

CALIFORNIA STATE UNIVERSITY, NORTHRIDGE

DIVING INTO WORD PROBLEMS:
A SEA THEME BOARDGAME FOR THIRD GRADERS

A graduate project submitted in partial fulfillment of the requirements
For the Degree of Master of Arts in Education,
Educational Psychology

By

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Dedication

I dedicate this to my family

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ABSTRACT

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Children in the United States are not performing at a proficient level in math and fail to perform adequately in problem-solving tasks. As a result it can affect the nation's economy due to the lack of math skills. Research states that textbooks are not providing effective problem solving instructions to help students improve. Therefore, the purpose of this project is to create a boardgame to start motivating children in third grade to learn and use problem solving skills. The project includes the need for the game and review of the literature to support its development, the design and development of the game through an instructional model. The project concludes with the final product, an evaluation by professionals and discussion on future plans.

Chapter One – Introduction

Children tend to struggle with math; word problems being a major topic of difficulty. Lipnevich, MacCann, Krumm, Burrus and Roberts (2011) stated that mathematics related skills are becoming ever more important, but students from various nations are not performing at the level that they should. In accordance to that reference, results from the 2007 National Assessment of Educational Progress (NAEP) concluded that only 32% of the U.S. eighth graders and 39% of fourth graders reached proficiency in math (Lipnevich et al., 2011). The reasoning for difficulty in word problems for elementary students is due to the complexity of the solution process (Jitendra, Griffin, Deatline-Buchman, & Sczesniak, 2007). In addition Jitendra et al. (2007) also stated that the traditional textbook with problem solving instructions has not been effective in improving the learning of students at risk for math difficulties. Jitendra, Sczesniak and Deatline-Buchman (2005a) indicated that results from international and national assessments of mathematics achievement specify that U.S. students fail to perform adequately on math problem-solving tasks. There has been relating research on math being a subject in which motivation and achievement declines across the education years. Gottfried, Fleming and Gottfried (2001) concluded that the greatest decline in academic intrinsic motivation occurred for math. Therefore, I believe that in order to maintain the interest and to increase intrinsic motivation, building the child's emotional and academic self-efficacy in understanding and being capable of solving problems will help them advance in and enjoy math. According to Gottfried et al. (2001) children who begin this sequence with lower motivation during childhood are likely to be at a greater

disadvantage over the age span. Also, according to Gottfried et al., (2001), home environments may also play a role in the decline of motivation. Not all children learn at the same speed and have the same learning styles. This is why providing a positive environment will help increase student motivation, but it must start in elementary school with parents and teachers working together. If tools are not implemented to help children become motivated and succeed, the lack of math skills can result in lower employability, wages, productivity, sense of well-being and effect on the nation's economy (Lipnevich et al., 2011).

Need/Problem

It is evident that children are not meeting the goals and criteria in math, the system of delivery is not efficient and the presentation of the materials are not motivating, interesting nor appealing. Adelson and McCoach (2011) declared that "The United States ranked ninth, behind Asian and European countries on the 2007 Trends in International Mathematics and Science Study (TIMSS)." Teachers, schools and curriculum have various ways of teaching, and sometimes those methods make connection and/or are not appealing to the students. It then results with less engagement and children becoming frustrated because they don't comprehend the material. Intrinsic motivation is related to school curriculum (Gottfried et al, 2001). According to Jitendra et al. (2005b) the TIMSS results suggested that the U.S. textbooks, as compared to other countries, are much larger and heavier, cover more topics with less in depth explanations and fail to develop linkages between subjects. In agreement, Jitendra et al. (2007) stated that many mathematics books are organized with one procedure (e.g. subtraction) to be used to solve all the problems on the page. Therefore, the learners are not able to

distinguish among word-problems that require a different strategy (Jitendra et al., 2007) Also, primary teachers often receive little professional support for achieving complicated tasks in mathematics (Burton, 2010). Other resources, such as math games, would make learning more fun. According to research, teachers whose goal was to foster their student's interest were more likely to use cooperative math activities (Durik & Eccles, 2006). Therefore, cooperative classroom activities have been shown to be beneficial for learners on a number of levels, such as nurturing interest, lowering anxiety levels and developing more math skills (Durik & Eccles, 2006). Burton (2010) also concluded similar findings for math games to encourage children to improve logical thinking skills and work on procedural knowledge such as addition, subtraction, multiplication, and division facts.

By providing additional educational resources to implement in the classroom, teachers can help raise the students' perceived confidence on their ability to regulate negative emotions due to stressful events; emotional self-efficacy. By increasing emotional self-efficacy in math it will motivate them to participate more during math activities. When young children have higher academic intrinsic motivation, they tend to have higher achievement, more favorable perceptions of their academic competence and lower academic anxiety (Gottfried, 1990). When instructional options [learning games, puzzles and audiovisual supplements] are implemented and because they cast in a form of play, they contribute not only to skill development but to effective consequences as well (Baker, Herman, & Yeh, 1981). In addition it has been found that students' attitudes are significantly related to their achievement in mathematics (House, 2006; Lipnevich et al., 2011). Most importantly mathematics self-efficacy is significantly associated with the

achievement of middle school students (House, 2006). Once again it brings back the importance of building self-efficacy in the early school years, with third grade being most important because this is when word problems become highly incorporated into the math curriculum.

Purpose

The goal of the boardgame is to motivate children in third grade to learn and use problem solving skills. The game will be a resource for teachers to apply in a classroom setting or for parents to use in the home. It will allow children to learn and gain math skills in a fun way.

The product is a math word problem boardgame. The boardgame has an under-the-sea theme. The game consists of 250 word problem questions covering addition, subtraction, multiplication and division. The vocabulary will be at beginning, intermediate, and advanced levels. The questions will be based on the California State Standards for math. Questions will also provide factual information about animals that live in the sea. The students will take turns playing the game by answering the questions accordingly and moving along the game board until getting to the end of the pathway on the game.

Terminology

This section provides definitions of critical terms used in the discussion, design, development, and implementation of this graduate project. These definitions are based on scholarly research and educational literature.

Emotional Self-efficacy: An individual's perceived confidence in his/her ability to regulate negative emotions when activated by stressful or adverse events. (Caprara et al., 2008; Muris, 2001)

Academic Self-efficacy: students' confidence in their ability to master new skills and tasks, often in a specific academic domain (Midgley et al., 1998; Pajares & Miller, 1997; Schunk, 1995)

Academic Intrinsic motivation: Enjoyment of school learning characterized by a mastery orientation; curiosity; persistence; task-endogeny; and the learning of challenging, difficult, and novel tasks. (A.E. Gottfried, 1985, 2001)

Self-efficacy: one's judgment of one's capabilities to organize and accomplish a task (Schunk Pintrich, P.R., & Meece, L., 2008, P.139)

Motivation: the process whereby goal-directed activity is instigated and sustained. (Schunk et al., 2008, P.4)

Flow: The holistic sensation that individuals feel when they act with total engagement in the task, often losing track of time, space and their self. (Schunk et al., 2008, P.254)

Bridge to Next Section

The following sections provide background research and a detailed explanation of the development of the boardgame. Chapter 2, the literature review, explores issues in three areas that are relevant to the project: motivation in math, effectiveness of math games and third-graders' ability to solve word problems. Chapter 3 covers the development of the boardgame, its intention, and its audience. Finally, Chapter 4 presents an evaluation and a discussion of the future plans. In addition, the Appendix provides actual print materials and pictures of the boardgame: *Diving into Word Problems*.

