AN IN-DEPTH DESCRIPTIVE CASE STUDY OF THE DEVELOPMENT

OF

5 A DAY ADVENTURES, THE CD-ROM

by

Mary Guy Miller

Dissertation submitted to the Faculty of the

Virginia Polytechnic Institute and State University

in partial fulfillment of the requirements for the degree of

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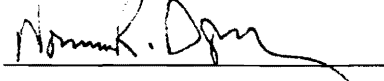
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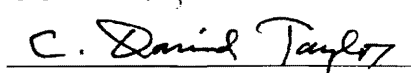Curriculum and Instruction

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(ABSTRACT)

The development of multimedia based educational materials have experienced major growth in the past three years. While many models of instructional development exist, most are narrowly focused and are rarely illustrated with actual project development. This dissertation addresses the development of *5 A Day Adventures*, a multimedia CD-ROM based product. This study provides details on the design decisions as documented in the historical records with supplementation of personal knowledge of the development of the program. The study includes data regarding the identification of program objectives, instructional design strategies, formative evaluation, and implementation.

ACKNOWLEDGEMENTS

Personal relationships are the fertile soil from which all advancement, all success, all achievement in real life grows.

Ben Stein

It is a joy to pause in this process to acknowledge just of few of the many talented, generous and loving individuals who have contributed to my personal development and the development of this dissertation.

First, I must acknowledge Dr. Lorelei DiSogra and the Dole Food Company. This document would not have been possible without their support. Their generosity in allowing me to design, develop and track the implementation of this project is greatly appreciated. Dr. DiSogra is a woman of vision who is on a mission to make a difference. She has made a difference in my life, and I acknowledge her for it.

Secondly, special acknowledgment must be given to the five individuals whose names appear on this document. While each one is an outstanding professional in their field of study, they are even more outstanding as human beings. They are my instructors and my friends. They are true educators who unselfishly give of themselves to nurture their students. From the moment I met Dr. Norm Dodl, in 1983, I was in awe of his vision for technology in education. Every student who has ever been associated with Curriculum and Instruction at Virginia Tech has been influenced by Dr. Dodl. Dr. John Burton is a man of impressive wisdom and style. He is a valued educator and I have greatly benefited from his wit and wisdom. Dr. David Taylor is to be acknowledged for his significant contribution to the development of instruction at Virginia Tech. He is an outstanding role model who has provided valuable guidance and support. Dr. Glen Holmes' thought provoking style, one of his strongest assets, can engage my brain in maximum thought with minimum words. I appreciate the fact that he continually provided an opportunity for

challenging interactions coupled with honest advice. And finally, I must acknowledge my committee chairman, Dr. Mike Moore. His outstanding reputation of supporting his students, "whatever it takes," is well deserved. He has been my co-author, my editor and my supporter. His open door has been a welcome sight early in the morning and late at night. He is to be recognized for his energy and effort in working with this rather "non-traditional" student.

Next, I must acknowledge the many individuals who worked with me to develop *5 A Day Adventures*. They willingly contributed their knowledge, as well as their blood, sweat and tears, to bring the idea to life. Two of these individuals deserve special recognition.

Carol Ness, Senior Project Manager for Interactive Design and Development, is recognized as an outstanding professional and friend. Her support throughout the development of the project and the development of this dissertation has been invaluable. She is one of the most organized, "think ahead" people I have ever known. She maintained the library of artifacts upon which this dissertation is based. In addition, she helped me maintain my sanity as I re-visited the material and created this document. She managed the production of this document in a first class manner and the management of my company in my absence. I will be forever grateful for her talent, her energy and her friendship.

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The staff of Interactive Design and Development, Inc. must be acknowledged for taking on new responsibilities as I stepped aside from mine to complete this document. I am fortunate to acknowledge that each one is a valued professional. I extend my deepest appreciation to Laura Shawhan, Dave DeVaux, Ed Harvey, Chris Shively, Matt Kurtin, Christy King, and again, to Carol Ness.

Because each of us are the sum total of our heritage and life experiences, I must acknowledge my family. My father, who is truly one of the most intelligent people I have ever known, fueled my love of learning at a very early age. I acknowledge him for his ongoing quest of knowledge and his belief that each of his children could accomplish anything. Additionally, I must acknowledge my siblings, who have always "rooted" for my success. From all across the country I have felt their love and support. I may never have finished this document without the Saturday morning pep calls from my "baby sister" Nancy and the late night calls from my dear sister Michelle.

Finally, I must acknowledge my two children, Matthew and Mandy, to whom this document is dedicated. From the moment they entered my life they have been a wonderful joy and a tremendous influence. May this document remind them that the world is full of possibilities.

