps people upright. The leg bones help people stand, sit, balance, and walk. Wrists and ankles are sliding joints. The elbow is a hinge joint. The hip is a ball-and-socket joint.

Instrumentation

Figural Transformations

Each week students completed a page of figural transformations to demonstrate their knowledge of healthy lifestyle and nutrition that they had obtained from the read-aloud. The teacher reviewed and discussed nutrition content with the students prior to completing the figural transformations. The figural transformations page is shown in Figure 1. Students added lines or shading to make the figure into something that was related to the weekly read-aloud. The figural transformations were assessed for creativity and for relevant nutrition content. The rubric that was used is shown in Table 9. The rubric was formed by the researcher using creative skills emphasized by Torrance, as indicated in the Literature Review. The only skill that was not associated with Torrance that was added to the rubric by a personal decision by the researcher was Wisdom, because it gave students the opportunity to indicate some of the nutrition content knowledge they had retained.

Student Attitude Survey

After completion of the figural transformations sheet each week, students completed a brief attitude survey to determine their liking for the book, enjoyment of creating figural transformations, and their perception of their own creativity. These attitude surveys were examined to see the effects of the variables (fantasy versus nonfiction books and classroom climate) on student attitudes. The attitude survey is shown in Table 10.

Name _____ Date _____

Make something out of each figure by adding lines or details. Try to draw something no one else will think of. Make each drawing tell a story. Then add a title to explain what you have drawn.

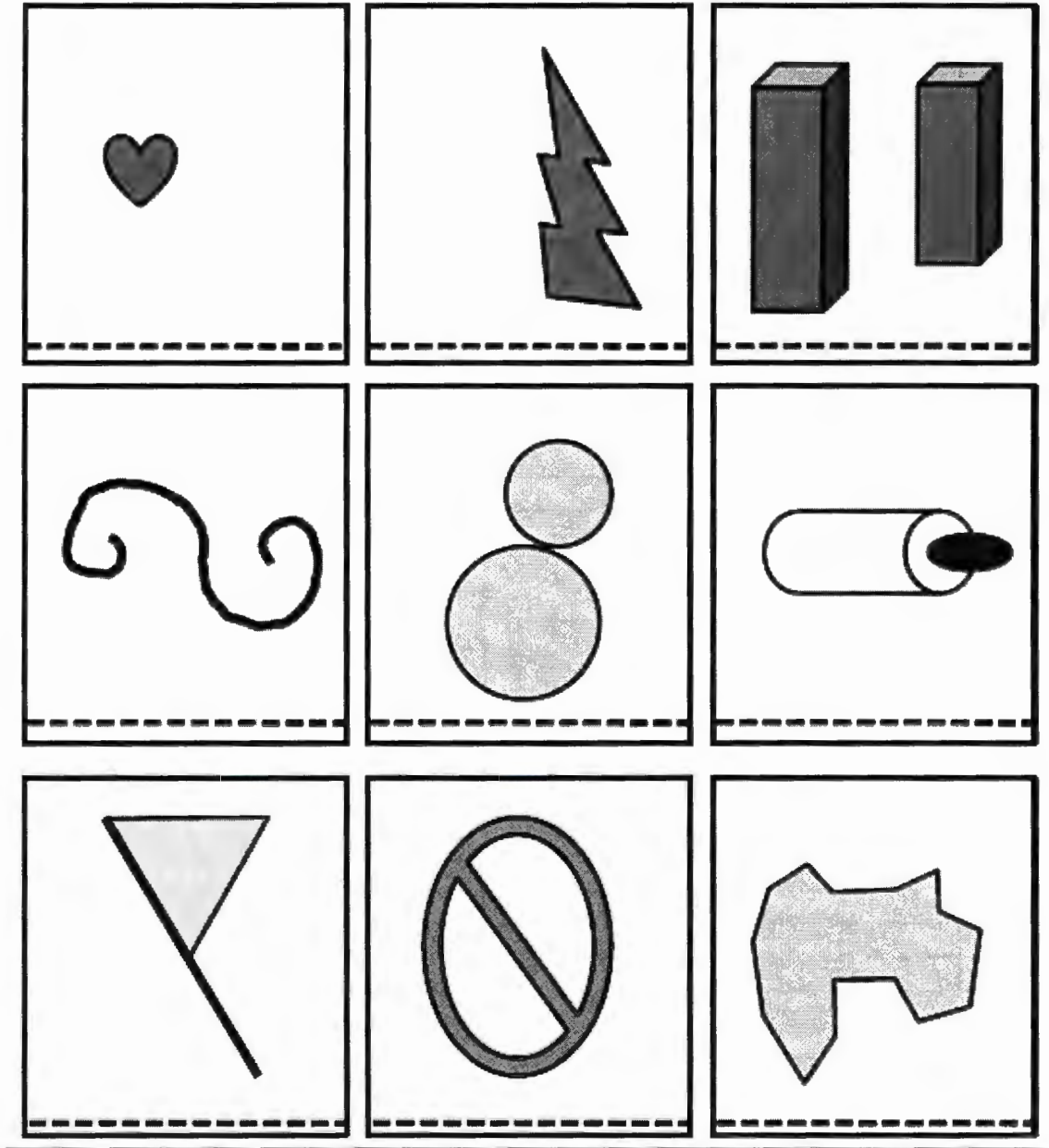


Figure 1. The Figural Transformation Assessment

Table 9.

Rubric for Scoring Figural Transformations

Type of figure	Elaboration: Two or more colors or extra details	Effective Title: Descriptive words, high vocabulary, abstract or word play	Originality: Making something no one else does	Storytelling: Show what happens before or after	Emotional Expressiveness: Puts in faces or callouts	Breaking Boundaries: Turning upside down, drawing outside box	Movement: Motion lines or action words	Humor: Pun, impossible situation, silly
Heart								
Lightning								
Blocks								
Curls								
Circles								
Cylinder								
Y Shape								
Buckle								
Irregular								
	Sound: Sound lines or noise words or talking bubbles	Three-dimensionality: Shading, see front and side	Resistance to Premature Closure: Closing figure	Internal Visualization: Showing what is inside something	Word Play in Title: Rhyming or alliteration	Sensory Impact: Sharpness or fuzziness	Unusual Visualization: Showing the underside or changing the scale	Wisdom or Insight: Having a message or moral to the story of the picture
Heart								
Lightning								
Blocks								
Curls								
Circles								
Cylinder								
Y Shape								
Buckle								
Irregular								
Number of relevant nutrition facts/themes represented (0-9)								
Fluency: Number of figures completed in a meaningful way.								

Table 10.

Student Attitude Survey

Instructions: On a scale of 1 to 10, circle the number that indicates how much you enjoyed the book we read today.

Didn't enjoy it at all	1	2	3	4	5	6	7	8	9	10	Enjoyed it very much
------------------------------	---	---	---	---	---	---	---	---	---	----	-------------------------

Please tell why.

Instructions: On a scale of 1 to 10, circle the number that indicates your enjoyment of making the figural transformations.

Didn't enjoy it at all	1	2	3	4	5	6	7	8	9	10	Enjoyed it very much
------------------------------	---	---	---	---	---	---	---	---	---	----	-------------------------

Please tell why.

Instructions: On a scale of 1 to 10, circle the number that indicates your level of creativity in the product you just made.

Not creative at all	1	2	3	4	5	6	7	8	9	10	Very creative
---------------------------	---	---	---	---	---	---	---	---	---	----	------------------

Tell how you were creative or not creative.

Data Analysis

Figural Transformations

Figural transformations were scored with a rubric. The scores were entered on a spreadsheet with student codes so that the repeated measures could be compared longitudinally for each student and across students. The researcher conducted the scoring, and an independent coder completed scoring of over 10 % of the results (student responses to lessons 3 and 14) to address reliability. Mean scores and standard deviations were calculated for each student during each condition, and paired *t*-tests were conducted to determine if differences were statistically significant. If significant differences were found, effect sizes were calculated using Cohen's *d* (Diener, 2010). Hittleman and Simon (2002) explain the purpose of a *t*-test:

The *t*-test is used to determine whether the difference between the means of two groups on a dependent variable is significant; that is, whether the examined results could have happened by chance or whether the researchers can reliably attribute the difference to the influence of the independent variable (p. 36).

Student Attitude Survey

The three attitude scores (enjoyment of book, figural transformation work, and perceived creativity) were entered on a spreadsheet with student codes so that the repeated measures could compare longitudinally for each student and between students for each condition. Mean scores and standard deviations were calculated, and *t*-tests were conducted to determine if differences were statistically significant. If significant differences were found, effect sizes were calculated using Cohen's *d* (Diener, 2010).

CHAPTER 4

RESULTS AND DISCUSSION

This chapter presents analyses of the results of the study. The first analysis compared the fiction to the nonfiction condition. This analysis addressed the first research question: Do fantasy and factual readings produce different levels of creativity, content knowledge of nutrition, and student enjoyment of work? The second analysis compared the standard to the enhanced condition. The results addressed the second research question: Does introducing the lesson to invoke a creative student mindset produce higher creativity outputs on the figural transformations and affect student enjoyment of work? Both the first and second analyses helped to answer the third research question: How can educators use figural transformation drawings to assess content knowledge while simultaneously encouraging creativity? To investigate the fourth research question, average weekly scores for each trait were compiled and graphed to reveal trends in the data to answer: What growth of various creativity skills do students evidence?

Findings from Comparison of Fiction and Nonfiction Conditions

The Fiction Condition Enhances Student Creativity in Many Areas

The total score resulting from student scores in each creative skill area was calculated for each student for each week, according to the rubric of creative skills. A mean was calculated for these total creativity scores for each student for the eight weeks in which a fictional book was read and similarly, a mean was calculated for each student during the eight weeks of nonfiction reading. These two pools of student scores were

compared through paired *t*-tests (each student's mean score under one condition was compared to that same student's mean score under the other condition). The means of each set of data and the results of the *t*-test are shown on the second line of data in Table 11.

For each creative skill, each student's mean score for the eight weeks under the fiction reading condition was calculated (the mean of eight scores – one for each week) and that same student's mean score for work completed under the nonfiction reading condition was also calculated. This produced a set of mean scores for all students under each condition. A paired *t*-test was performed to compare the two sets of data. If there were a significant difference between the mean student performances under each condition, Cohen's *d* effect size (Diener, 2010) was calculated. The mean of students' mean total creativity scores under each condition and the results of the paired *t*-tests with effect sizes are shown in Table 11. This analysis showed that there was a significant difference in student creative performance overall between these two reading conditions with a large effect size favoring the fictional reading condition.

To determine if certain creative skill areas were more strongly affected by the difference in reading conditions, student scores in each creative skill area were analyzed next. In a manner similar to that used to calculate the overall creativity scores, each student's score in a particular skill area was recorded for the eight weeks of the fictional condition, and then for the eight weeks of the nonfictional condition. A mean was calculated for each eight-week condition for each student. The two data sets were compared in a paired manner with each student's mean score under one condition being

paired with the same student's score under the other condition. A paired *t*-test was conducted and Cohen's *d* effect size was calculated and interpreted. The results of all of these calculations are shown in Table 11 are summarized in the next paragraphs.

Students performed significantly better in the following creative areas when working after reading a fictional rather than nonfictional book: Fluency, Elaboration, Originality, Storytelling Articulateness, Humor, Breaking Boundaries, Effective Title, Emotion, and Unusual Visualization. A very large effect size (Cohen's $d = 2.07$) occurred in Humor portrayed in the drawings from the fiction condition compared to the nonfiction condition. Large effect sizes were recorded for the creative strengths of Storytelling Articulateness, Breaking Boundaries, Emotion, and Unusual Visualization. Student performance in the areas of Fluency, Elaboration and Effective Title showed a medium effect size, while the creative trait of Originality produced a small effect size in performance between reading conditions.

No statistically significant differences were found for student performance comparing drawings completed after fictional and nonfictional readings in the following areas: Wisdom, Sound, Movement, Resistance to Premature Closure, and Internal Visualization. The incidence of students evidencing the following creative traits was very low; therefore no conclusions can be drawn about these strengths under the two conditions: Sensory Impact, Three-Dimensionality, and Word Play.

Table 11.

Comparison of the Mean of each Student's Score for Eight Trials Completed in the Fiction Book Condition to the Eight Trials of the Nonfiction Book Condition

Content Knowledge or Skill	Mean Score*		Fiction versus Nonfiction		
	Fiction	Nonfiction	Significant Difference?	<i>t</i> -test <i>p</i> -value	Cohen's <i>d</i> Effect Size
Nutrition Content	4.8 (1.5)	4.5 (1.3)	No	$p > 0.05$	-
Total Creative Skills	25.9 (7.3)	19.4 (7.7)	Yes, favoring fiction	$p < 0.001$	0.87 Large
Fluency	5.0 (1.4)	4.0 (1.4)	Yes, favoring fiction	$p < 0.001$	0.73 Medium
Elaboration	5.2 (1.2)	4.3 (1.2)	Yes, favoring fiction	$p < 0.001$	0.71 Medium
Originality	4.3 (1.3)	3.8 (1.3)	Yes, favoring fiction	$p = 0.02$	0.32 Small
Storytelling Articulateness	2.7 (1.1)	1.7 (1.2)	Yes, favoring fiction	$p < 0.001$	0.92 Large
Humor	2.4 (1.4)	0.6 (0.7)	Yes, favoring fiction	$p < 0.001$	2.07 Very Large
Breaking Boundaries	1.9 (0.7)	1.3 (0.7)	Yes, favoring fiction	$p < 0.01$	0.89 Large
Effective Title	1.8 (1.3)	1.2 (1.0)	Yes, favoring fiction	$p < 0.001$	0.58 Medium
Wisdom	1.7 (0.9)	1.6 (1.0)	No	$p > 0.05$	-
Emotion	1.5 (0.8)	0.9 (0.6)	Yes, favoring fiction	$p < 0.001$	0.83 Large
Unusual Visualization	1.4 (0.5)	0.9 (0.6)	Yes, favoring fiction	$p < 0.01$	0.90 Large
Sound	0.8 (1.0)	0.7 (0.9)	No	$p > 0.05$	-
Movement	0.7 (0.5)	0.6 (0.5)	No	$p > 0.05$	-
Resistance to Premature Closure	0.7 (0.3)	0.7 (0.3)	No	$p > 0.05$	-
Internal Visualization	0.6 (0.3)	0.7 (0.3)	No	$p > 0.05$	-
Sensory Impact	0.3 (0.3)	0.1 (0.2)			
Three-Dimensionality	0.0 (0.1)	0.0 (0.0)	These creative traits had very low incidence and therefore comparison data are not reported.		
Word Play	0.0 (0.1)	0.1 (0.2)			

*Note: Standard deviations in parentheses

Why did the students show increased incidence of many creative traits after reading fictional rather than factual texts? Fiction encourages students to use their imaginations, thereby supporting creative thought (Rosen, 2012). It was not surprising to see a very large effect size for use of humor in the figural transformations following fictional readings because many of the fictional stories showed exaggerated, funny characters and hilarious situations, thereby modeling creative humorous expression for students. Studies show that humor is necessary for creativity and is sparked through imagination (Rosen, 2012).