Chapter Two – Literature Review

Introduction

The purpose of this chapter is to explore research on issues relevant to the design and development of a boardgame on learning how to solve math problems. Therefore, the first part of this chapter focuses on research on motivation levels in math, the effectiveness of instructional games, and the ability of third graders to solve word problems. The chapter concludes with a synthesis of the results and their implications for developing the boardgame *Diving into Word Problems*.

Motivation Levels in Mathematics for Elementary School

Gottfried (1985) conducted a study for academic intrinsic motivation amongst elementary and junior high students. The students were from schools in the same school district. The research consisted of three studies. The first participants for the study were 141 white-middle class children from fourth and seventh grade. The second study was composed of 260 black and white middle-class children, grades 4 through 7. Finally the third study group consisted of 166 middle class boys and girls in grades 5 through 8. All of the three studies' participants participated in an inventory that measured their intrinsic motivation for school learning. They were also measured with an inventory that measured anxiety into subject areas. The only difference amongst the groups was that the third group included the teachers' ratings of their students' academic intrinsic motivation, according to how they perceived them in reading, math, social studies, science and in general. Another component that was incorporated in the third group was an instrument used to measure children's intrinsic motivations versus extrinsic motivation in the classrooms. Once the data was collected from the instruments of measure, it was

concluded that there was a positive relationship between academic intrinsic motivation and perception of academic competence. Another conclusion was that there was a negative relationship between academic intrinsic motivation and anxiety, meaning that children with high levels of anxiety had lower academic intrinsic motivation and vice versa. Amongst all three studies math was the component in the inventory measuring academic intrinsic motivation with the most consistency and independent prediction of its corresponding achievement area, aside from any other motivation subscale. The findings of this study help the development of *Diving Into Word Problems*. This study makes it clear that it is important to promote a joyful experience which will motivate learners to engage in math activities. The researcher found that there are high anxiety levels when there is low intrinsic motivation. Therefore, it is important not to make word problems too difficult which would overwhelm the learner. The data also supports organizing word problems by difficulty level.

In another study, conducted by Gottfried et al. (2001), based on the Fullerton Longitudinal Study, which began in 1979 when the participants were 1 year of age, with a sample of 130 participants. When the participants reached the ages of 9, 10, 13, 16, and 17 they were assessed on their academic intrinsic motivation. The reason for those specific ages was because they allowed for comprehensive measurement for academic intrinsic motivation from childhood through late adolescence. The instrument used in the study was reliable and valid for measuring academic intrinsic motivation. The analysis indicated that academic intrinsic motivation is a stable construct from childhood through late adolescence for math along with verbal and general. There is a decline of academic intrinsic motivation over the ages in math, science, reading and for general which suggest

that its decline is related to the school curriculum. Although the greatest decline was in math which supports previous findings such as Gottfried (1985, 1990), it has also been concluded that math is a unique area for academic intrinsic motivation. Along with the school curriculum that effect intrinsic motivation are an extrinsic school atmosphere, an increase in extrinsic consequences and a controlling school environment. The study also suggested that as children continue on to middle school and high school their environments increase their anxiety towards grades and competitive school activities. Overall, it implied that if intervention is going to take place to enhance academic intrinsic motivation, it would be to the best benefit of the child to begin early in their schooling. As previously stated children who begin with lower motivation during childhood are more likely to be at a greater disadvantage over the years. The findings indicate that intrinsic motivation declines in math; therefore, there is a need for activities that support engagement and motivation to help increase intrinsic motivation. A boardgame will introduce the concept of how much fun math can be. The findings of the study support the implementation of thorough explanations of the word problems, in order for the learner to understand how to execute word problems successfully.

Broussard and Garrison (2004) researched classroom motivation and its effect on academic achievement. The participants were children from 19 different schools from first and third grade. The majority of the children were African American or White and only 12 children were Native American, Hispanic/ Spanish/ Latino, or Asian/ Pacific Islander. In total there were 251 children from both grades accounted for the study. The scale used was to assess intrinsic motivation versus extrinsic motivation in the classroom. The scale had items based on 5 subscales: a) preference for challenge, b) curiosity, c)

independent mastery, d) independent judgment and e) internal criteria. Based on those items mastery and judgment motivation were both found to influence higher grades for third grade children. For first grade children, only mastery was correlated to higher grades. The study agrees with previous findings indicating that there are positive relationships between motivation and achievement in young children (Gottfried, 1985, 1990, 2001). A major finding for the research was that intrinsic motivation in the classroom had a positive correlation for academic achievement, predominantly for children in third grade. The results promote the importance of motivating third graders in math, therefore the boardgame *Diving Into Word Problems* is a good method for creating a positive and enriched environment. By creating a positive and fun environment the learners can gain the skills to problem solve and succeed in math.

The Effectiveness of Educational Games for Learning and Teaching Math

Changing the way of teaching math or finding alternatives that actually work may not be easy, but there is research that supports the benefits of choosing activities and games that can help children learn math.

Chang, Wu, Weng, and Sung (2012) created a problem-posing computer system game to identify the effect of the system on problem-posing (accuracy, flexibility, elaboration and originality) problem solving abilities (equation-listing and calculation) and flow experiences before and after. The participants were four fifth grade classes, with a total of 92 participants. The children were divided into two experimental classes, who used the problem-posing system and two control classes who took the traditional paper-based approach for problem-posing. In accordance to their task, there were pre and post tests for problem posing to examine any differences in the students' ability after the

experiment. Once completed the tests concluded that the experimental group performed better than the control group in problem-posing as well as helping improve students with lower problem-solving scores. The system encouraged students to focus again and apply strategies such as review, elaboration, organization, planning and adjustment to process the information given or to make connections with the concept. The students in the experimental group would return to solving the problem to improve their score and view more problems to solve. As far as flow, the students in the experimental group experienced a higher level than those in the control group. The finding correlates with previous research that computer games can encourage higher interest in students which allows higher level in experiencing flow. In conclusion of utilizing the computer system game, the participants performed better in the problem-posing posttest. Although, the study was not conducted on children in third grade it provides useful data on how interest can be obtained from the learners and how there's a high level of engagement that can be reached (flow). The findings for the study focus on how to keep the learners engaged through the content of the questions for the boardgame. The engagement will then create flow, which allows for the learner to focus, succeed and keep working through word problems until the correct answer is reached.

In a related study Durik and Eccles (2006) examined activities that were used during elementary school math and reading lessons. The children in this study were contacted through their school and participated with the consent of the family. The study also consisted of teachers from 12 elementary schools, totaling 126 teachers. The teachers were asked to provide information regarding gender, years of teaching and their current grade level being taught. They were also given questionnaires to evaluate their

experiences while teaching math and reading, as well as the extent to which they adopted goals to promote their student's interest. Another item they were asked to share was the extent of how often they used cooperative, competitive and individual activities for either math or language arts lessons. The results stated that teacher who had been teaching for fewer years used more cooperative activities for both math and reading. Other factors that contributed to selecting cooperative activities, competitive and individual activities were: grade level, subject area and characteristics of the teacher. In addition, as previously stated, cooperative classroom activities have shown to benefit learners on various levels. Other data collected included negative impressions about math and anxiety about their math performance. Therefore, the study suggests that teachers might incorporate activities in their math lessons to sustain the students' interest in math. Although as children continue on to higher grades and they develop more math skills, teachers might encourage more independence to work on their own, but this might instead have negative consequences on the students' motivation and decrease their enjoyment of math. This study's findings indicate the importance of having the boardgame incorporate teamwork. The learners can have a more positive experience in the classroom which may contribute to higher success and new peer relationships.