For

Matthew and Mandy

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INTRODUCTION AND REVIEW OF LITERATURE

INTRODUCTION

This dissertation is about sharing. It is entitled a descriptive case study for lack of a better term. It is more than "just" a case study. It is a qualitative study written by a participant observer, documented with quantitative data. It is about doing, feeling, interpreting, and reflecting. Within the dialogue is an attempt to bring to life the development of a project. It is my hopes that this document will speak, at least in part, to both the knowledge users and knowledge producers.

There has always been a gap between research and practice in the field of instructional development. Snelbecker (1983) summarizes it by noting, "There are knowledge producers and knowledge users. The knowledge producer group typically tends to view research findings, principles and theories as end results. At least for many [knowledge producers], there is little or no real concern with practical implications..." (p. 440). "The knowledge-user group perennially is searching for information that it can use in practical situations. For the knowledge-user group, it is not sufficient that instructional theory lead "merely" to journal publication - no matter how highly regarded the journal may be. . . . For this group, the only "true" test of value for instructional theory lies in the extent, if any, to which it improves instruction and student learning" (p. 441).

I am a knowledge user. I want to utilize research findings to improve the quality of instruction which I develop. However, I am also a knowledge producer. I design instruction, test it, modify it, and observe users. I log interactions, I communicate with users, and then I re-design the instruction and hope to put into place all that I learned on the next project.

Typically, knowledge users do not share their information with other knowledge users. There is no time or reward for such sharing. However, knowledge users have valuable information that even knowledge producers might be interested in. There are lessons learned and behind the scenes tours that might help others better understand the development environment with all its constraints and opportunities. Indeed, two of the methods which Rowland, Parra, and Basnet (1994) promote as effective in educating instructional designers are the study of artifacts and case studies.

Instructional Theories - A Brief Overview

This dissertation focuses on the development of instructional materials and relates this development to the research in many of the disciplines associated with the area of improved learning. The process of developing instruction involves many areas of specialty including: instructional design, message design, learning theory, behavioral psychology, cognitive psychology, and communication research. While more details on these topics will be included in later sections, this section provides a very brief introduction to the area of instructional design.

It was in 1899, in an address to the American Psychological Association, that John Dewey, "perhaps the most influential American philosopher of education" (Heinich, Molenda, Russell, & Smaldino, 1996, p. 67), first called attention to the need for a linking science, to better associate knowledge of learning theory with practice in the educational setting. Today, the needs which Dewey identified may seem quite obvious, however, it was not until the early 60's that any significant effort was made to articulate theories or models of instruction. The initial theories and models were well grounded in the behavioral sciences, with work by B.F. Skinner being the most notable. In behaviorists' models, instructional outcomes are defined in performance terms, a strategy that first gained popularity in military training during World War II. The behaviorist orientation dominated the instructional research and theory construction until the early 1970's (Reigeluth, 1983).

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While instructional strategies from behavioral psychology (Gropper, 1987) are still incorporated into many prescriptive models, most instructional design and learning research in the past two decades has been dominated by cognitive psychology (Hannafin & Hooper, 1993).

Andrews and Goodson (1980) report that by 1980 over 60 models of instructional design were being proposed. While even more models of instructional design exist today, most can be classified as one of two types: the descriptive model and the prescriptive model. The descriptive model identifies treatments which can bring about specific performance under certain conditions, in essence, it describes outcomes which can be expected when specified conditions are met. On the other hand, the prescriptive model, prescribes what treatments to use when specific outcomes are desired. Landa (1983) distinguishes between the two models by identifying the descriptive model as an "if then else" model and the prescriptive model as an "in order to accomplish X do Y" model (p. 60). In most cases the prescriptive model has broader applicability for designers. A large number of prescriptive models have been articulated (Andrews & Goodson, 1980; Briggs, 1977; Gagne & Briggs, 1979; Keller & Kopp, 1987; Landa, 1983; Merrill, 1983; Reigeluth, 1983; 1987). These prescriptive models of instructional design provide instructional developers with strategies, methods, rules, and algorithms, which, the researchers believe, will improve both the effectiveness and the efficiency of instruction. While some of the models have little in common (Briggs-Gagné and Gropper) other models vary significantly only on the surface (Andrews & Goodson, 1991; Gagne & Briggs, 1979; Landa, 1983), and with closer inspection, one can see that they have more similarities than differences (Collins & Stevens, 1983; Landa, 1983; Scandura, 1983). Andrews and Goodson's (1991) analytic review provides an in-depth report of the situation. In essence, they find that most models make an effort to help the developer

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analyze the objectives and identify treatments which address both the needs of the learner and the subject matter.