Fiction also provides a good background for telling imaginative stories that highlight emotion. Research indicates that when people engage in make-belief thinking they form an emotional connection with the characters and the stories (Brock, 2007). Therefore, students may feel inspired to display Storytelling Articulatness and Emotion, two areas in which large effect sizes were shown between conditions. Breaking Boundaries and Unusual Visualization allowed students to connect and see the figural transformations as a story instead of isolated pictures, so that could explain why those strengths were also recording a large effect size. The nonfictional books generally did not have “stories” but rather explained how nutrition affects the health of body organs or systems or provided information about healthy lifestyles. Therefore, students may have tended to connect the figural transformations into a story more when reading fiction.

Imagination and stretching of the truth in fictional stories makes students feel bolder in breaking unspoken rules and in devising clever titles (Brock, 2007). Elaboration and Effective Title gave students the opportunity to add details and colors to their figural

transformations, along with catchy titles for their stories. Fiction stories, which present imaginative, fanciful tales, promoted creative thinking, so Elaboration and Effective Title were increased showing a medium effect size.

Student performance in the area of Originality showed a small effect size between the two book conditions. With so many traits being enhanced by reading fiction, why was the effect size for originality small rather than larger? Perhaps originality does not depend so much on use of the imagination that is stimulated by reading fictional stories. Students may have occasionally felt inspired by nonfictional readings to show some original interpretations of the figures.

Wisdom, Sound, Movement, Resistance to Premature Closure, and Internal Visualization were areas that did not favor either condition. One possible reason for this is that to fit the wisdom criteria there had to be some type of lesson or moral taught by the student's completion of the figural transformation, which was perhaps suited as well to the nonfiction readings as the fictional readings.

The creative strengths that were low in incidence: Sensory Impact, Three-Dimensionality, and Word Play were more difficult skills for the second graders to develop and display. Sensory Impact was challenging for students, because depicting hard or soft, blunt or sharp, shiny or dull, cold or hot, etc., is difficult to do in pictures. Three-Dimensionality is also a more difficult skill for students to portray in their drawings. Word Play requires the student to complete the picture and then find a rhyme, alliterative phrase, homophone, or double entendre that illustrates what is happening in the picture. These skills were not exhibited very frequently by the second graders because

they needed more time to develop these skills. Students also demonstrated higher fluency (number of figures completed in a meaningful way) during the fiction condition with a medium effect size.

Book Condition and Content Knowledge of Nutrition

The data did not show a statistical difference in student portrayal of nutrition content knowledge between reading conditions. A mean of Nutrition Content scores for each individual was calculated for the fiction condition (eight weekly scores) and then again for the nonfiction condition. A one tailed, paired *t*-test was calculated to compare the conditions, and the results are shown in Table 11. No significant difference was found indicating that students learned similar nutrition content from both fiction and nonfiction readings.

Student-Perceived Affect between Fiction and Nonfiction Conditions

The survey results were analyzed by isolating the eight ratings provided by each individual student for the fiction condition weeks to calculate a mean, then determining the same for the nonfiction weeks. A one tailed, paired *t*-test on each student score for each of the three survey categories (Enjoyment of Book, Enjoyment of Figural Transformations, Perceived Level of Creativity) was calculated. The mean scores and Cohen's *d* effect size (for those areas in which significant differences were found) are reported in Table 12.

Students reported higher levels of enjoyment for the fiction readings compared to the nonfiction readings. The difference in rating scores for enjoyment of fiction was statistically significant with a medium effect size. This attitudinal finding probably

contributed to the fact that students demonstrated more creative strengths in the fiction condition when compared to the nonfiction condition. Students are more creative when they are motivated and enjoy the task they are given (Jaquith, 2011).

There was no statistical difference between the enjoyment of making the figural transformations and perceived levels of creativity. Students seem to have enjoyed the figural transformations regardless of the nonfiction or fiction content. They also might have felt that they were performing well all of the time, because they were enjoying the transformation activities.

Table 12.

Comparison of the Mean of each Student's Rating for Eight Trials Completed in the Fiction Book Condition to the Eight Trials of the Nonfiction Book Condition

Survey Topic	Mean Score*		Fiction versus Nonfiction		
	Fiction	Nonfiction	Significant Difference?	<i>t</i> -test <i>p</i> -value	Cohen's <i>d</i> Effect Size
Enjoyment of Book	9.5 (0.6)	8.6 (2.3)	Yes	$p = 0.5$	0.56 Medium
Enjoyment of Making Figural Transformations	9.0 (1.5)	8.7 (1.6)	No	$p > 0.5$	-
Perceived Level of Creativity	9.1 (1.6)	9.0 (1.3)	No	$p > 0.5$	-

Findings from Comparison of Enhanced and Standard Introduction Conditions

Lesson Introduction Condition on Creativity

For each creative skill, each student's mean score for the eight weeks under the enhanced introduction condition was calculated (the mean of eight scores – one for each week) and compared to that same student's mean score for work completed under the standard introduction condition. A paired *t*-test was performed on the set of mean student scores for each condition and Cohen's *d* effect size (Diener, 2010) was calculated for significant differences. The results are shown in Table 13. Portrayal of Movement in drawings was statistically significant between these introduction conditions with a large effect size favoring the enhanced condition. Other traits showing a statistical significance favoring the enhanced condition with a medium effect size were: Originality, Storytelling, Humor, Wisdom, and Emotion. Elaboration favored the enhanced condition with a small effect size. Students exhibited greater fluency of ideas during the enhanced lesson introduction with a medium effect size.

It is not surprising that these creative strengths were more frequently demonstrated in the enhanced condition, because the enhanced condition was designed to encourage creativity. A teacher's verbal support during the lesson introduction can also remind students to try to use creative strengths they have previously learned, as indicated by the script used in this study.

Table 13.

Comparison of the Mean of each Student's Score for Eight Trials Completed in the Enhanced Introduction Condition to the Eight Trials of the Standard Introduction Condition

Content Knowledge or Skill	Mean Score*		Enhanced versus Standard		
	Enhanced	Standard	Significant Difference?	<i>t</i> -test <i>p</i> -value	Cohen's <i>d</i> Effect Size
Nutrition Content	4.9 (1.4)	4.5 (1.3)	Yes, favoring enhanced	$p = 0.01$	0.32 Small
Total Creative Skills	25.4 (8.0)	19.9 (6.9)	Yes, favoring enhanced	$p < 0.001$	0.74 Medium
Fluency	5.0 (1.4)	4.0 (1.21)	Yes, favoring enhanced	$p < 0.001$	0.76 Medium
Elaboration	5.1 (1.3)	4.5 (1.2)	Yes, favoring enhanced	$p < 0.01$	0.47 Small
Originality	4.5 (1.3)	3.6 (1.3)	Yes, favoring enhanced	$p < 0.01$	0.63 Medium
Storytelling Articulateness	2.7 (1.2)	1.8 (1.0)	Yes, favoring enhanced	$p < 0.001$	0.78 Medium
Humor	1.8 (0.8)	1.1 (0.8)	Yes, favoring enhanced	$p < 0.001$	0.76 Medium
Breaking Boundaries	2.0 (0.8)	1.1 (0.5)	Yes, favoring enhanced	$p < 0.001$	1.23 Very Large
Effective Title	1.5 (1.0)	1.5 (1.2)	No	$p > 0.5$	-
Wisdom	1.9 (1.1)	1.4 (0.7)	Yes, favoring enhanced	$p < 0.001$	0.61 Medium
Emotion	1.5 (0.8)	1.1 (0.7)	Yes, favoring enhanced	$p < 0.001$	0.56 Medium
Unusual Visualization	1.2 (0.5)	1.1 (0.5)	No	$p > 0.05$	-
Sound	0.9 (1.2)	0.6 (0.7)	No	$p > 0.05$	-
Movement	0.9 (0.6)	0.4 (0.3)	Yes, favoring enhanced	$p < 0.001$	1.00 Large
Resistance to Premature Closure	0.7 (0.3)	0.6 (0.3)	No	$p > 0.05$	-
Internal Visualization	0.7 (0.4)	0.6 (0.3)	No	$p > 0.05$	-
Sensory Impact	0.0 (0.1)	0.3 (0.3)			
Three- Dimensionality	0.0 (0.1)	0.0 (0.0)	These creative traits had very low incidence and therefore comparison data are not reported.		
Word Play	0.0 (0.0)	0.1 (0.1)			

*Note: Standard deviations in parentheses

Unusual Visualization, Sound, Resistance to Premature Closure, and Internal Visualization did not produce results that were statistically significant. Three-dimensionality, Sensory Impact, and Word Play had low incidence, so comparison data were not derived. These are important authentic skills in many professions. Artists, architects, and mathematicians are a few of the many professions that use three-dimensionality on a regular basis. Fashion designers use sensory impact when selecting fabric. Poets and writers are a few professions that may use word play in their creations. The recommendations for future studies are provided in Chapter 5.

Lesson Introduction Condition and Content Knowledge of Nutrition

In regard to the enhanced introduction condition compared to the standard introduction condition producing different results for the content knowledge of nutrition, the data did show a statistical significance favoring the enhanced introduction condition with a small effect size of 0.32. The results suggest that by using an enhanced introduction, teachers can both encourage creativity *and* impact retention of content knowledge. The enhanced introduction reminds students of the creative skills they have learned, therefore, allowing them to practice these skills immediately from week to week. When they are given more creative strengths to explore by a teacher's verbal review and suggestions at the start of the activity, they may produce more on the figural transformations, and show more content knowledge they have retained.

Lesson Introduction Condition on Perceived Affect

The survey results were analyzed by isolating the student rating scores for each individual student for the eight enhanced introduction weeks and calculating a mean. The

same was done for each student for the standard introduction weeks. A paired *t*-test was conducted on the data set for each condition for each of the three survey categories (Enjoyment of Book, Enjoyment of Figural Transformations, Perceived Level of Creativity). The mean scores and Cohen's *d* effect size are shown in Table 14. All three of the survey categories did not show any statistical significance favoring either condition. These data indicate that using an enhanced introduction condition did not affect student enjoyment and perceived level of creativity. The results suggest that the students enjoyed the content regardless of the condition.

Table 14.

Comparison of the Mean of each Student's Rating for Eight Trials Completed in the Enhanced Introduction Condition to the Eight Trials of the Standard Introduction Condition

Survey Topic	Mean Score		Enhanced versus Standard		
	Enhanced	Standard	Significant Difference?	<i>t</i> -test <i>p</i> -value	Cohen's <i>d</i> Effect Size
Enjoyment of Book	9.1 (1.2)	9.0 (1.4)	No	$p > 0.5$	-
Enjoyment of Making Figural Transformations	9.0 (1.5)	8.7 (1.7)	No	$p > 0.5$	-
Perceived Level of Creativity	9.1 (1.4)	9.1 (1.4)	No	$p > 0.5$	-

*Note: Standard deviations in parentheses

Growth of Creativity Skills

Average student scores were compiled for each week for each of the creative strengths. The data were graphed to evidence the growth in creative skills. The first skill that was taught was Elaboration, shown in Figure 2. The horizontal axis shows the weeks, while the vertical axis is the mean frequency score. A mean score of “5” indicates that on average, students showed five instances of elaboration on the figural transformation drawing set.

Overall, student frequency of exhibiting elaboration increased early to a mid-study peak and then declined a bit, showing some overall growth. The decline may have been caused by students becoming a bit tired of the exercise.