In another study Baker, Herman, and Yeh (1981) focused on the use of puzzles, games and other instructional additions in relationship to cognitive achievement and affective behavior. There were 72 schools selected for the study in which two second and third grade classrooms were chosen at random. All the students who were selected were assessed in their performance for math and reading by various instruments. Other procedures included were: classroom observations, teacher questionnaires and interviews

about material availability, children were also selected and interviewed on activities they engaged in, what they were more likely to do after completing an assignment and what they liked to do best. From the gathered data it was concluded that puzzles, games and audio-visual activities are used a considerable amount in elementary school classrooms in California. There was also no relationship between children's attitude and instructional options. It was also concluded that children having a difficult time learning were the most likely to be engaged in puzzles, games and audio-visual activities, as these activities serve as break from a stressful and unrewarding experience of trying to learn and failing. Due to educational trends teachers are encouraged to use more individualized approaches to learning, for the learner's individual needs for skill development. The results of the study help in the development of the word problems for the game and provide a variety of styles and approaches to help the learner gain problem solving skills, because one set of cards may be suitable for one group but not for another.

Third-Graders and Problem Solving Skills

In regard to problem solving skills Leh, Jitendra, Caskie and Griffin, (2007) examined curriculum-based math word problem solving (WPS) as a tool to monitor progress in student's rate of growth or slope in achievement over time. Participants for the study consisted of 58 third grade students. From those 58 participants 15% were racially and ethnically diverse, 17% economically disadvantaged and 5.3% spoke English as a second language. The sample also included five children with learning disabilities. The students were first assessed to assign them in the following groups: a) low-performing students or students at risk for mathematics learning difficulties, (b) average-performing students and (c) high performing students. To measure their progress on WPS

they were assessed once every two weeks for 16 weeks. The assessment required the students to answer eight questions in 10 minutes. Results showed no significant changes with children who were low or average, even though the specific tool for WPS was valid for monitoring student progress, for a neglected area in math. Due to the results, evaluations of various reasoning were stated; one being the WPS' complexity had many components in cognitive skills (decoding, reading, comprehension and computation), affecting student progress. Another reason could be that the curriculum or the classroom doesn't address problem solving frequently. The study helps in creating an organization on how to look at a word problem and develop steps to solve them. Therefore, the white board included in *Diving Into Word Problems* is divided into three sections to help the learner become organized in executing word problems. The learners are then able to transfer the learned skills of organization onto school work.

In a previous study Jitendra et al. (2005a) focused on evaluating the validity of curriculum-based word problems as a measure of students' proficiency in math. The participants were 77 third graders from four third grade classrooms. Of the 77 students, 15% were racially and ethnically diverse, 17% were economically diverse, and 5.36% spoke English as a second language. The students were then grouped into four different groups, according to ability levels and assessed with four different instruments. One of the instruments was to measure initial mathematics achievement, another was measuring concepts, processes and skills, and there was also one that measured word problem-solving fluency and finally a math computation fluency measure to coincide with problem solving fluency. After reviewing the scores, it was evaluated that word-problem curriculum based measure tasks was valid in assessing student learning. Another of the

study's findings coincided with previous research that math is a complex subject that draws on many different cognitive abilities. In correspondence to the previous study by Leh et al. (2007) this study also showed that problem-solving tasks require reading, problem representation and solution skills in math. Therefore, the game will support the learners in what needs to be identified in word problems to solve correctly. The findings for the study also support the organization of steps for executing a word problem by using the method of steps.

Jitendra et al. (2007) conducted another study in which schema-based instruction (SBI) was acquired to investigate the effect it has on skills for solving math word problems, while applying SBI to a different group of children to find a difference. Another concept that was examined was the influence word problem-solving instruction on the skills for word problems in the development of number operations. The experiment had two studies. The first study obtained 40 third grade students, in which 15% were African American, Hispanic or Asian, 17% were economically disadvantaged and 5% were English language learners. The students were then grouped by ability level (low and high). The results for the first study stated that SBI helped identify effective ways to improve problem-solving curriculum, as well as making it easier for teachers to implement and students to learn. The second study held 56 third grade students in which 20% were African American, Hispanic or Asian. Within the group there were nine children who either had a learning disability, attention deficit disorder or were considered low achievers. The results for this study was small to moderate improvements in word problem-solving and calculation performance, also the students who were low performing benefited. High performing students made the least amount of improvements.

This study supports the creation of an expansion of a new set of cards with word problems. It supports not only focusing on children struggling with math, but also those who excel in it. It is why creating a set of advanced level cards for advanced learner is a great addition to the game.

Synthesis

The research supports the development of the boardgame *Diving into Word Problems*. It identifies the factors that need to be addressed to get children motivated and to successfully solve math word problems. First, the game needs to be motivating. Learning math through playing a game can be motivating by itself, but making sure that the content is motivating is another aspect. The game should have a topic area that can interest the targeted group, as well as having a variety of ability levels for questions so that children can gain self-efficacy in math and don't become anxious. Second, it is known that regarding word problems, children have most difficulty when it comes to math. This is because of the complex language structure and the learners not having mastered all the skills and/or because of the complexity of cognitive abilities it requires. Therefore, providing guidance by identifying key math vocabulary may be of help to thrive in answering correctly. Overall, by providing alternative activities to teach math the learners have the opportunity to step away from stressful assignments and start having fun learning math.

It is why I have come forth with the idea of creating a math word problem game that can help children learn the skills needed to solve correctly for word problems and that will provide a fun way to learn and motivate them to engage in more math activities.

Chapter 3 – Audience and Implementation Factors

Introduction

The boardgame *Diving Into Word Problems* is a much needed product that helps young learners gain the skills to problem solve and to become motivated towards math. As noted in Chapters One and Two, math scores in the U.S. are fairly low and children are not motivated to engage in mathematics. Also research supports the use of games as an effective way to help teach math. Therefore, in order to address the need for alternative ways of teaching problem solving, I developed the boardgame *Diving Into Word Problems*. This chapter provides an explanation of the tools used to design and develop the game, its audience, the environment and equipment needed to conduct the boardgame, and details of the content and procedures.

Development of the Project

Introduction.

The development of *Diving Into Word Problems* came about through three significant phases. Each stage helped gradually mold the boardgame into its final product.

Evaluation of a similar product.

The first step to help further develop my game was to evaluate others that are out on the market. After doing various research on the Internet and local stores such as Toys ‘R Us, Target, and Lakeshore. I came across a variety of games for word problems. One that I found most similar to my boardgame was *The Math Star Word Problem Game*. The game is based on a space theme, in which the children are navigating around space. As they move around and answer questions, for any correct answer there is a chance of

collecting a power cell, which they want to gain four of to win. There are four topics that are color coordinated, which indicates what type of questions you will be answering. The game covers topics such as money, geometry, operations, algebra and many others. To evaluate the product, Dr. Jeffries' JIP evaluation form was completed (See Appendix A for the completed form). The evaluation helped to determine important components for instructional games such as content, levels of activities, and development appropriateness for the target audience and other matters. The differences for *Diving into Word Problems* are the following: The questions will vary by beginning, intermediate and advanced levels and will provide helpful hints according to its level of difficulty. Also, there will be no rewards or penalties for correct or wrong answers. The questions will also contain fun sea-animal facts. Another component incorporated is positive peer interaction. The game encourages players to use positive words by cheering one another on.

Dick, Carey, and Carey Model.