In addition to models which can be used to prescribe instructional treatments, developers can also turn to succinct rules or principles of instructional design (Fleming & Levie, 1993). These principles differ from models in that they do not offer a complete blueprint for lesson treatment, rather they articulate a single strategy or set of strategies to improve the effectiveness or the efficiency of a specific aspect of the instruction and are often based on observations and findings gathered from across many research projects.

While models of instructional development and principles of message design are extremely valuable to the developer, their focus has been to provide information on the identification of what treatment to use when. While some researchers test out their ideas with example lessons, many lessons which are used for illustrative purposes have never actually been delivered to students (Reigeluth, 1987). Few authors provide an in-depth look at how their model would be applied to an extensive project, with real clients, real timelines, costing real dollars and requiring real deliverables. Few resources detailing a behind the scenes look at actual project development are available to help developers understand the myriad of factors which impact the instructional design and development of a project.

<div align="center">Why a Descriptive Dissertation</div>

This descriptive dissertation addresses the development of *5 A Day Adventures*, a multimedia CD-ROM based product sponsored by the Dole Food Company to teach third-grade students the importance of eating five fruits and vegetables a day. It offers a unique opportunity to look inside the development of a commercial product that has enjoyed a distribution of more than 500,000 copies. This study provides details on the design decisions as documented in the historical records with supplementation of personal knowledge of the development of the program. The study includes data regarding the

identification of program objectives, instructional design strategies, formative evaluation, and implementation. Included in the discussion is the detailed documentation of focus groups with related illustration of how this particular analysis strategy was used to impact the design of the program. Emphasis is given to identifying the intentions of the designer as it related to the implementation of instructional design treatments. Additionally, anecdotal materials from end-users are provided to correlate intended affects to the reported effects.

Perhaps one of the most unique opportunities in the current study is that the designer can speak to the intentions of a design and also relate the intentions to observed and reported outcomes. While this dissertation is a descriptive and not a evaluative study, it would be unfortunate to discuss the development of the project without also providing the reader with information on "the rest of the story." Over the past three years qualitative data has been collected in regard to the project. Data collected about the project provides valuable insights into its acceptance, impact, and utilization in the public school setting. This data is useful for this project, in particular, and multimedia projects in general. The descriptive data includes: 150 letters from educational professionals and children; over 295 e-mail communications from teachers, students, and parents; 32 detailed responses to teacher surveys; an evaluation conducted by Consumers Union; and 1048 pre- and post-test evaluations conducted by the Hawaiian Department of Public Health and Ketchum Communications, assessing knowledge gain.

In recent years multimedia researchers and evaluators (Clark, 1989; Reeves, 1992b) have identified problems associated with current methods of evaluating the effectiveness of multimedia treatments and multimedia projects. Clark (1989) reports that most evaluation studies involving the evaluation of instructional strategies last no more than an hour. Reeves (1992b) reports that in most learner controlled studies, the treatment, on average, is only about 30 minutes. He writes, "How can one expect important findings from studies wherein students are exposed to trivial treatments for short periods of time?" (Reeves,

1992b). In order to gain meaningful data which can impact design decisions, these researchers call for all evaluations to be conducted with participants who are involved in purposeful learning, responding to either intrinsic or extrinsic motivational factors. They further suggest that opportunity be given for the learner to actually be engaged with the material in the manner originally intended by the designer.

One of the reasons many evaluation studies are "shallow" is that the effort and resources required to study the use and reactions to an application in a natural educational setting can be significant. Indeed, the data available to this researcher would not have been feasible without the permission and financial support of the Dole Food Company. It is unusual that use and useability data from a commercial application is available for inclusion in this type of document. The comments and insights from educators concerning *5 A Day Adventures* often represent observations teachers made over an entire school year or, in some cases, multiple school years. Many of the letters students have written reflect their thoughts and involvement with the project over weeks or even months. While it is not intended that this data provide a thorough evaluation of the product, it does provide information which can be used to better understand the effectiveness of the materials.

On numerous occasions I have been privileged to speak with students who aspire to become multimedia designers. When I share with students actual designs and insights as to why the designs developed in the manner in which they did, they are always surprised to learn how many factors impact a design, how many details are involved in the development of a project and how challenging the development process can be. While models provide road maps of getting from point A to point B, few of us would argue that the road map provides the same information as a video of the trip from point A to point B, and no one would equate the viewing of the video to the experience of actually being the traveler. Having been the traveler it is my intention to provide the reader with an opportunity to "view the video" of my experience during the design and development of *5 A Day*

Adventures. As in any recounted presentation of history, there are two points the reader should remember: the story is mine, told through my eyes, and it is impossible to convey all the details. However, understanding this, I have made an effort to include the landmarks, coupled with many of the road maps used on my trip. It is my hope that by honestly sharing the journey, that my good decisions and especially my lessons learned, will in some way, help others who choose to undertake similar journeys.