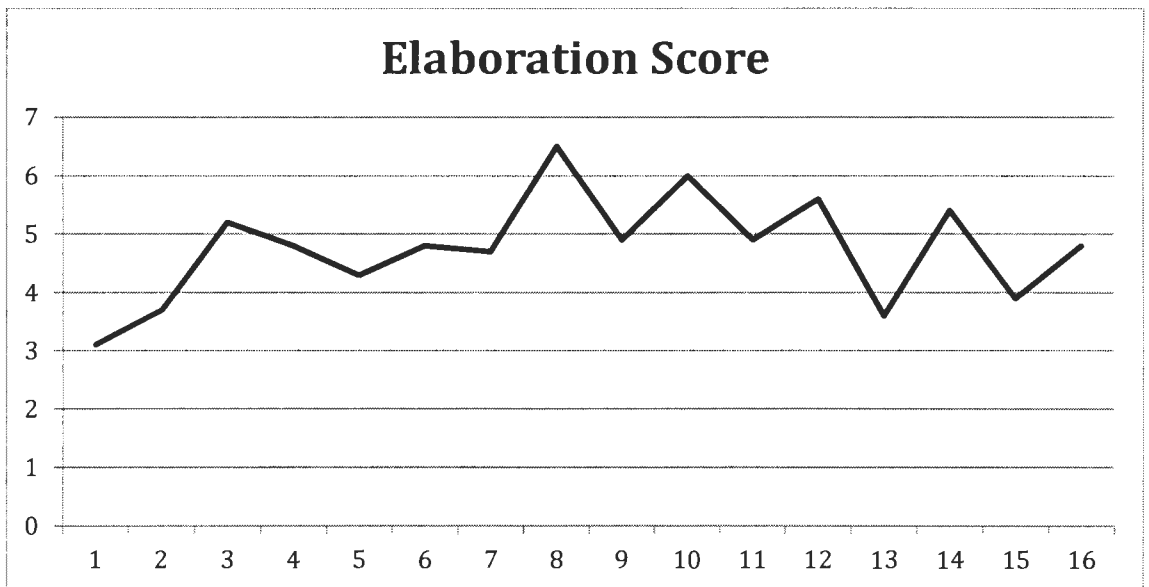


Figure 2. Graph of Mean Student Elaboration Scores per Week

Effective Title was taught the second week, shown in Figure 3 with the weeks distributed across the bottom and the score on the vertical axis. The line of the graphed data showed fairly steady growth throughout the study until the last weeks. Effective Title was scored by the number of descriptive words given in the title, originality, and use of descriptive vocabulary directly from the reading material for the week. If the student simply labeled an illustration with a noun, then that was not counted as an Effective Title. Students may have become tired near the end of the study, and that could account for the decline towards the end.

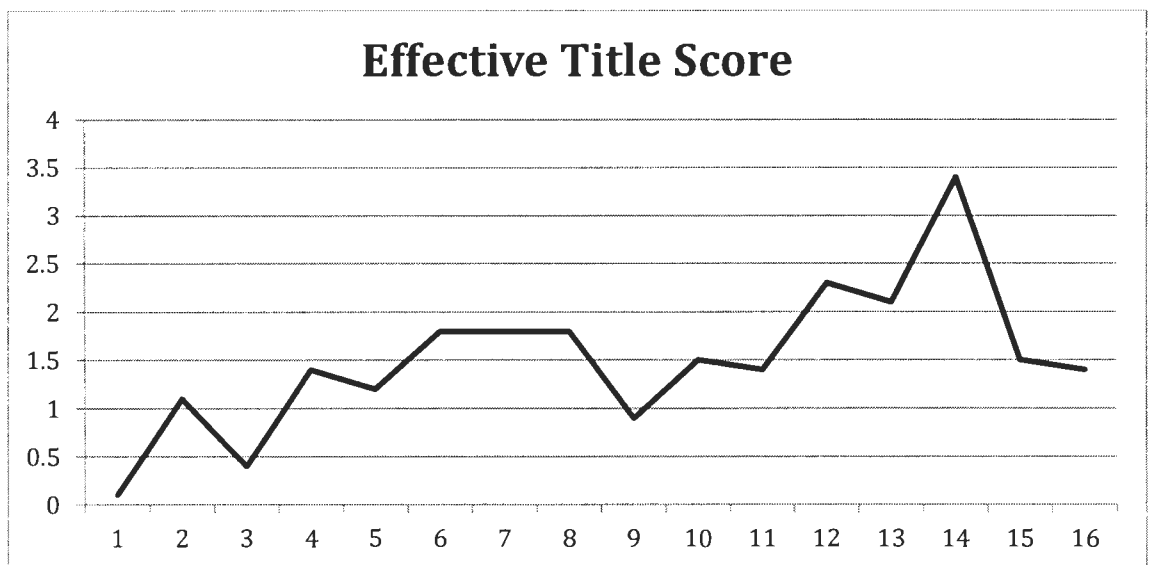


Figure 3. Graph of Mean Student Effective Title Scores per Week

Originality was emphasized during the third week. Mean student scores by week are shown in Figure 4. Students received a point for each figure they completed that was different from other classmates' work for that week. The shape of the graphed line (week along the horizontal axis, scores on the vertical axis) indicates strong initial growth and then general leveling off with some decline near the end of the study. The jagged up and down motion of the line matches the alternating fiction and nonfiction conditions.

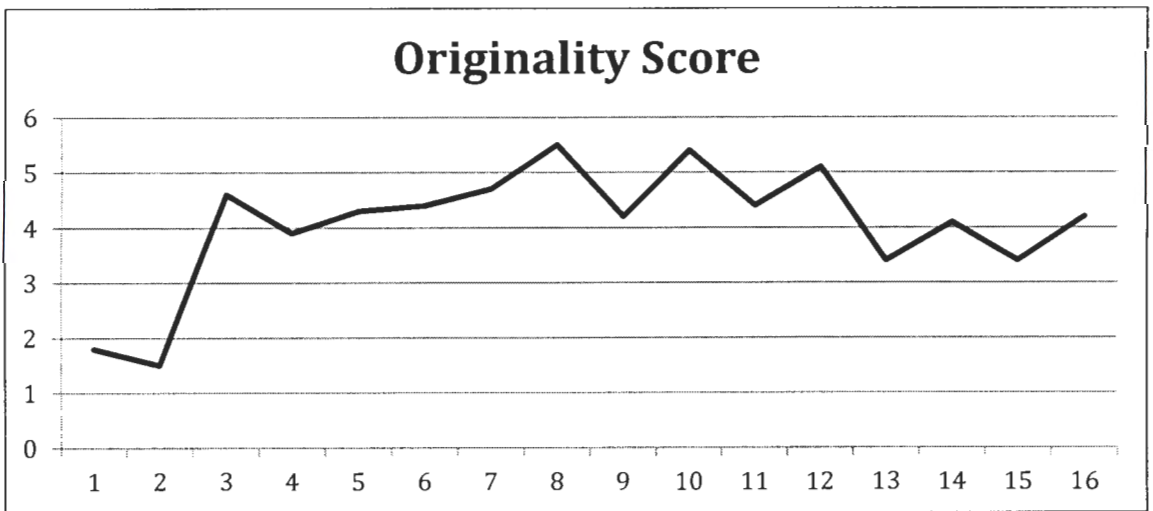


Figure 4. Graph of Mean Student Originality Scores per Week

Storytelling Articulatness was the focus of the fourth week, shown in Figure 5. The weeks with the fiction condition showed higher scores in Storytelling Articulatness. Students were able to use their imaginations and develop stories for their illustrations. There was a decrease in Storytelling Articulatness in Week 13, which is similar to the trend for Elaboration, so Week 13 could have been a harder week for students since it was the standard introduction condition and creativity was not verbally emphasized by

the teacher. Storytelling Articulatness was scored by if the student connected boxes and showed a before and after picture, or if they told a story in their verbal explanation of their images. The story had to go along with the content that was taught for that week.

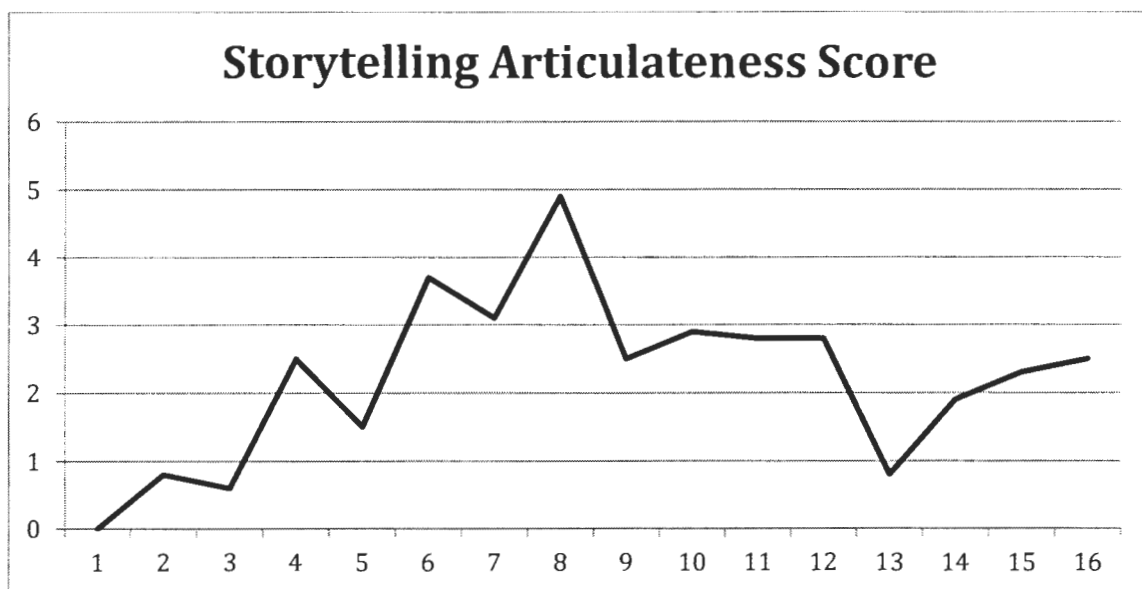


Figure 5. Graph of Mean Student Storytelling Articulatness Scores per Week

Portraying emotion in a figural transformation was taught the fifth week. The graph of student scores in this skill area is shown in Figure 5. The jagged line indicates that student frequency of exhibiting this skill alternated with fiction and nonfiction conditions.

Students were more likely to use emotion during weeks of the fiction condition. Fiction allows for students to connect emotionally with the characters (Brock, 2007).

Students were scored for Emotion when they drew expressive faces or wrote callouts with exclamation points in their illustrations.



Figure 6. Graph of Mean Student Emotion Scores per Week

Breaking Boundaries was emphasized the sixth week. The graph of student mean scores is shown in Figure 6. The ascending line indicates consistent growth, then a dip in Week 13, and then steadying out toward the end of the study. Breaking Boundaries was scored by if the student drew outside the box (not scribbles but an actual design) or connected pictures.

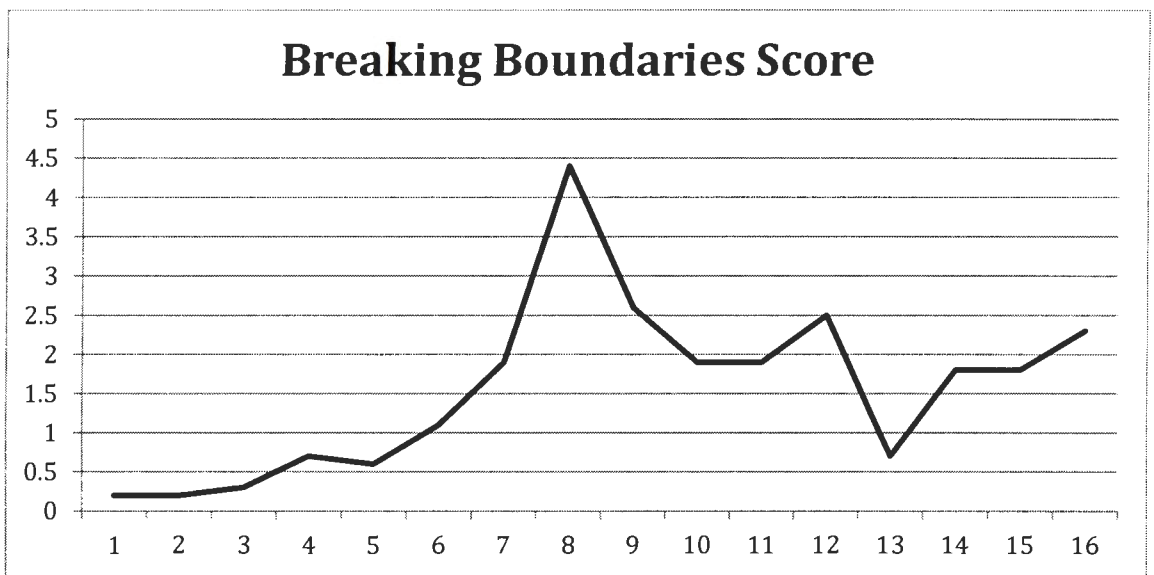


Figure 7. Graph of Mean Student Breaking Boundaries Scores per Week

Movement was demonstrated in the seventh week. The resulting student data for the study is shown in Figure 8. Movement showed growth, a decline in Week 13, and then improvement again towards the end of the study. Movement was scored when the student drew waves or lines that showed action. It was also considered Movement when the character's arms or body parts were illustrated to imply motion.

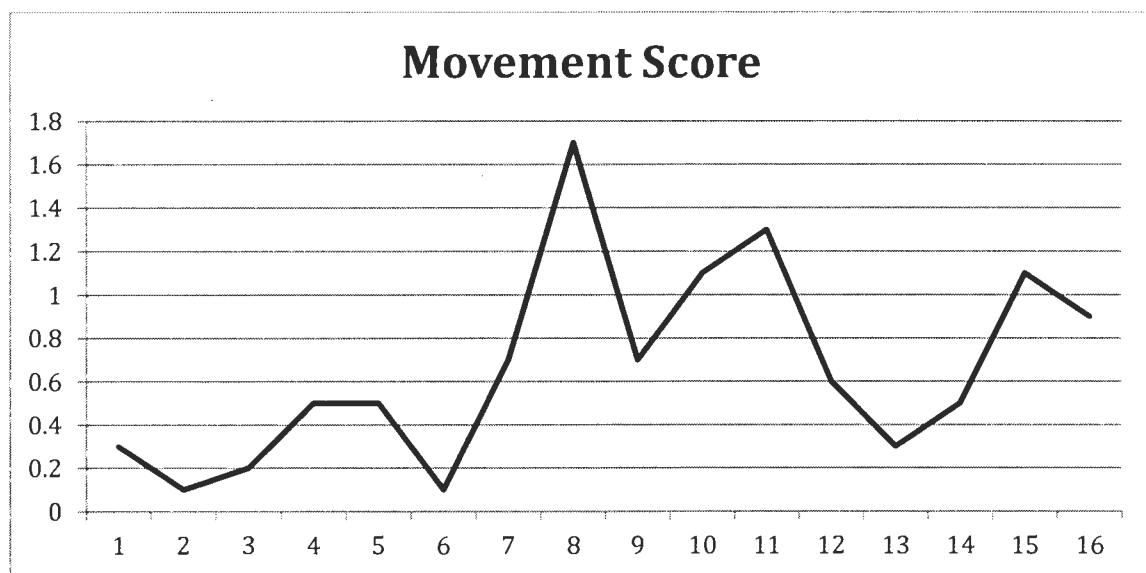


Figure 8. Graph of Mean Student Movement Scores per Week

The teacher directly taught and demonstrated humor in the eighth week. Student mean scores of Humor are shown in Figure 9. Student performance in this skill area alternates from low to more frequent instances of Humor, most likely resulting from alternating book reading conditions. Weeks in which students read fictional nutrition books showed a trend towards more frequent use of humor. A drawing was scored as humorous if the student created a funny, impossible situation.