The Dick, Carey, and Carey Model was used to design and develop the boardgame. The model was introduced in a course; Introduction to Instructional Design (EPC 615). The model is made up of ten process components; starting by identifying instructional goals and ending with a summative evaluation. There are nine steps in a repetitious cycle and a culminating evaluation of the effectiveness of the instruction. The first step is the creation of instructional goals to identify what the learners are expected to accomplish by the end of the instruction. The instructional goal for this game is that the learners (children ages 7-9, 3rd grade) will solve word problems up to an advanced level from playing *Diving Into Word Problems* for a month. The second step is the instructional analysis, a list of steps of what the learners will be doing when performing

the goal. The skills that the learners need to acquire are the following: the student needs to read the card with the word problem, identify the corresponding symbol of operation to the key vocabulary words, identify the numbers that will be part of the operation, and solve for the equation. This step is to verify what skills and knowledge are required for each step, but overall to reach the goal. The third step is to analyze learners and context to determine the learner's present skills, attitudes and preferences. One item of review was the California State Math Standards for third grade in order to create appropriate word problems. I also conducted interviews with teachers, parents, and students. The teachers shared information about the class' progress in math, perceived motivation, areas of struggle, and instructional math games being used. The parents' interview gathered information on perceived struggles, motivation, and resources used. Finally, the students were asked if they enjoy math, what they like and dislike about math, what they find difficult and whether they would enjoy learning this topic with games and activities. The fourth step is the performance objectives which indicate what the learners will do with the learned skills. By learning problem solving skills, students will have the ability to identify key words, create number sentences with the appropriate symbols of operation and solve word problems properly. Knowing how to dissect a word problem helps improve learner's comprehension of word problems. The learners will gain the skills necessary to do simple math such as adding, subtracting, grouping, multiplying, and dividing. The fifth step is the development of assessment instruments. This is where a pre and post-test will be developed as an assessment to measure the learner's ability to perform what was stated in the objectives. The creation of practice word problems varying in difficulty from basic, intermediate, and advanced is the key component of the

game. The students are asked to identify the highlighted key words that help identify the operation that will be used and the numbers for the operation. The students are then asked to create a math sentence and to solve it (e.g. $5+5=10$). With the students' increasing problem solving skills, the highlighting will be taken away and they will identify all the key information. The sixth step is the instructional strategies which includes pre-instructional activities, presentation of information, practice and feedback, testing, and follow through activities. The creation of *Diving Into Word Problems*, allows students to learn in a fun way, but also in an environment that doesn't cause anxiety or pressure. The game requires the students to be engaged doing math and trying to grasp the skills needed to solve word problems, but it is not like an assignment that requires a specific date or grading. The word problems are created according to the California State Math Standards. The seventh step is the development of instructional materials, either existing ones or creating new ones. *Diving Into Word Problems* consists of-1 game board, 1 die, 4 pawns, 1 white board and dry erase marker, 2 sets of cards, each with 120 question, and 1 booklet with full explanation of how to solve all the cards word problems. The eighth step is to design and conduct a formative evaluation to collect data to identify how to improve the instruction. I created a mock-up of the game which I was able to share with my colleagues for feedback in an instructional design course. The feedback I received was very valuable. Some of their feedback helped me further develop appropriate questions and to increase the intended audience for the boardgame. See Chapter Four for specific feedback and results. A survey was also created that consists of nine *yes* or *no* questions and an additional four questions that allows for additional comments and suggestions. The survey was distributed to third grade teachers. The ninth step is to revise

the instruction using the data from the formative evaluation to examine and eliminate barriers that may prevent the learner from achieving the learning objective. See the data and resulting modifications outlined in Chapter 4 and Appendix. This phase also helps to refine techniques and materials. The final and ultimate step is to conduct a summative evaluation to determine the value of the instruction. This will be an experimental study to determine whether or not the instructional goal was reached. See Chapter 4 for summative evaluation details.

One of the contexts in which the Dick and Carey model is directed to is K-12 education, which is the population that *Diving Into Word Problems* focuses on, more specifically for third grade. The model creators also identified characteristics of their model that makes it a well-developed and high reliance. The model is goal directed in which all components work together, all components depend on each other, the system uses feedback to determine if the goal is being met and modifications will be made until the goal is reached.

Intended Audience

There are three intended audiences for this game. One is students in third grade, ranging from 7-9 years of age, both male and female and of all ethnicities, cultures and race. The game aims towards students who have difficulty solving word problems and low motivation in math or who are struggling in the subject. Their reading levels vary between second grade and third grade. The students vary in language classifications such as: English Learners (EL), English Only (EO), Initially Identified Fluent English Proficient (IFEP) and Reclassification English Fluent Proficient (RFEP). The learners typically have basic motor skills; hand-eye coordination to grab the game piece along the

board, roll the die, and hold on to the cards. The learners have relatively fair vision in order to read the questions, as well as to move on the board. This specific group interacts better with visual materials and physical engagement. Their preference of learning and engaging in activities is by having the opportunity to manipulate the materials. They find joy in playing games with their friends because they have the opportunity to converse and to do something “fun,” stepping away from classwork or homework. They highly enjoy cartoons and movies e.g. SpongeBob, Phineas and Ferb, Cars, Toy Story, Kung Fu Panda, etc. There are also a high number of students who are involved in extracurricular activities such as: soccer, basketball, ballet, karate, gymnastics, etc. Some of their interests are animals; they often express what their favorite animal is and sometimes give facts about animals as well.

The other two target audiences for the product are third grade teachers and parents; both male and female, and of all ethnicities, cultures, and race. These teachers and parents have children who struggle or have low motivation for solving word problems. The teachers are able to identify if word problems is an area of difficulty for their students. The teachers have the following knowledge and skills: they know children have different learning styles (e.g. visual or hands on), are aware that children enjoy playing games, and can identify what resources are motivating for their students. The teachers are experts at specific strategies for solving word problems and can provide the support needed. As for the parents, they can read at second grade level English. The parents are able to compute addition, subtraction, division and multiplication. Parents have adequate vision in order to read the word problems and rules. The parents are concerned about their children’s math abilities. They are motivated to help their children

and become involved in their learning process. The parents feel that math games are an important resource because it's a great way for children to learn. Overall, they feel that math is an important school subject and that their children should be performing well.

Personal Qualifications

Diving Into Word Problems requires students to have certain knowledge and skills in order to play productively. They must be able to read at least second grade level literature. They must compute simple math skills such as, adding, subtracting, multiplying and dividing. The last component they must meet is having basic motor skills; hand-eye coordination to grab the game piece and move it along the boardgame. The learners also have to communicate with other players. The players must practice appropriate manners when communicating with others throughout the game. Some incidents are asking for something and cheering.

The boardgame is specifically designed for use by third grade teachers. These teachers must have basic motor skills; hand-eye coordination. They must be fluent in English and be able to speak clearly. The parents should be able to read English at a second grade level and speak fluently. They must have basic motor skills as well. Parents must have the following basic math skills: addition, subtraction, multiplication, and division.

Environment and Equipment

The boardgame can be played just about anywhere. There needs to be a relatively flat surface, such as a table, floor, or lawn. The game includes all the materials needed to play, allowing for it to be played in various places. *Diving Into Word Problems* can be

incorporated by teachers in the classroom during math instruction and parents can play with their children at home.

Project Outline

Description of the boardgame.