The Scope of the Project

While the scope of the project will become apparent as one engages in this document, it seems appropriate, at this time, to provide the reader with an introduction to the goal of the *5 A Day Adventures* and an overview of the size and complexity of the project being discussed, such that an appropriate mental model can be constructed to better understand this endeavor.

The Goal

5 A Day Adventures is a CD-ROM based project, designed for third graders to encourage students to eat more fruits and vegetables. This overall goal is articulated in detail on the disc and provided in the supporting material for teachers. An excerpt of this document follows:

> Teaching students the *5 A Day* message is very important. On average, children eat only 2 1/2 servings of fruits and vegetables a day - half of what national health authorities recommend for good health. In fact, an important national health objective is to increase consumption of fruits and vegetables to at least 5 servings a day among all Americans by the year 2000. You can play an important role by using this CD-ROM with your children. Remember, the goal of the program is to encourage children to eat 5 servings of fruits and vegetables a day. *5 A Day Adventures* is more than just an adventure for the home or classroom, it is an adventure for life (Miller, 1994).

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While this goal is supported by twenty objectives based in the cognitive domain, this main program goal is based in the affective domain. Clearly, the funder wished to develop a product that could play a role in the development of new attitudes and eating habits for children which they hope will be carried into adulthood. This strategy of presenting educational materials to young learners in the hopes of developing, in Karthwohl's (1964) terms, a value complex, is not new. You are probably familiar with this "trickle up" strategy being used to promote the use of seatbelts, recycling and anti-smoking. In later sections of this document, detailed discussions will ensue as to the impact of this goal on the design.

Program Size and Complexity

5 A Day Adventures contains approximately 15 - 20 hours of individualized instruction. The program is organized around six main content areas, incorporating 72 QuickTime movies, 21,000 audio words, 34,000 text words, and presented using 2650 Authorware display icons. In addition, 21 cross curriculum lesson plans are provided to illustrate how the disc can be integrated into science, math, social studies, and language arts.

For ten months, a team of seven full time multimedia developers allotted approximately 75% of their time to the project. This team was comprised of an instructional designer, a project manager, two project assistants, two programmers, and a secretary. The project was additionally supported by four part-time or freelance individuals, two animators, one artist, and a video producer. Since the fall of 1993, two revisions have been made. The disc is available in a hybrid version, containing programs for both the Mac and Windows environment. A third revision is scheduled for Summer 1996, and plans are underway to localize the product for Germany and France.

This author directed the design and development of the project and has been involved in the integration of the product into 20,000 classrooms. Additionally, I worked

with Apple Computer Inc. to have the product evaluated and bundled with several of their Performa Series computers. The disc is also marketed by SoftKey International. Today, over half a million copies of the product have been distributed in public schools and in the commercial market. The product has been showcased on NBC's Today Show, demonstrated at the White House, and recognized by the National Cancer Institute as a significant effort in addressing The 5 A Day National Initiatives. In 1995 it was awarded the Outstanding Communications Technology award by the Agricultural Communicators in Education in the category of multimedia technologies developed for public consumption.

The Author

Anderson (1989) points out that teachers hold conceptions of learning and instruction which function as our personal theories to guide our decisions and teaching practices. I would attest that the same is true of instructional designers. While there are many models to provide prescriptive theories, we are greatly influenced by what we have experienced. Instructional designers, much like any learners, build upon prior knowledge of their own instruction to formulate theories of design. Thus, to better understand this author, I will briefly discuss my professional involvement in education.

Early in my professional career, I was a classroom teacher. My first teaching assignment was in a very challenging rural environment. My first class of sixth graders had amassed, as a fifth grade, the worst attendance record of any class in the county system. My in-coming sixth grade students simply did not come to school as fifth graders. Many of their parents worked in factories that opened at 7:30 a.m. In the absence of a parent or authority figure to superintend school attendance, students chose to avoid the school setting and gathered in a local store. The superintendent encouraged me to modify my curriculum, if necessary, to increase attendance. I realized that first and foremost I had to address motivation. I did so intuitively, with little knowledge of motivational theories. I began with a focus on the individual and their interest and I worked hard to develop a no-

risk environment for success. I would arrive early at school and set up experiments and extra activities available only before school in the hopes that I could arouse my students' curiosity to learn. I often taught a single subject for the entire day, allowing students the time to become immersed in the learning experience. Many of our classroom activities were non-traditional, for example, we engaged in a furniture refinishing project in which all students had the opportunity to re-finish their desk, and in doing so, gained an ownership of their work space.