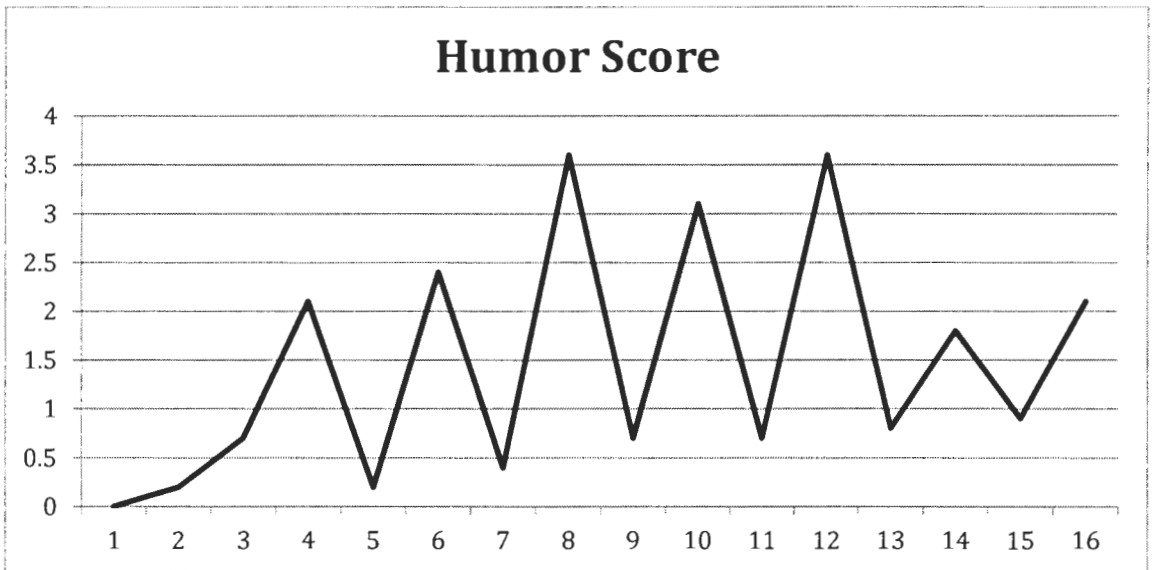


Figure 9. Graph of Mean Student Humor Scores per Week

The idea of adding sound through callouts or talking bubbles or sound wave drawings was emphasized in the ninth week. Mean student scores for this skill are shown in Figure 10. The frequency of students' use of Sound in their figural transformations peaked in Week 8, then declined to Week 10, showed further decline to Week 13, and finally showed growth towards the end of the study. Emotional expressiveness was

introduced in Week 5, in which students learned how to include faces showing expression. A natural outgrowth of that work would be to add sounds or callouts to the faces such as “Help!” or “Ouch!” Therefore, starting at Week 5, student drawings showed more Humor, even though it had not been directly taught. Week 8 was a fantasy reading week and the creative skill taught was humor, so it is not surprising that sound accompanied humor. Why didn’t students continue to incorporate many instances of Sound in their work after Week 8? Perhaps students focused more on the new skills being introduced that required more concentration such as Three-Dimensionality in Week 10 and Internal Visualization in Week 12.

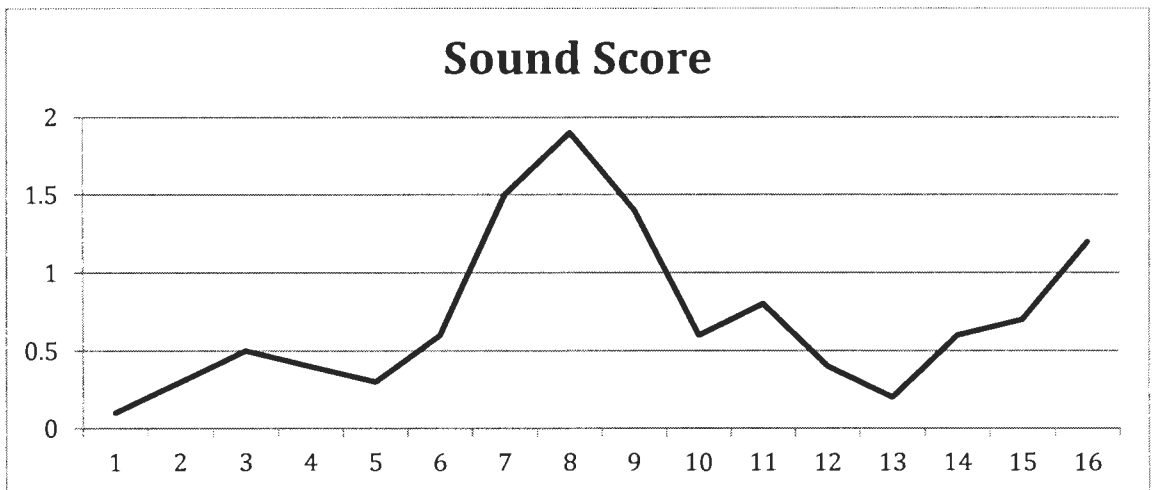


Figure 10. Graph of Mean Student Sound Scores per Week

Three-Dimensionality was taught in the tenth week of the study. Student mean scores for this skill are shown in Figure 11. The graphed data shows peaks on the four weeks in which fictional books were read during the standard introduction condition.

Please note that this skill occurred in very low incidence throughout, so it is difficult to draw conclusions from the data. It does appear, though, that three-dimensionality was influenced by the fictional reading condition. A student's work was scored as exhibiting Three-Dimensionality if the student showed more than one side of a shape or showed a shadow or shaded area.

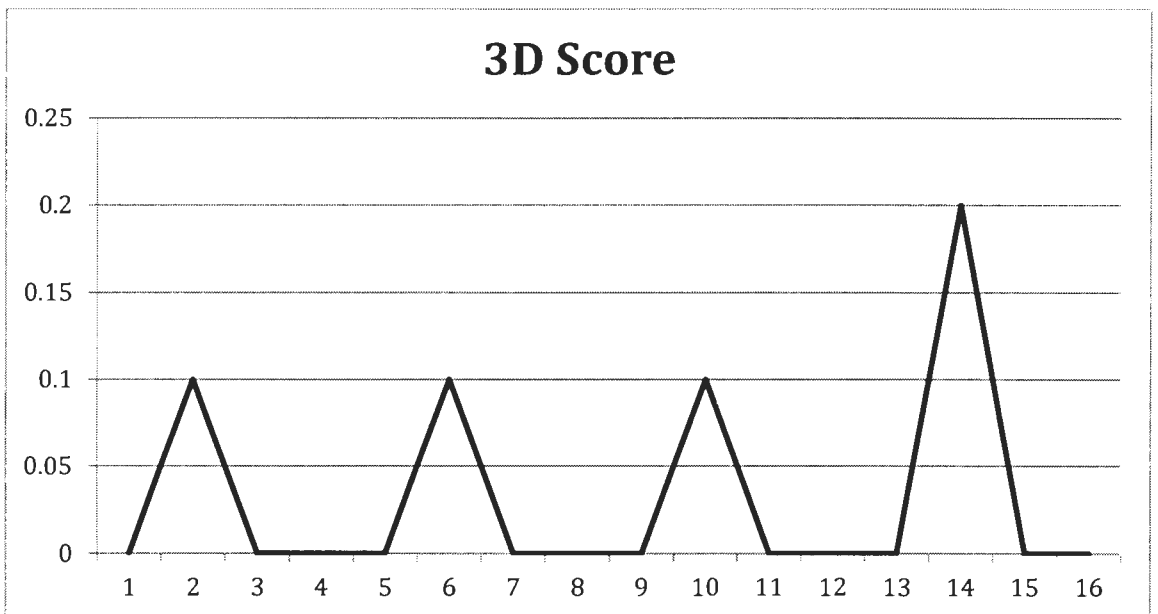


Figure 11. Graph of Mean Student Three Dimensionality Scores per Week

Resistance to Premature Closure was taught in the eleventh week of the study. The graphed mean scores for this skill area are shown in Figure 12. The graph shows an overall decline for this low-incidence trait. There were only two opportunities for students to exhibit resistance to premature closure on the figural transformation page. Resistance to Premature Closure was scored if students took the two open shapes (the third shape which is two blocks and the seventh shape which looks like a bridge that is half closed) and closed them. In the weeks prior to Week 11 when this skill was introduced, students were not really aware that this was a creative skill they might implement. Because this trait was seen so infrequently, no strong conclusion can be drawn from the data.

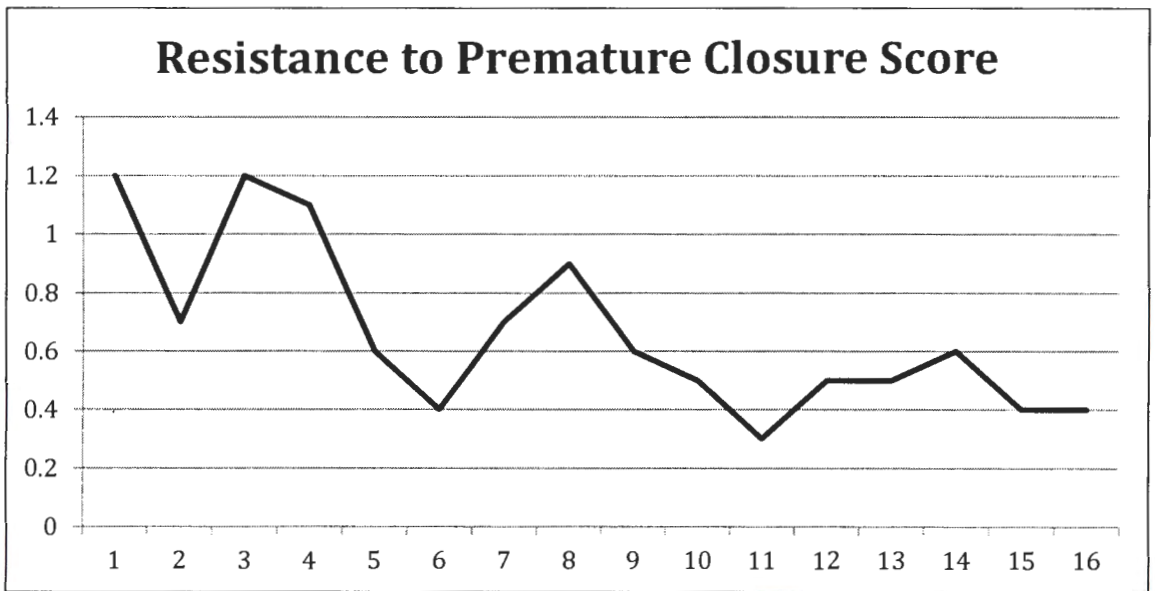


Figure 12. Graph of Mean Student Resistance to Premature Closure Scores per Week

Internal Visualization was taught in the twelfth week. The graphed student mean scores are shown in Figure 13. The graphed mean scores were scattered across the weeks, but again the data showed low incidence throughout, which makes conclusions impractical. Internal Visualization was scored if the student illustrated something unseen normally inside in the shape, like a heart or veins in a person or animal or an interior view of a room through a window.

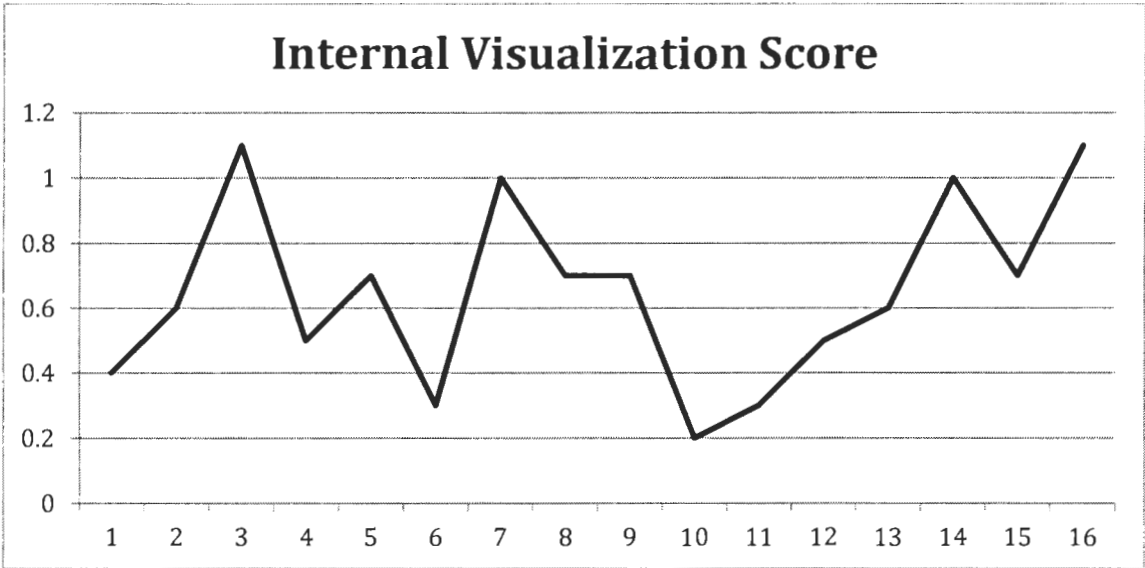


Figure 13. Graph of Mean Student Internal Visualization Scores per Week

Word Play was focused on in the thirteenth week. The graphed student mean data for each week is shown in Figure 14. The graphed mean scores peaked the week Word Play was taught, but overall this was not a skill that was easily acquired. The scores were low incidence, making it impossible to draw appropriate conclusions. Word Play was scored when the student used alliteration, rhyming, or other word play in the title.