The box for the game contains important information. The top part of the game box has a sea design with all the animal characters of the pawns included in the game. On the side it states that it's for 1-4 players and for children ages 7-9. The box is made up of recycled materials. The bottom part of the box states what materials are included in the box, how to set up the game, how to play and the objective of the game. It also states that the game meets the California State Content Standards for Math. The board of the game is made up of a path with four different colored spaces. The blue, green and purple spaces are for questions in the beginning and intermediate level. If the player lands on a yellow space "Challenge Space," the question for this space is an advanced level question. There are two corresponding sets of cards with the board. One set is for learners who are having difficulty with math. The other set will be for learners who are exceeding in the subject. The answers are provided on the back. The cards are made of recycled paper, as well. They are also laminated for durability. A white board with a marker is provided to solve the equation. This is due to conservation of paper. The white board is separated by three sections. One section is labeled "Key Words" where they're supposed to write down words that signify addition, subtraction, division, multiplication and equals. The second section is titled "Important Numbers," this section is to help identify what numbers are being used to create an equation. The final section is labeled "Math Sentence," where the learner will create an operation to solve for and produce an answer. The four pawns

provided are of four different creatures found in the ocean. The pawns are sturdy, lightweight and made of recycled household materials. The die is for each player to roll on their turn, which will tell them how many spaces to move along the board. The last component of the game is a booklet of all the answers for the word problems of the game. The answers contain a full step by step explanation. The booklet is made up of thick, sturdy recycled paper, which is laminated. For pictures of the game components see Appendix B-D.

Content of the cards.

The content of the boardgame's word problems were constructed using simple vocabulary, creating beginning and intermediate level questions. There is also the opportunity to engage in advanced level questions. The content of the questions are on sea-animal facts and the California State Content Standards for Math.

There are two sets of cards that are differentiated by difficulty levels. The first set of cards is for learners who are struggling solving word problems; basic level. The language for these questions is set on a second grade and third grade vocabulary. It will provide more obvious and basic level math key words, for the purpose of learning the basic skills of problem solving. In accordance to the color coding of the gameboard, the blue and purple will be beginning level questions. These questions provide key math vocabulary that will be highlighted, as well as three answer choices. The green section will be intermediate questions which will only provide highlighted key vocabulary words. Then the yellow section; the "challenge space" will have no guidance/help, it will just have the word problem written. Each card is labeled on the bottom right corner with "Card # ___". The second set of cards it is for learners who excel in solving word

problems; overall excel in mathematics; Challenge level. This set of cards will not include key math vocabulary, but will provide guidance. There will be beginning, intermediate and advanced level questions. The questions also have the same color coding. The blue and purple are the beginning level that have only the key numbers highlighted; this provides the hints for the math operation that needs to be performed. They also provide three answer choices. The green space are again the intermediate level questions in which the learner only has key numbers highlighted and they have to try and identify what operation needs to be solved. The yellow space is the challenge space; here there is no help and some are made up of up to two steps to solve. This set of cards also has each card labeled on the bottom right corner, but with “Challenge Card # ___”, in order to differentiate the two set of cards.

Activities.

In implementing the game having two set of cards, the same materials will be used for both. The two levels that can be played are basic level and challenge level. The purpose of reaching the end of the boardgame is applied to both set of cards. If the players are playing with the basic level cards the goal is to move up to the challenge level in order to expand problem solving skills. When the players play with the challenge level cards the goal is to master problem solving skills with various math vocabulary.

Outline.

Diving Into Word Problems Boardgame

- I. Game Contents
 - A. Written Materials
 1. Answer Booklet

2. Directions and Rules

- B. Cards

1. Basic Level

- i. California State Content Standards for Math
- ii. Sea-Animal Facts
- iii. Addition, Subtraction, Division and Multiplication
- iv. Key words
- v. Second and third grade level language

2. Challenge Level

- i. California State Content Standards for Math
- ii. Sea-Animal Facts
- iii. Addition, Subtraction, Division and Multiplication
- iv. No keywords
- v. Third and fourth grade level language

- C. Game Tools

1. Boardgame
2. Pawns
3. Die

- II. Game Play Activities and Steps

- A. Basic Level

1. One player or get into a group of 2-4
2. Choose a one of the four pawns

3. Identify who is the youngest player is to start and the person to the left continues
4. The first play must roll the die and move the number of spaces provided
5. Then pick a card and read the question with the color bullet point that matches the space landed on
6. Answer the question by using the whiteboard
7. Check answer on back of the card
8. If a player answers correctly or is having trouble answering the word problem, the other students are encouraged to do a cheer for them. If playing alone once done tell someone you answered correctly and get a high five or if s/he had trouble with a question, ask an adult at the end for help or self-check with the answer booklet.
9. Steps four through eight will be repeated for every player until one reaches the castle.
10. Once a player reaches the castle, it means s/he wins the game!

B. Challenge Level

1. One player or get into a group of 2-4
2. Choose a one of the four pawns
3. Identify who is the youngest player is to start and the person to the left continues
4. The first play must roll the die and move the number of spaces provided
5. Then pick a card and read the question with the color bullet point that matches the space landed on

6. Answer the question by using the whiteboard
7. Check answer on back of the card
8. If a player answers correctly or is having trouble answering the word problem, the other students are encouraged to do a cheer for them. If playing alone once done tell someone you answered correctly and get a high five or if s/he had trouble with a question, ask an adult at the end for help or self-check with the answer booklet.
9. Steps four through eight will be repeated for every player until one reaches the castle.
10. Once a player reaches the castle, it means s/he wins the game!

Chapter Four – Conclusion

Summary

In Chapter One it is put forth that there is a need in supporting the learning of word problems, due to low levels of math proficiency in the United States. The purpose of this project was to create a boardgame that would motivate third grade students to gain and use problem solving skills. Chapter Two reviews literature on important concepts that helped develop and design *Diving Into Word Problems*. Chapter Three introduces the tools that were used to design, which includes the Dick, Carey and Carey Model, evaluation of similar product and evaluation by colleagues. It also includes the details of the completed project. This chapter reviews and discusses the evaluations of experts. It concludes with future plans for the project.

Evaluation

For the evaluation of *Diving Into Word Problems*, three third grade teachers from the same elementary school were asked to answer a thirteen question evaluation (See Appendix D for the evaluation form). There was evaluator A, evaluator B and evaluator C. The evaluation had nine yes or no questions and an additional four, labeled A-D they were asked to provide their thoughts and ideas about the game. The first question asked if *Diving Into Word Problems* provides a more successful way of presenting word problems. Evaluators A,B, and C answered yes. Question number two asked if the word problems provide appropriate vocabulary for the audience. All three of the evaluators answered yes. Question number three asked if the difficulty levels of the questions are appropriate. All three evaluators answered yes. Question number four asked if the rules are clear and easy to follow. All evaluators answered yes. Question number five asked if

the game seemed motivating. All evaluators answered yes. Question number six asked if the under-the-sea theme is appropriate for the age group. All evaluators answered yes. Question number seven asked if the graphics for the game are appropriate and appealing for the audience. All evaluators answered yes. Question number eight asked if they would use the game as an additional tool to practice word problems. All evaluators answered yes. The tenth question asked if they would recommend this game. All evaluators answered yes. In the second section of the evaluation, they were asked for their ideas and thoughts. Question A asked if they had any ideas for other types of questions. Evaluator A answered that he liked the array of questions, but suggested to include questions using facts about endangered species or extinct marine life. Evaluator B stated she enjoyed the questions. She also liked the wide variety of vocabulary for the different operations. Evaluator C stated he liked the science relation the questions provided. Question B asked what they thought about the booklet and if they had any ideas for it. Evaluator A answered that it was well done. Evaluator B stated that they liked the clear explanation of the word problems and how the key vocabulary is highly focused on. Evaluator C stated that the booklet is very nice because it makes self-checking very easy. Question C asked what they liked and disliked about the game. Evaluator A answered that playing a game for word problems is a great idea. Also, that it's good practice and it's motivating. Evaluator B answered that they liked the game because it approaches a difficult concept for kids in a fun and exciting way. It was also stated that the game was perfect because kids learn more when they think it's a game. Evaluator C stated that there were no dislikes that they would actually like to own the game to use in the classroom. The final question, question D asked if they had any additional comments or suggestions.

Evaluator A suggested adding a set of cards or booklet with pictures of all the sea-animals included in the game, for the visual learners. Another suggestion was to provide an additional space on the white board for the players to draw to the problems. The last suggestion was to provide wrong answers to the questions that provided choices. The reason for it would be to provide typical calculation mistakes or using the wrong operation. Evaluator B stated that they liked that the players are not penalized for answering incorrectly because that way they maintain motivated and will want to continue playing. Evaluator C also suggested providing a space for illustration so that the players can visualize the word problems. In addition to the feedback of the evaluators, evaluator C made the decision to have his classroom play the game. Before the children he selected started playing, he expressed that the children were impressed by the graphics on the box and that they automatically started naming all the animals. He stated that he was impressed how easy it was for the children to read the rules and play on their own. He also exclaimed that the children really enjoyed the game and were actually learning how to dissect the word problems and learning more about sea-animals. In accordance to their word problem solving skills, he mentioned that he liked how the white board was divided into sections because it helped. Also, that since he only choose three students to play that the other children kept asking when they were going to get a turn.

Conclusion

In conclusion to the feedback given by the evaluators, there were a couple of important concepts that I considered. The first thing was based on question D in where evaluators A and C suggested providing a space for illustration. I have provided a slightly bigger whiteboard that is now divided into four sections. The original three remain the

same but the new addition is labeled “Picture.” The second thing that was suggested was providing pictures either on the cards or as an additional booklet. The suggestion is definitely considered for future changes, but it is under revision on how it will be incorporated. The final suggestion being considered is by evaluator A based on question D about other ideas for the questions. Evaluator A suggested for the questions that provide answer choices for those choices to be based upon typical calculation mistakes or using the wrong operation. This suggestion is going to be incorporated. All the cards will be revised and provide specific answer choices. As stated in Chapter Three, my colleagues also helped in providing feedback. Their first suggestion was the development of the questions. Since I had shared that I wanted to arrange them by difficulty level, they questioned how questions would be differentiated by difficulty levels. Their questioning helped me create the beginning level to provide the most guidance; highlighting key vocabulary and numbers as well as providing answer choices. The intermediate level questions are to only provide the highlighting of key words and numbers. Then the advanced level questions are to just simply provide the word problem without guidance. Another concept they helped with was the intended audience. At the beginning I had only thought about making specifically for teachers, for schools. My colleagues suggested that I should expand so that it can be used outside of school, by the parents. I absolutely made the accommodations for the game to be used in the classroom and in the home. Making such changes have and will help *Diving Into Word Problems* to become a much better product and effective towards children having fun while learning through play.

Future Work

One of the future plans for the game is to conduct a summative evaluation in order to determine how effective it is. I would first get the funding to conduct the evaluation in various elementary schools for third grade students, ages 7-9. The group will consist of children who are racially and ethnically diverse, range of social economic status and children with learning disabilities. Once the participants are gathered they will be divided evenly into three groups. One group will be a control group in which the students will be taught through presentation by the teacher and their mathematics textbook, they will only participate in traditional math activities. A second control group will also be taught by the teacher and their textbooks, and will engage in additional math rehearsal activities and games. The last group will be the experimental group in which students will still be taught through the presentation by the teacher and their textbooks, but will also play *Diving Into Word Problem*, as additional support. All participants would undergo a pre-test in which beginning, intermediate and advanced level questions are asked. Along with the pre-test, the students will be provided with a questionnaire about their feelings towards math. After the pre-test and questionnaire, the three groups will each be separated in additional groups. The first group is for those who are low performing, second is average performing and the last will be high performing. Once the groups are set I will have the experimental group students play the boardgame for a month, two or three days out of the week. The reasoning for separating them amongst those three groups is to apply the appropriate set of cards, either “Basic Level” or “Challenge Level.” The separation into groups will also help identify improvement. Control group two will do additional math activities for a month as well for two or three

times out of the week, for one month. After a month all students will take a post-test with the same questions, as well as complete the questionnaire. The evaluation results will determine whether or not the game reached its goal of helping third grade students gain problem solving skills, have a more positive attitude towards math, and increase their self-efficacy. My ultimate goal for *Diving Into Word Problems* is to publish to make it easily available to teachers, parents, and children in stores such as Target, Toys R' Us, and Walmart at a reasonable price. In the future, I would like to reach a greater audience of learners by developing versions of *Diving Into Word Problems* for other grade levels. I would also like to make it into a software for those who have access to a computer.

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Appendix A

Evaluation of Similar Product

JIP EVALUATION FORM

1. GENERAL INFORMATION
<p>Product Name: The Math Star Word Problem Game</p>
<p>Type of Product: Board Game</p>
<p>Publisher/Company: Lakeshore</p>
<p>Copyright/Publication Date: 2002</p>
<p>Cost: \$24.95</p>
<p>Target Audience: 4th- 6th graders/ 9 years – 11 years</p>
<p>Brief Product Description: (general goal, components/sections/topics, sizes/comprehensiveness, type of media, etc.)</p> <p>The game is based on a space theme, in which the players are navigating around space. As they move around and they answer questions, for any correct answer there is a chance of collecting a power cell, which they want to gain four of to win. There are four topics that are color coordinated in both the game board and the question cards.</p>

2. PACKAGING, INFORMATION SHEET, HOME PAGE	Yes	No
Is the target audience's age range or required knowledge/skill level stated?	X	
Does the audience age range or required knowledge/skill level seem appropriate?	X	
Are there appropriate product and use warnings/limitations/requirements listed?	X	
Is the content accurately represented?	X	
Are the listed awards/endorsements/accolades independently earned?		X
Are the educational goals and objectives presented and accurate?	X	
Are the components/parts/sections listed and accurate?	X	
Are graphics present and attractive to the target audience?	X	

Is the information/packaging appropriate/safe for the target audience?	X	
Is the art style appropriate and timely for the audience and topic?	X	
Total Number of <i>Yes</i> Checks	9	

Explanation/Comments: The packaging is very simple and not very attractive. I feel that the top part of the box has too many words and that there needs to be more graphics. The bottom part of the box has the rules and information of the game alongside with a picture of the game board and other material. That helps to see what is inside and how to play.

3. CONTENT & PEDAGOGY	Yes	No
Is the content accurate?	X	
Are topic and audience experts (consultants, editors, authors) cited?		X
Does it address and list state/national standards or regulations?	X	
Does it use appropriate vocabulary for the topic and audience?	X	
Does it review background knowledge and skills needed for use?		X
Can it be easily integrated into a learning context?	X	
Are the guides/instructions/activities/content clear, complete, & appropriate?	X	
Are the instructional goals and objectives clear, appropriate, and realistic?	X	
Does it present a novel/better way of addressing the topic?	X	
Does it have individual and multiple user options?		X
Are many modalities and senses addressed/elicited?		X
Does it address different genders, cultures, and backgrounds?	X	
Is it developmentally appropriate?	X	
Are there multiple and increasing layers of complexity?	X	
Are the content and activities challenging but not overly difficult?	X	
Are the content and activities relevant?	X	
Is it interactive or does it stimulate interactivity?	X	
Does it stimulate curiosity and invite exploration?		X
Does it promote problem solving, inquiry, and creativity?	X	
Does it instill/model/promote morals and values?		X
Total Number of <i>Yes</i> Checks	14	

Explanation/Comments: The game is organized according to topics in math. It has questions on: money, geometry and measurement, operations and patterns and algebra. The questions are in word form, filling in the blanks, true or false and solving for a variable. The word usage is very simple and clear for the players, but also the concepts they use in their problems are things they can relate to, such as: going out with friends, getting ice cream, going to the library, and many more. The concept that is not appropriate is the

rewarding system it provides. The players are rewarded with a cell only when s/he answers correctly. This can create negative attitudes and decrease motivation in the learners.