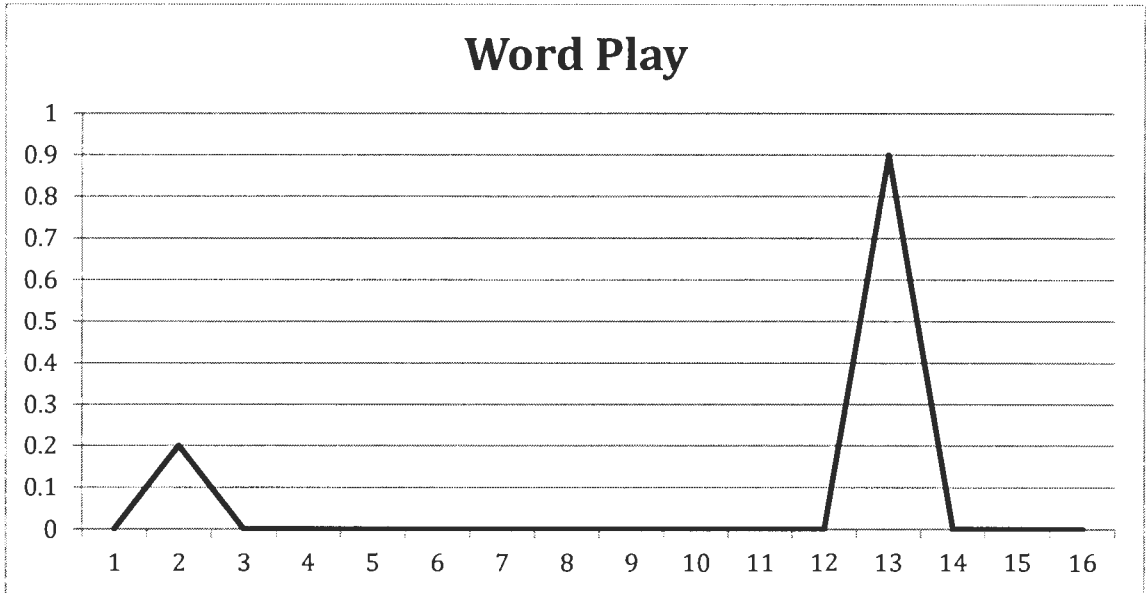


Figure 14. Graph of Mean Student Word Play Scores per Week

Sensory Impact was practiced in the fourteenth week, and the mean scores for each week of the study are graphed in Figure 15. Similar to Word Play, it peaked the week it was emphasized, but overall was a skill with low incidence making conclusions difficult to develop. Sensory Impact was graded by if the student illustrated something that showed sensory perceptions of an object, such as hard, soft, sharp, blunt, cold, hot, wrinkled, or smooth.

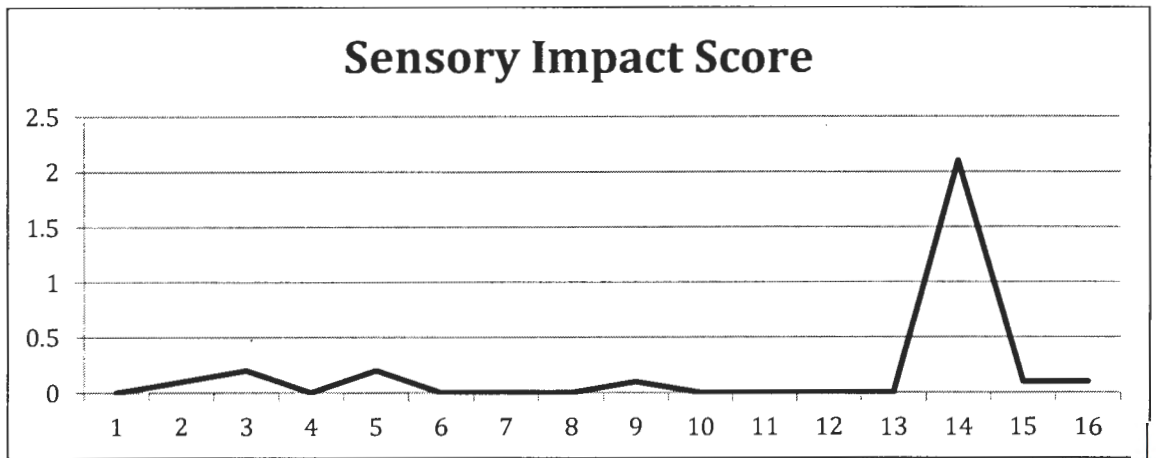


Figure 15. Graph of Mean Student Sensory Impact Scores per Week

Unusual Visualization was taught the fifteenth week, as shown in Figure 16. The graphed mean scores showed higher scores during the fiction weeks. Unusual Visualization was scored if the student showed the underside or changed the scale of the objects featured in the figural transformations. Fiction stories allowed for higher Storytelling Articulateness and students often changed the size of their illustrations to match their stories.

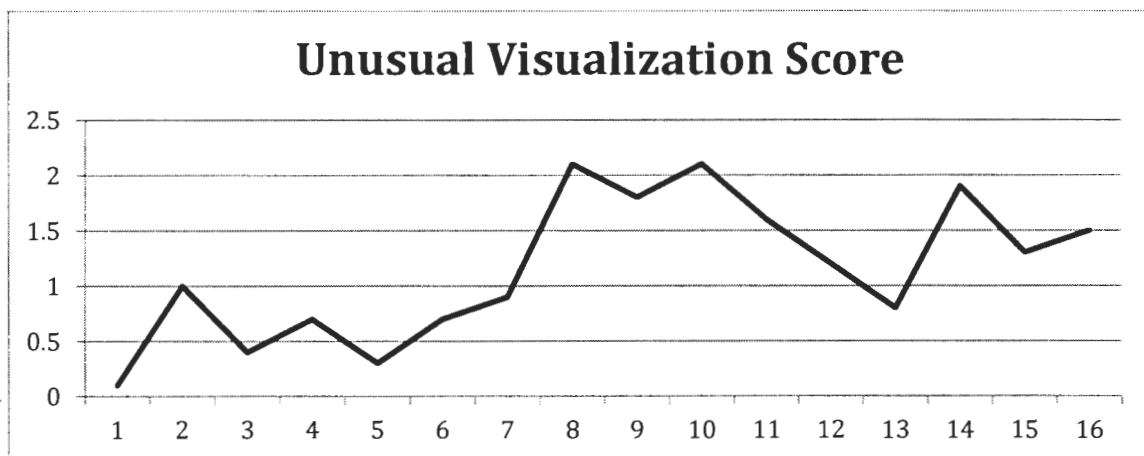


Figure 16. Graph of Mean Student Unusual Visualization Scores per Week

Wisdom was taught the last week of the study, the sixteenth week, as shown in Figure 17. The graphed mean scores peaked during Week 9, which was during a factual reading, which could have meant students had more lessons or morals to share during that week. Wisdom was graded by if the student had a message or moral to their illustration.



Figure 17. Graph of Mean Student Wisdom Scores per Week

Overall, student performance during Week 13 showed a decline across most of the creative strengths graphs. This could have been due to the fact this was the last lesson before Thanksgiving Break. Word Play was taught that week, and it is a non-drawing skill that required students to focus intensely on verbal skills and matching them to their illustrations. In the allotted ten minutes, they may have spent their efforts on Word Play, neglecting other creative skills.

The mean total of creative trait scores, shown in Figure 18, shows that students grew in creative strengths from the start of the study to the end of the study with a strong peak at Week 8.

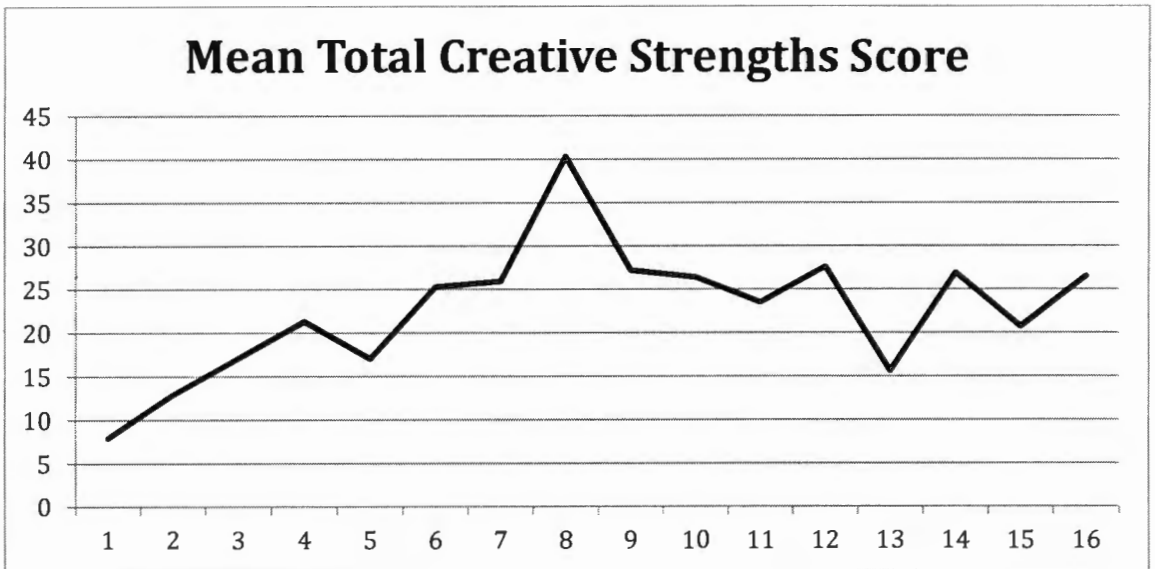


Figure 18. Graph of Mean Student Total Creative Strengths Scores per Week

Nutrition Scores Across Conditions

The mean nutrition scores were greater during the enhanced introduction weeks (Weeks 3, 4, 7, 8, 11, 12, 15, 16), as shown in Figure 19. Although nutrition content was not specifically referenced in the script (Table 2), the teacher emphasized that students should “make it look like something else from the story.” This may have prompted students to think about nutrition facts they had recently learned. Another aspect might be that the teacher told students that the figural transformations were going to be “fun.” This positive atmosphere likely motivated students to remember what they had learned. The fiction and nonfiction weeks did not show a statistically significant difference between conditions. That finding suggests that students retained about the same amount of nutrition content regardless of the type of reading being nonfiction or fiction.

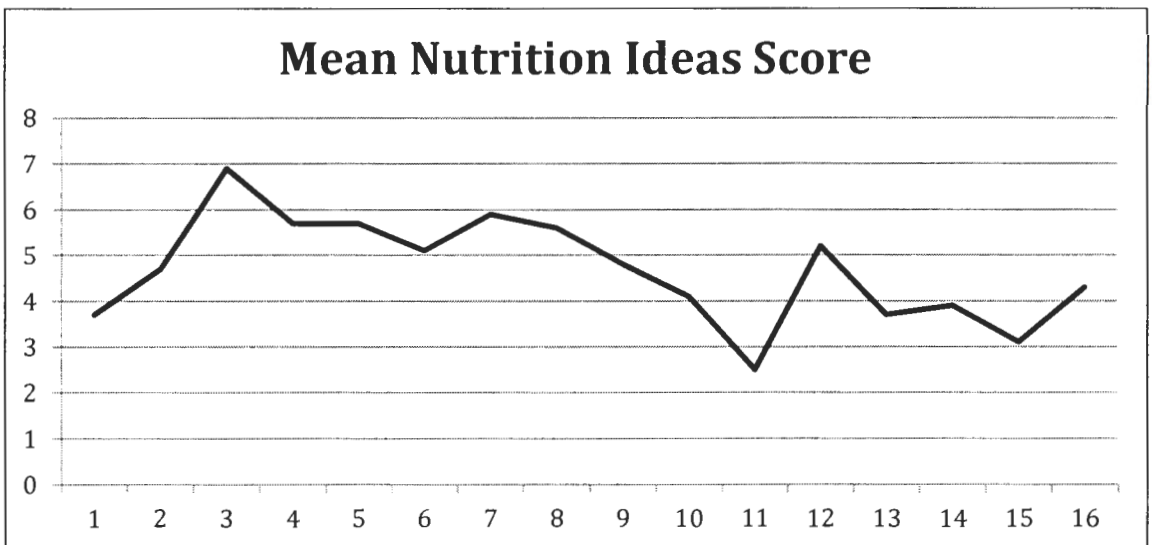


Figure 19. Graph of Mean Nutrition Ideas Score per Week

Results of Survey on Students' Perceptions

Figure 20 shows student perceived level of creativity across the study. Student perceptions of creative performance were relatively high throughout the study. Reported perceived levels of creativity were typically higher during the enhanced Weeks 3, 4, 7, 8, 11, 12, 15, and 16 with the exception of Week 12. The lesson for week 12 was on Internal Visualization, a difficult concept for students and the skill that had low incidence across the entire study. The perceived level of creativity scores were also slightly higher on fiction weeks (even numbered weeks), again with the exception of Week 12. These results were not statistically significant.