4. ARTWORK & GRAPHICS	Yes	No
Do the artwork and graphics depict the topic in a realistic, accurate, complete, and/or appropriate manner?	X	
Are the artwork and graphics clear and do they help explain content?	X	
Are the artwork and graphics developmentally appropriate and appealing?		X
Does the artwork appropriately depict a balanced racial, age, and gender mix?		X
Do the artwork and graphics adhere to graphic design principles?	X	
Total Number of <i>Yes</i> Checks	3	

Explanation/Comments: At first glance the game's board is a little overwhelming with all the colors. Also it is a little confusing to where you're supposed to start just by looking at it. The box for the game is a little dark, in comparison to the board. On the board there are symbols in each space which are easy to identify what topic you will be answering a question for. The theme to the game is a space theme which gears mostly to males.

5. USABILITY	Yes	No
Does the product fill a specific need or set of needs?	X	
Does the product do what it should and what it advertises?	X	
Is there an explanation of how to implement/use/navigate the product?	X	
Is it well-designed/long-lasting/durable?	X	
Is it easy to access/compact/portable?		X
Does it encourage social learning or collaboration?	X	
Is it environmentally friendly? (avoids all types of pollution, e.g., noise, odor, including wasting energy or paper in order to develop or to use it)		X
Is it practical, easy to read, and easy to use/navigate?	X	
Is the product complete (are content, sections, or physical parts missing)?	X	
Does it require minimal preparation/background knowledge to use/implement/deliver?	X	
Total Number of <i>Yes</i> Checks	8	

Explanation/Comments: The product doesn't give suggestions about various ways in which it can be utilized. The only alternative they give is how to play it in a shorter amount of time. The materials needed for the game are minimal and are durable and can be replaced with homemade or any other products. I feel like the box is too big. The game doesn't require for an adult to implement the game, the learners can do it on their own. It's also a great way for the learners to socialize with peers.

6. SECTIONS/COMPONENTS & COST	Yes	No
Are all parts/sections included?	X	
Do the parts/sections appear to be safe/appropriate for the age group?	X	
Are the parts durable/washable/reusable?	X	
Are all the parts/links functioning/complete?	X	
Is it logically sequenced/organized?	X	
Is reference and resource information included?		X
Do the buyers get value for their money/time?	X	
Does the cost seem appropriate in comparison to similar products?		X
Is it more than an exciting package or fun idea?	X	
Is the cost affordable for the target audience?		X
Total Number of <i>Yes</i> Checks	7	

Explanation/Comments: I think that the cost for the game is a bit high. The materials are simple, therefore I feel that the price is not adequate. The idea of the game of practicing word problems through a game is very exciting and inviting for the audience.

OVERALL RATING	Total Number of <i>Yes</i> Checks
PACKAGING AND/OR INFO SHEET	9
CONTENT & PEDAGOGY	14
ARTWORK & GRAPHICS	3
USABILITY	8
SECTIONS/COMPONENTS & COST	7
TOTAL PRODUCT SCORE	41

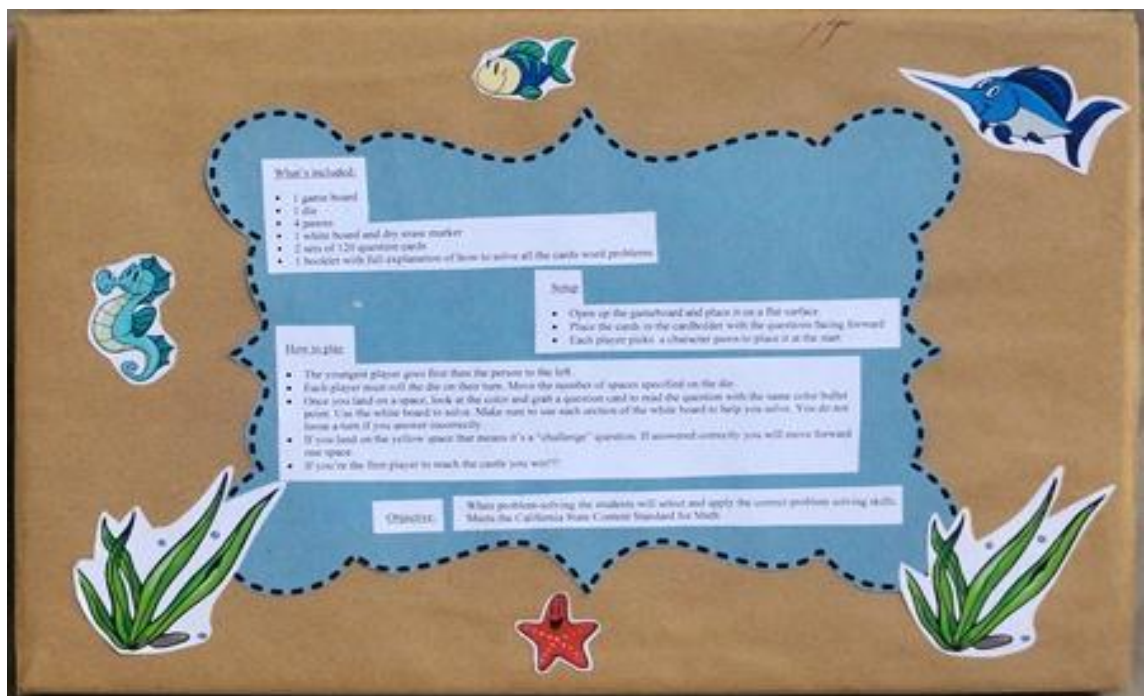
EVALUATION SCALE:

49 - 55 EXCELLENT 35 - 43 NEEDS EMBELLISHMENT 0 - 29 USER **JIPPED!**
 44 - 48 VERY GOOD 30 - 34 NEEDS MUCH WORK

Summary Explanation/Comments: The content of game to practice word problems is great. It is a more fun way to learn, work with others and being in a non-stressful environment. The word usage in both the cards and rules is user friendly. The only thing that I feel needs changes is the graphics and color on the box doesn't stand out and is not eye catching. The board is the quite opposite. It's very busy. As for the content, the components that I feel show be eliminated or revised is the rewarding system because it may take away some of the fun component and not be inviting for the learner.

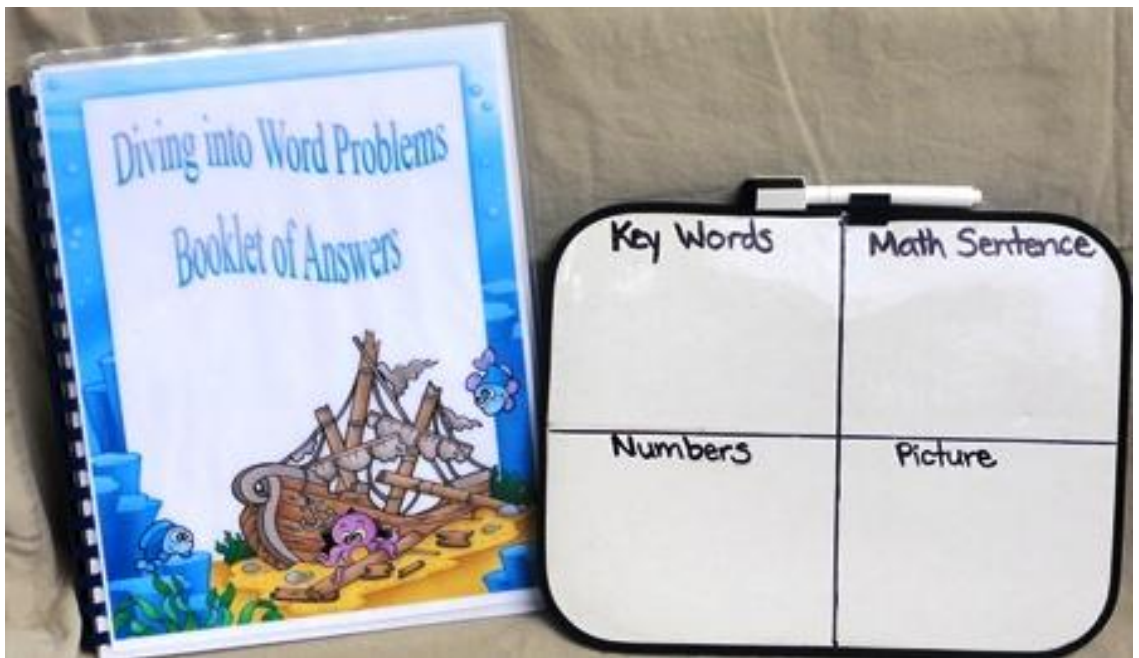
Appendix B

Box for the Game



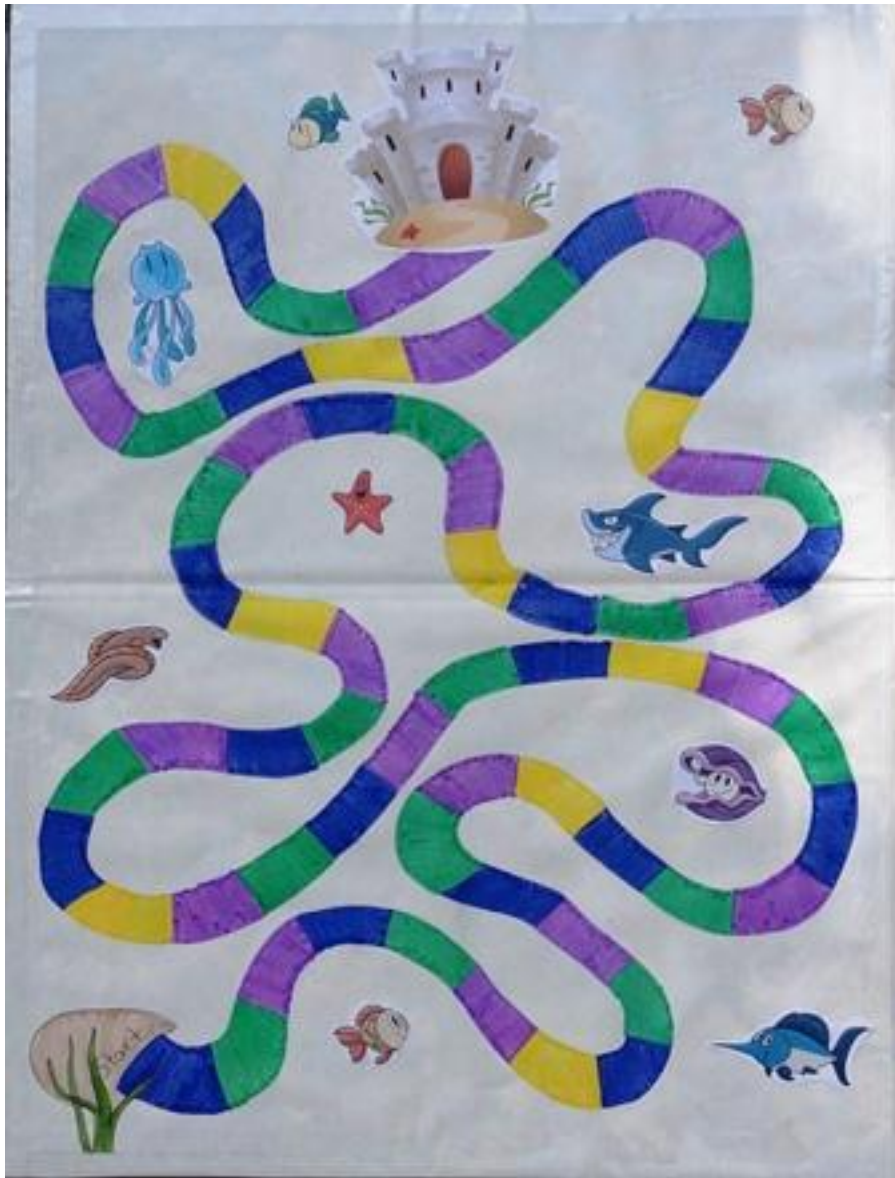
Appendix C

Materials for the Game



Appendix C- Continued

Materials for the Game



Appendix C- Continued

Materials for the Game

• A Whale shark has 310 rows of tiny teeth, it lost 33 rows and has been able to grow back 11. How many rows of teeth does the whale shark have?
a. 266 b. 288 c. 353

• The Weddell seal grows to be 30 feet long. It is currently 25 feet and 3 inches long. How much does it need to grow?

• A seahorse flutters its fin 35 times per second. It fluttered for 2 minutes. How many flutters did it take?
a. 4,400 b. 4,210 c. 4,200

• There are 4 seahorses. They measure, .6 inches, 3 inches, 4.3 inches and 2.8 inches. What's their length?

Challenge Card # 8

• 288 Rows Of Teeth

• 4.7 Inches (in.)

• 4,200 Flutters

• 10.7 Inches

Challenge Card # 8

• In order to maintain its weight the Blue whale eats about 5 tons of food each day. If it eats that much food for 7 days. What is the **product** of food the Blue whale eats?
a. 2 b. 35 c. 45

• A Bottlenose dolphin can live up to be 40 years old and an Orca can live up to be 80 years old. What's the **difference** of years that an orca live up to be?

• An octopus has 3 hearts. If there is a group of 8 octopus. What's the **product** of the hearts in the group?
a. 24 b. 21 c. 5

• There are 10 starfish lined up and together they measure 60 inches. How many inches does each starfish measure?

Card #8

• 35 tons

• 40 years

• 24 hearts

• 6 inches

Card #8

Appendix D
Evaluation Form

Name: _____ Title: _____

Evaluation Form

Please answer questions 1 – 9 by simply checking either yes or no. Following are additional questions A-D where I would like to hear some of your thoughts and ideas about the game. Thank you for your participation.

- | | | |
|---|-----------|----------|
| 1. Does <i>Diving Into Word Problems</i> provide a more successful way of presenting word problems? | _____ Yes | _____ No |
| 2. Do the word problems provide appropriate vocabulary for the audience? | _____ Yes | _____ No |
| 3. Is the difficulty level of the questions appropriate? | _____ Yes | _____ No |
| 4. Are the rules clear and easy to follow? | _____ Yes | _____ No |
| 5. Does the game seem motivating? | _____ Yes | _____ No |
| 6. Is the under-the-sea theme appropriate for the age group? | _____ Yes | _____ No |
| 7. Are the graphics for the game appropriate and appealing for the audience? | _____ Yes | _____ No |
| 8. Would you use the game as an additional tool to practice word problems? | _____ Yes | _____ No |
| 9. Would you recommend the game? | _____ Yes | _____ No |

A. Do you have any ideas for other types of questions?

B. What do you think about the answer booklet? Do you have any ideas for it?

C. What do you like about game? What do you dislike about game?

D. Additional comments and suggestions.