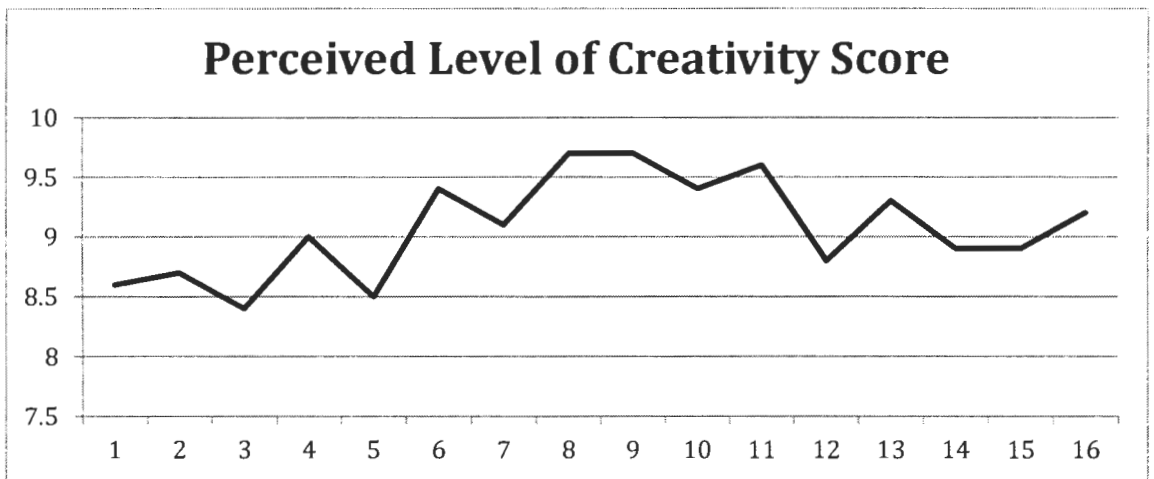


Figure 20. Graph of Mean Student Perceived Level of Creativity Scores per Week

Student enjoyment of the figural transformation work remained high throughout the study, as shown in Figure 21. The scores were slightly higher during enhanced weeks (Weeks 3, 4, 7, 8, 11, 12, 15, 16), but these results were not statistically significant. Although other graphs indicated a marked decline in creativity skills during Week 13, the drop in enjoyment of drawing was small. Most of the peaks in Figure 21 occurred during the fiction weeks (even numbered weeks), but the variations were too small to be statistically significant.

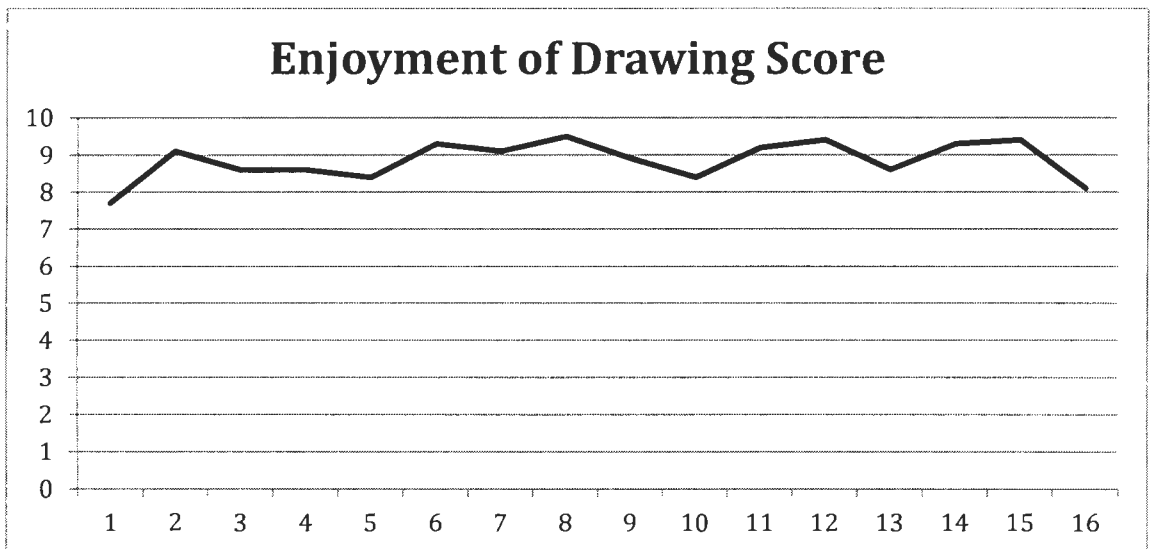


Figure 21. Graph of Mean Student Enjoyment of Drawing Scores per Week

Student enjoyment of the book was higher during the fiction condition (even numbered weeks) with a statistical difference and a medium effect size. As mentioned previously, fictional readings support student imagination. Improved performance during fiction weeks included strengths such as Storytelling Articulatness, Humor, Breaking Boundaries, Emotion, Unusual Visualization and Total Creative Strengths. There were no statistically significant differences between the standard and enhanced introduction conditions regarding student reported enjoyment of the book.

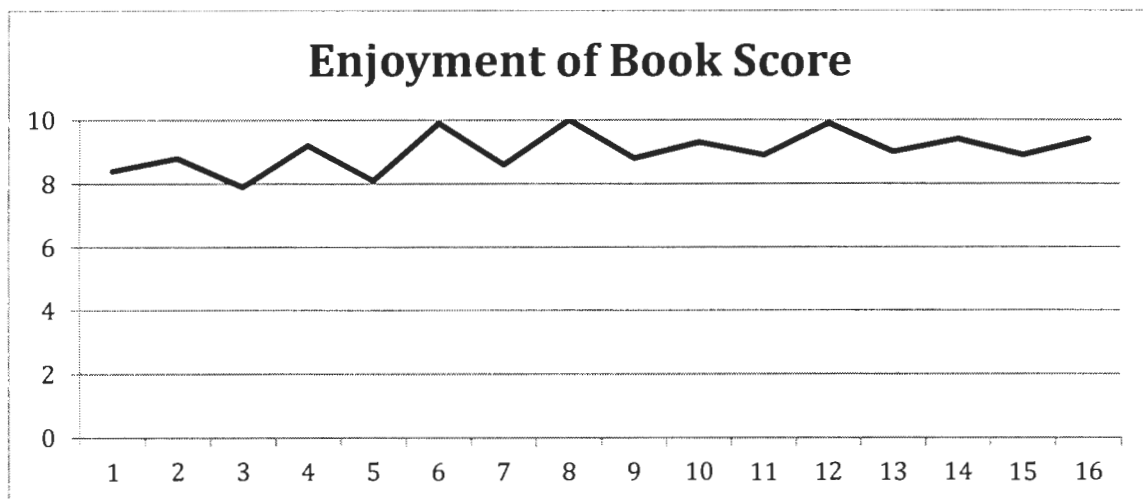


Figure 22. Graph of Mean Student Enjoyment of Book Scores per Week

Fluency Results

Fluency of ideas was another measured component of the study. Fluency refers to the number of ideas generated. Fluency was measured by the number of figures the student completed on a figural transformation page in a meaningful way. If the student just colored or scribbled in the item without any extra details or a title, a fluency point was not given. Students exhibited more fluency of ideas during the fiction weeks and during the enhanced introduction condition.

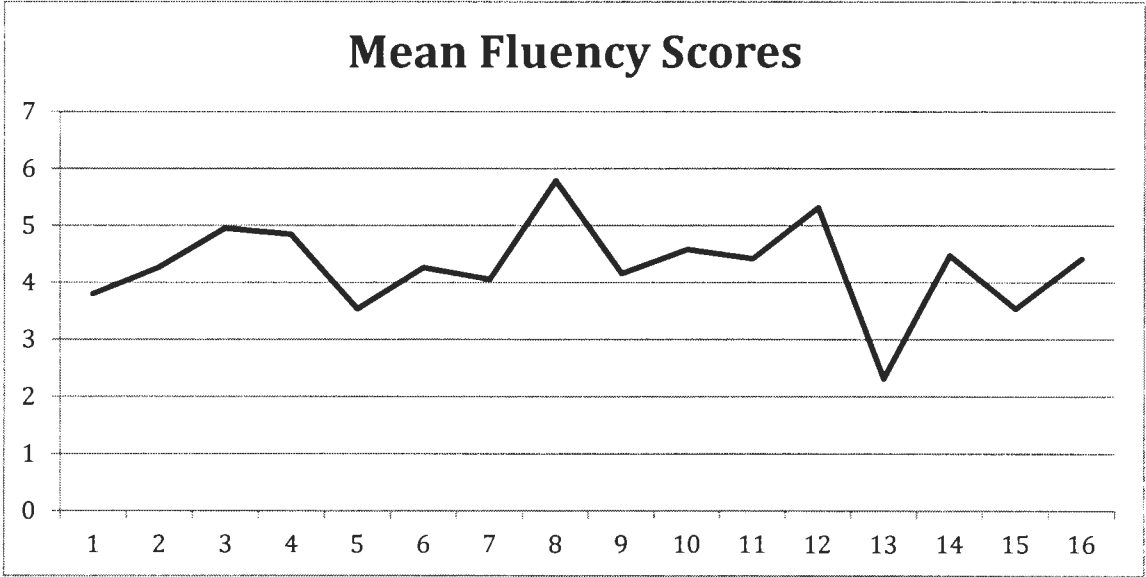


Figure 23. Graph of Mean Student Fluency Scores per Week

CHAPTER 5

CONCLUSION

The purpose of the study was to examine student creativity, expressed nutrition content, and student attitudes under different reading and teacher lesson introduction conditions in an instructional unit involving activities that met current school literacy standards and regulations. The study was designed to investigate whether environment modifications through a standard or enhanced lesson introduction could produce higher creativity and nutrition content knowledge in student performance. The investigation also examined how students performed after reading fiction or nonfiction texts. Student performance was examined for trends in creative strengths over the course of the 16-week study. The following research questions were addressed:

1. Do fantasy and factual readings produce different levels of creativity, content knowledge of nutrition, and student enjoyment of work?
2. Does introducing the lesson to invoke a creative student mindset produce higher creativity outputs on the figural transformations and affect student enjoyment of work?
3. How can educators use figural transformation drawings to assess content knowledge while simultaneously encouraging creativity?
4. What growth of various creativity skills do students evidence?

Summary of Findings

Table 15 shows how the study findings connect to the research questions.

Table 15.

Study Findings Related to the Research Questions

Research Question	Findings
1. Do fantasy and factual readings produce different levels of creativity, content knowledge of nutrition, and student enjoyment of work?	<p>The total and individual creativity skill scores determined by rubric indicated that when a difference existed between conditions, this difference favored the fantasy book condition.</p> <p>Figural transformations evidenced these creative traits more frequently during the fantasy condition: Humor (very large effect size); Total Creativity Skills, Emotion, Unusual Visualization, Storytelling Articulatness, Breaking Boundaries (large effect sizes); Effective Title (medium effect size); and Originality (small effect size). No differences between the fantasy and factual conditions were found for the following creative skills: Wisdom, Sound, Movement, Resistance to Premature Closure, and Internal Visualization. Creative strengths of such low incidence that no conclusion could be drawn were: Sensory Impact, Three-Dimensionality, and Word Play.</p> <p>Student enjoyment of books from the attitude survey showed that students reported enjoying fictional books more than the factual books with medium effect size.</p> <p>Nutrition scores determined by using a rubric showed no statistically significant difference between the book reading conditions.</p> <p>Student ratings of enjoyment of figural transformations and perception of creativity from attitude survey were high and showed no statistically significant difference between reading conditions.</p> <p>The researcher's weekly log indicated that students were more enthusiastic during the fiction readings. It was also noted that students engaged in more storytelling during the exercises following fiction readings.</p>
2. Does introducing the lesson to invoke a creative student mindset produce higher creativity output on the figural transformations and affect student enjoyment of work?	<p>The total and individual creativity skill scores from the rubric indicated that when a difference existed between conditions, this difference favored the enhanced introduction condition.</p> <p>Figural transformations evidenced these creative traits more frequently during the enhanced introduction condition: Breaking Boundaries (very large effect size); Movement (large effect size); Total Creativity Skills, Emotion, Storytelling Articulatness, Originality, Humor (medium effect sizes); and Elaboration (small effect size). No differences between the fantasy and factual conditions were found for the following creative skills: Effective Title, Unusual Visualization, Sound, Resistance to Premature Closure, and Internal Visualization. Creative strengths of such low incidence that no conclusion could be drawn were: Sensory Impact, Three-Dimensionality, and Word Play.</p> <p>Student ratings of enjoyment of the book, making the figural transformations, and students' perceived level of creativity were high with no statistically significant differences between the standard and enhanced conditions.</p> <p>Nutrition scores determined by using a rubric showed that students incorporated more facts into their work during the enhanced introduction condition with a small effect size.</p> <p>The weekly researcher log indicated that students were more excited about their work during the enhanced introduction condition.</p>

(table continues)

Research Question	Findings
3. How can educators use figural transformation drawings to assess content knowledge while simultaneously encouraging creativity?	<p>Nutrition scores showed that students were able to retain between 2 and 7 facts or concepts on average per week; therefore, the teacher was able to assess nutrition knowledge through this activity.</p> <p>Student figural transformation drawings showed that students were able to incorporate both nutrition information and creative skills into their drawings.</p> <p>The teacher's weekly log of notes was used successfully to interpret the figural transformation drawings.</p>
4. What growth of various creativity skills do students evidence?	<p>Students' creativity scores determined by using a rubric indicated that overall, students increased their creativity skills from the beginning to the end of the study. It was also noted that in general student scores of a creative strength peaked when that strength was introduced and taught.</p> <p>Students' perception of creativity from the attitude survey started high and increased somewhat over the course of the study.</p> <p>The teacher's weekly log of notes indicated that students applied skills as they were taught, and were enthusiastic about learning the creative skills.</p>

Enhanced Introduction Environment Yielded Higher Creativity and Content Knowledge

Throughout the study, the enhanced environment showed greater student gains in creative strengths and nutrition facts exhibited. This finding implies that adding a few comments during the introduction inspires students to take creative risks. The positive, enthusiastic environment introduced by the teacher allowed students to access and display more content knowledge than during a minimal lesson introduction. Students also exhibited greater fluency of ideas during the enhanced lesson introduction. The enhanced lesson introduction script had students engaged in answering open-ended questions and encouraging them to be persistent, which were keys to setting up a creative environment (Cropley et al., 2010).

Fiction Readings Produced Higher Creativity and Book Enjoyment

Student creative performance during this study indicated that reading fiction supported creative work. Students reported greater enjoyment of fictional books compared to nonfictional books. This finding indicates that books that spark imagination can be used to inspire student creativity and motivate students. Students also showed greater fluency of ideas during the fiction condition. Students were able to come up with many creative ideas due to the imaginative nature of fiction stories (Rosen, 2012).

Construal Level Theory Supported by this Study

The results of this study support Construal Level Theory in that students demonstrated more creative strengths during the fiction-reading weeks of the study. Construal level theory suggested that the greater the distance in probability of an event (the greater the fictional aspects of an event), the more likely the events are going to be represented as abstract (high-level construals), instead of more concrete (low-level construals) details about the event (Förster et al., 2004). In this research study, the greater probabilistic distance was delivered through the fiction readings, because it allowed students to believe in fictitious characters and events. The high-level thinking would creatively be represented in their figural transformation illustrations after listening to the fiction readings, and in the case of this research study, that was shown to be true.

Student Retention of Content

The analysis of student scores in nutrition content demonstrated that students retained content knowledge regardless of the type of reader (nonfiction or fiction) used. There was, however, a significant difference of nutrition content retained during the enhanced lesson introduction condition compared to the standard lesson introduction. This finding indicates that when students were given a prompt to think creatively through the enhanced lesson introduction, they not only demonstrated higher creativity on the figural transformations but also greater content learning. The enhanced lesson introduction had the teacher enthusiastically reminding students of the creative strengths. When they were able to come up with greater ideas and strengths to illustrate, they could show their knowledge in new ways. Enthusiasm can encourage students to seek new opportunities (Jamison, 2004).

Student Enjoyment of the Figural Transformations

Student scores remained high throughout the study for enjoyment of figural transformations. Students may have enjoyed the time for illustrations and drawing, as this is not a common part of the second grade curriculum.

Creative Strengths With Low Incidence

Sensory Impact (Week 14), Three-Dimensionality (week 10), and Word Play (Week 13) were all creative strengths that students showed less frequently than other strengths in the study. All three of these creative skills were taught during the standard introduction condition. Students may have felt unmotivated to try them, or the skills may have been too difficult and required extended practice. This research result indicates that

teachers may want to introduce these skills earlier in the school year so that there is time to review and reinforce them, or possibly introduce them with the enhanced lesson introduction.

These three creative strengths that were low in incidence are not among the main skills Torrance assessed through fluency, flexibility, elaboration, originality, and effective title (Hebert et al., 2002). Throughout the study, limitations were present and discussed below.

Limitations

One possible limitation is a maturation effect. Maturation effect is a potential threat to internal validity (Creswell, 2002). Students become older and more experienced as the research progresses. However, the repeated measures design with conditions alternating throughout the study time allowed for close-in-time comparisons between conditions. The data were examined for maturation effects from the beginning to end of the study. The study contained evidence that students grew creatively, and that educators can teach students how to become more creative.

An additional limitation was that students were not taught the creative strengths before the study began because of restrictions due to the real-world nature of the lessons that were conducted within the curriculum of a public elementary school. Each week a new creative strength was introduced. This might be changed in future studies by teaching the creative strengths before the study begins.

Another limitation of concern is potential bias of the researcher on scoring the data collected. To address this limitation, an independent coder who was trained to assess

figural transformations examined at least ten percent of the data selected for two random weeks. Week 3 and Week 14, from the study to uncover any potential bias or error in scoring. Student work was scored for creative traits and for nutrition content. The inter-rater reliability for creative traits for Week 3 was 0.98; for Week 14, it was 0.97. The inter-rater reliability for nutrition score for Week 3 was 0.87; for Week 14 it was 0.98. Overall, the mean inter-rater reliability score for all four of these measures was 0.95 with a standard deviation of 0.05. The inter-rater reliability agreement scores were very good, indicating that the researcher's criteria outlined on the rubric were easily interpreted and scoring was repeatable.

Student absences were a potential limitation to the study. The calendar for completing the research included a make-up week. In the event that numerous students were gone on a given week, the researcher had the flexibility to choose a date in which all students were present. This situation did not occur during the study. Individual students who missed a day of the study were administered a make-up session within a couple of days that duplicated the conditions that were missed. Despite these limitations, this study had several positive findings for classroom practice discussed below.

Implications for Classroom Practice

The findings from this study regarding creativity and learning of nutrition information indicated that students were able to practice creativity and still demonstrate retention of content knowledge. As a reminder, the creativity rubric was used to score each of the creative strengths exhibited each week and used to tally the amount of nutrition content demonstrated. Therefore, it is recommended that teachers integrate

figural transformations into content lessons as a way to assess student learning and teach creativity skills at the same time. Student motivation was high throughout the sixteen-week study, showing that students never tired of this activity, but instead continued to learn new skills and apply their content learning to the exercise. Parents also fully supported the initiative to include creativity into the curriculum. Both the nutrition content and the creativity exercises aligned with current initiatives in education (Partnership for 21st Century Thinking Skills, 2011).

Through performance during this study, three students were identified to receive talented and gifted servicing for the first time. Their figural transformation work uncovered a creative side that had not been previously identified. They demonstrated several creative strengths from week to week, so the researcher engaged in conversations with the Talented and Gifted Coordinator to have them assessed for the program. Two of these students are of a low socio-economic status. Identifying students for talented and gifted servicing should include a variety of assessments including in the area of creativity (Renzulli, 2011). Unfortunately, many decisions for servicing are based on standardized assessments, and that would have caused these three students to be overlooked. By using the figural transformations, educators are not only assessing content knowledge, but identifying creative strengths that might not otherwise be uncovered.

Students also enjoyed participating in the activities of this study regardless of the fiction or nonfiction book condition. They enjoyed the read-aloud equally from week to week. Reading books aloud can sometimes be neglected because of time constraints in the school day. However, reading aloud has several benefits including exposing students

to fluent reading, introducing a wide range of genres, and is a highly enjoyable experience for students (Serafini, 2011). This study showed that not only did students gain nutrition knowledge and creativity skills, but that they also enjoyed hearing the books read.

The classroom environment does matter to creativity production. Students were able to demonstrate more creative skills with the enhanced introduction condition. The script used during the enhanced introduction condition allowed for continual review of creativity strengths, a positive tone, and required a lot of energy from the teacher. This had a positive impact on creative performance. A positive classroom environment has a positive impact on academics and behavior (Wilson-Fleming & Wilson-Younger, 2012). Future curriculum could incorporate an enhanced script similar to the one used in this study. The implications for future studies are discussed below.

Implications for Future Studies

One area that was poorly understood prior to this study was the impact of different aspects of the environment on creativity. This study showed that students were able to exhibit higher creativity with the addition of an enhanced introduction. Future studies may examine the long-term effects of an enhanced environment on student performance. Also, conductors of future studies will want to study larger samples, with the possibility of conducting a longitudinal study to see if the students retain the creative skills over time.

Another area that needed research was how ongoing teaching of creative skills might impact student creativity. All throughout this study, the students grew in their

ability to demonstrate creative strengths. Investigators of future studies may possibly want to introduce the creative strengths prior to the study. Also, additional time and practice could be given for the creative strengths that had low incidence (Sensory Impact, Three-Dimensionality, and Word Play) to see if those skills may be increased.

An important outcome of this study is the demonstration of how educators can teach creativity skills in conjunction with an existing reading curriculum. This integration of creativity skills with content are instruction will increasingly become important as more and more focus is given to the area of reading and mathematics. Future studies could possibly integrate teaching creative skills into other content areas like mathematics.

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APPENDIX A
STUDENT WORK

Elaboration Examples



This student is exhibiting elaboration by using extra colors and details. The illustration shows a person eating a healthy tray of food. (Week 8, *Rabbit Food*, Fiction/Enhanced Condition)



This student is using elaboration by adding extra colors and details. The illustration shows a “muffin” with blueberries. (Week 3, *Food Pyramid*, Nonfiction/Enhanced Condition)

Effective Title Examples

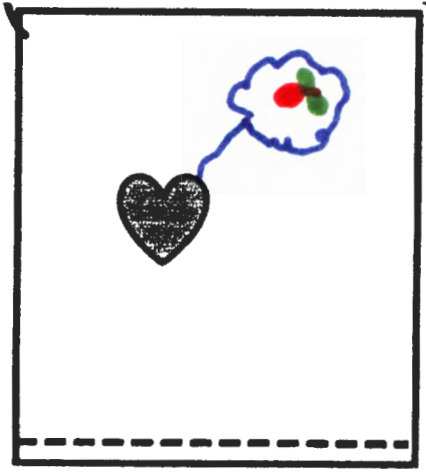


This student is using effective title by describing what the person is eating: “The guy is eating pancakes.” The illustration shows a person eating a tray of pancakes. (Week 10, *Cloudy With a Chance of Meatballs*, Fiction/Standard Condition)



This student is using effective title by describing the carrot in the title, “Carrot with Vitamins.” The illustration shows a carrot and the hidden nutrients it contains. (Week 9, *Vitamins and Minerals*, Nonfiction/Standard Condition)

Examples of Storytelling Articulatensess



This student is using storytelling by telling a story in the illustration. The illustration shows a heart that thinks about making healthy choices and eating apples. (Week 2, *King's Taster*, Fiction/Standard Condition)

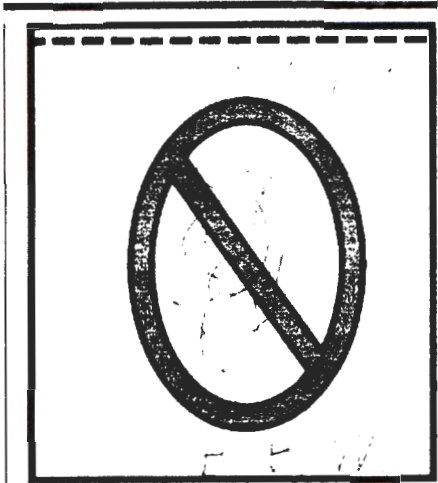


This student is using storytelling by telling what is happening in the picture. The illustration shows a town where food is falling from the sky. (Week 10, *Cloudy With a Chance of Meatballs*, Fiction/Standard Condition)



This student is using storytelling by telling a story about her picture. The illustration shows a girl who is asking her mother if she can have a vitamin (the heart shape). The mother is happy that her daughter is asking for the vitamin. (Week 9, *Vitamins and Minerals*, Nonfiction/Standard Condition)

Emotional Expression Examples



This student is using emotional expressiveness by showing a baby who is upset about what they are eating. The illustration shows a baby who will not stop overeating. (Week 6, *Harry Hungry*, Fiction/Standard Condition)



This student is using emotional expressiveness by giving an expression to the person in the illustration. The illustration shows a girl who is happy to be eating healthy. (Week 2, *King's Taster*, Fiction/Standard Condition)

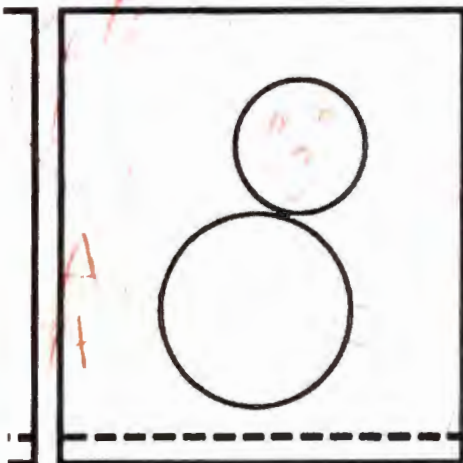
Examples of Breaking Boundaries



This student (work shown at the left) is breaking boundaries by going into more than one box for the illustration. The illustration shows a carrot saying “I’m a healthy carrot.” (Week 9, *Vitamins and Minerals*, Nonfiction/Standard Condition)



This student (work shown below) is breaking boundaries by going into more than one box for the illustration. The illustration shows a person thinking that a carrot has vitamins and going to grab a carrot, “Someone getting a carrot.” (Week 9, *Vitamins and Minerals*, Nonfiction/Standard Condition)



Handwritten scribbles or text at the bottom right of the page.

Examples of Movement

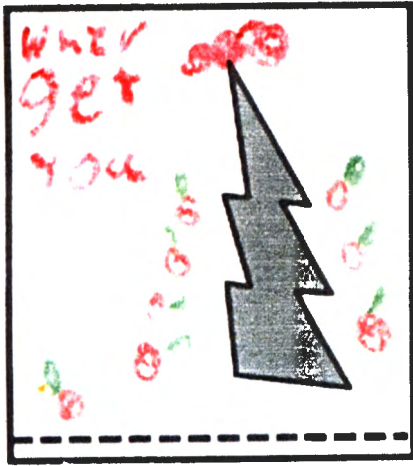


This student is using movement by indicating that the two shapes are fighting each other. The illustration shows a piece of corn fighting a piece of candy (Week 4, *Princess Picky*, Fiction/Enhanced Condition)



This student is using movement by showing the person eating. The illustration shows a guy putting carrots into his mouth, "shoving carrots in his mouth." (Week 8, *Rabbit Food*, Fiction/Enhanced Condition)

Humor Examples

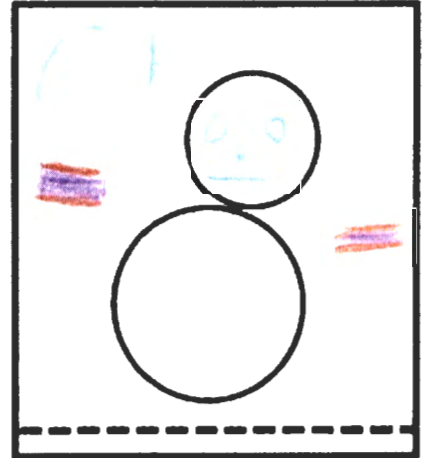
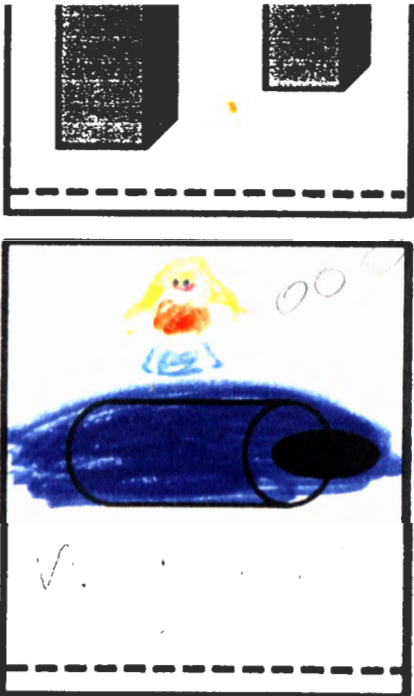


This student is using humor by showing candy and apples fighting a war against each other. The illustration shows apples climbing a mountain to fight the candy at the top, “We’ll get you.” (Week 3, *Food Pyramid*, Nonfiction/Enhanced Condition)



This student is humor by showing a person eating something that is not possible. The illustration shows a guy eating power lines. (Week 6, *Harry Hungry*, Fiction/Standard Condition)

Examples of Sound



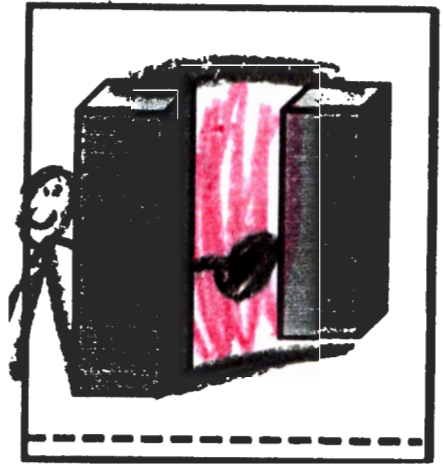
This student is portraying sound by showing someone talking through a sound bubble. The illustration shows a girl who is saying that water is good and that she loves water. (Week 7, *Food and Nutrition*, Nonfiction/Enhanced Condition)

This student is using sound by showing what someone would say if they were overeating. The illustration shows a guy who has junk food in both hands and is grumbling because he has overeaten. (Week 10, *Cloudy With a Chance of Meatballs*, Fiction/Standard Condition)

Examples of Three-Dimensionality

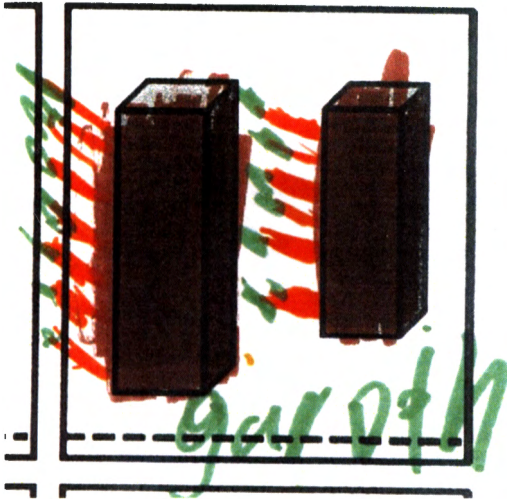


This student is displaying three-dimensionality by showing the three-dimensional texture of the brain's folds and creases. The illustration shows a happy face and textured brain tissue. (Week 5, *Nervous System*, Nonfiction/Standard Condition)

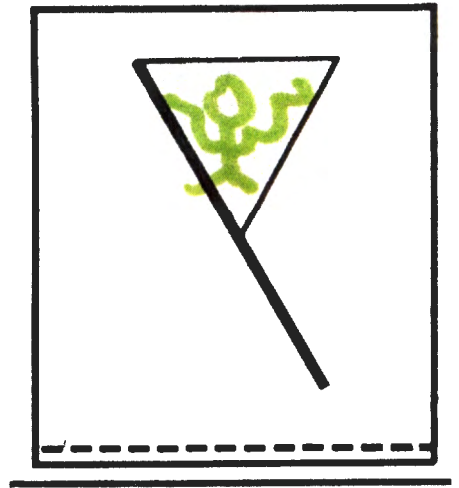


This student is showing three-dimensionality by showing the refrigerator with sides and an inside. The illustration shows someone reaching inside the refrigerator. (Week 9, *Vitamins and Minerals*, Nonfiction/Standard Condition)

Examples of Resistance to Premature Closure



This student is showing resistance to premature closure by not closing off the boxes by drawing a line connecting the two boxes. The illustration shows two rows of a carrot garden (need to turn the illustration sideways to see them correctly). (Week 3, *Food Pyramid*, Nonfiction/Enhanced Condition)

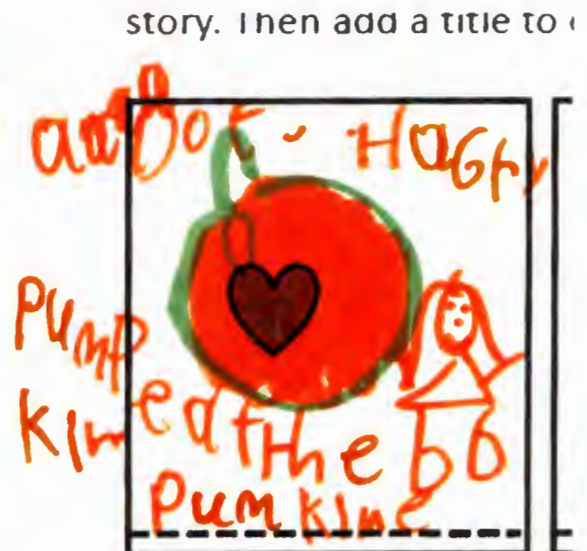


This student is showing resistance to premature closure by not closing off the flag by drawing lines. The illustration shows the flag untouched. (Week 15, *Body in Action*, Nonfiction/Enhanced Condition)

Examples of Internal Visualization



This student is showing internal visualization by showing what is inside the heart, which cannot be seen with our eyes. The illustration shows blood and veins ("Blood veins") pumping through the body. (Week 7, *Food and Nutrition*, Nonfiction/Enhanced Condition)



This student is showing internal visualization by showing what is inside a pumpkin. The illustration shows a girl who is hungry and wants to eat a pumpkin. The heart represents a seed inside the pumpkin. (Week 6, *Harry Hungry*, Fiction/Standard Condition)

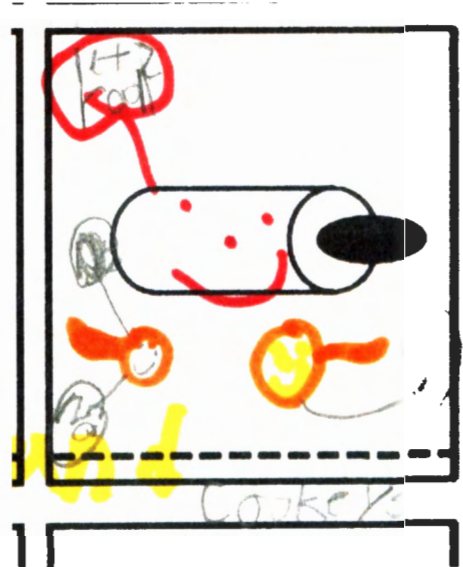


This student is showing internal visualization by showing what is inside the human body. The illustration shows a person with blood cells. (Week 7, *Food and Nutrition*, Nonfiction/Enhanced Condition)

Examples of Word Play

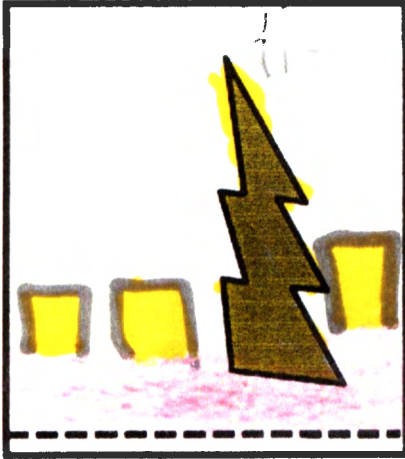


This student is showing word play by saying “Water” and “Watermelon.” The illustration shows how water is a part of watermelon through its wave shape. (Week 3, *Food Pyramid*, Nonfiction/Enhanced Condition)



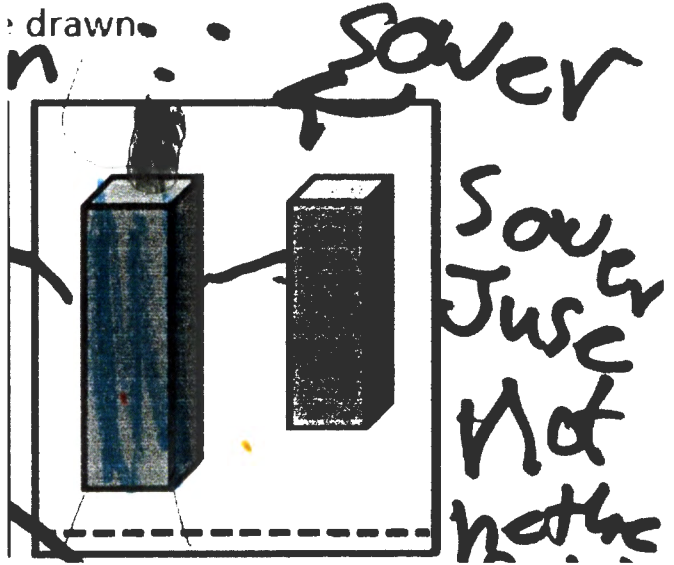
This student is showing word play by having the rolling pin saying “Let’s Roll,” because rolling pins naturally roll and “Let’s roll” is an idiom that means let’s go. Therefore, this is a double entendre of the word “roll.” The illustration shows a rolling pin rolling cookies. (Week 8, *Rabbit Food*, Fiction/Enhanced Condition)

Examples of Sensory Impact



This student is showing sensory impact by showing a set of teeth. The lightning bolt represents the sensation of something being sharp, like a jagged tooth. (Week 7, *Food and Nutrition*, Nonfiction/Enhanced Condition)

Make each drawing tell a story.

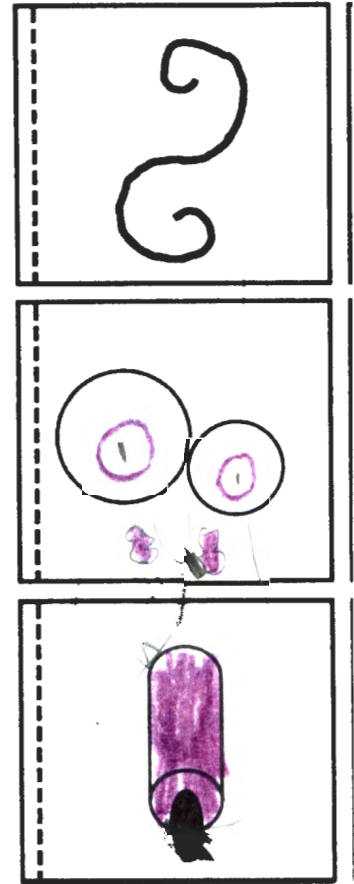


This student is showing sensory impact by showing someone eating something that is sour. The face shows how someone might react when eating something sour. (Week 11, *Sense of Taste*, Nonfiction/Enhanced Condition)

Examples of Unusual Visualization



This student is showing unusual visualization by showing what a spine looks like. The illustration shows a spine made out of hearts. (Week 5, *Nervous System*, Nonfiction/Standard Condition)

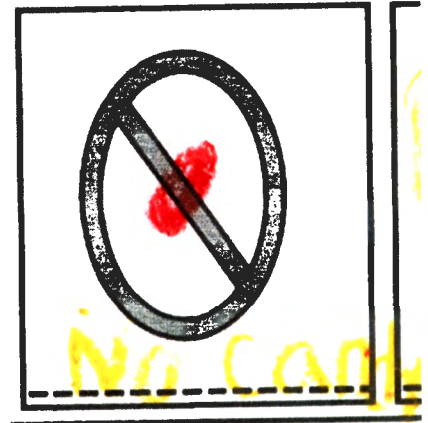


This student is showing unusual visualization by changing the scale of three pictures to show a person with their mouth open and what is inside. The illustration shows a person eating a lollipop. (Week 9, *Vitamins and Minerals*, Nonfiction/Standard Condition)

Examples of Wisdom

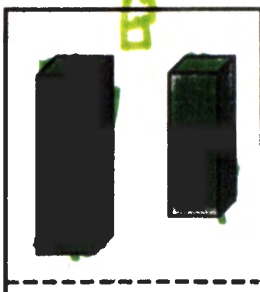


This student is showing wisdom by telling people they will feel sick if they eat too much junk food. The illustration shows a person feeling sick after eating junk food. (Week 2, *King's Taster*, Fiction/Standard Condition)



This student is showing wisdom by telling people to not eat candy. The illustration shows a sign that advertises for not eating candy. (Week 4, *Princess Picky*, Fiction/Enhanced Condition)

lines or details. Try to
ke each drawing tell a
drawn.



This student is showing wisdom by telling people not to put a lot of ranch on vegetables. The illustration shows a piece of celery looking at a ranch bottle and telling it not to pour out. (Week 8, *Rabbit Food*, Fiction/Enhanced Condition)

Examples of Nutrition Content



This student was given a point for demonstrating nutrition content in the drawing. The illustration at left shows a plate full of fruits and vegetables. The story was about a rabbit who did not like fruits and vegetables because he would not try them, “Eating things he hates.” At the end of the story, he decides he likes the fruits and vegetables. (Week 8, *Rabbit Food*, Fiction/Enhanced Condition)



This student is showing nutrition retention by depicting vegetables growing underground. The student is showing how vegetables need soil and water to survive. (Week 12, *Jack and the Beanstalk*, Fiction/Enhanced Condition)