What I did seemed to work. At the end of the school year, my class had the highest attendance of any 6th grade in the county and the fifth highest attendance across all elementary classes. They attended school and enjoyed it and their test scores were greatly improved over prior years. That year was an experience which greatly impacted my view of the educator's role. I believed it was my responsibility to excite the students about learning, and to coach their involvement rather than direct their involvement with the subject matter.

Later in my teaching career, while working for the Department of Labor, teaching GED courses in a Job Corps setting, I carried my classroom teaching experiences into a programmed instructional environment. While I found this behavioral model to be in opposition to some of my own educational beliefs, I was able to supplement the materials with more personal instruction.

Eventually, I left teaching to return to school to study computer science, with the sole purpose of learning to use technology to address individual learning needs and information access. Since 1985, I have been involved in the development of multimedia information and educational programs.

In the late 1980's, I learned a great deal from developing laserdisc based kiosks systems for educational and informational access. These systems were available in places and at times convenient to patrons (libraries and shopping malls) and their use was strictly

voluntary. After observing and evaluating over 20 million interactions of the public with the systems, I formulated a number of theories concerning the design of materials for learners who are at liberty to walk away at a moments notice (Miller, 1987; Miller & Lambur, 1988a; 1988b; 1989). I theorized that all learners, regardless of the setting, are in essence, free to walk away from the learning activity, if not physically at least emotionally. I feel strongly that all instructional materials must be motivationally satisfying (Miller & Ruberg, 1990). However, all too often the motivational aspect of educational materials is ignored. As Keller (1983) acknowledges, "Motivation is the neglected heart of our understanding of how to design instruction" (p. 390).

After five years of directing multimedia projects within the university community, I left the university to begin my own company. As president of a small multimedia company, I provide the primary leadership for the design of instructional materials. I also serve as the primary client liaison, grant writer, and contract negotiator. At any one time I am involved in 3 to 4 development projects while discussing new project ideas with clients. My company is not a development company, it is an educational company that "partners with" clients to produce software to meet their educational goals. I will not be involved in the development of a project unless I can also be involved in the design of the project.

While I am president of the company and chief executive officer, there are times that I should not be in charge. I know in my heart that I am first an educator and second a business woman. To understand the development of *5 A Day Adventures* it is important to understand the order of my priorities.

INSTRUCTIONAL DEVELOPMENT

Introduction

Instructional developers work through a process in which they must conduct assessments, identify goals and objectives, analyze learning tasks, develop instructional strategies, and set up evaluation methods. Desired learning outcomes must be described in terms of objectives. Entire courses are devoted to the process of instructional development but, in simple terms, this identification process focuses on the "what." What has to happen? What must the student know? What behavior must be displayed? Given that we can identify the "what," we can address the "how." Reigeluth (1983) equates the "what" to curriculum questions and the "how" to instruction questions.

Many models of instructional design are available to help the designer deal with both the "what" and the "how" in the development of instructional materials. While it is possible to use a single model to develop a lesson, it is unlikely that an entire course or curriculum would be developed using a single model. In most cases, pieces and ideas from many models are integrated in a single course.

Analysis of Objectives

One of the first tasks in the development of instructional materials is to identify the goals and objectives of the project. Once this is complete, the objectives are evaluated. In evaluating objectives, it is evident that some objectives cannot be accomplished without a lower order objective also being accomplished. It is not possible to judge if a meal is healthy unless one has knowledge of what vitamins and minerals our body needs each day, what nutrients are in the foods to be served, and how they were prepared. In order to judge a situation, the person must have knowledge about the situation and the ability to apply that knowledge to the situation. Thus, objectives can be ordered hierarchically.

While this type of analysis seems obvious today, no framework was given to the analysis of objectives until Benjamin S. Bloom and his colleagues met at the American

Psychological Association Convention in Boston in 1948 (Krathwohl, Bloom, & Bertram, 1964). At that time these psychologists determined that it would be quite helpful to communicate with common terminology. They identified three areas of educational objectives: cognitive, affective, and psychomotor, and agreed to design a taxonomy for each by which an instructional designer could specify objectives in terms of behaviors. By 1956, they had devised what is now known as Bloom's Taxonomy of Educational Objectives.

The Cognitive Domain

As stated earlier, the overall goal of the project is grounded in the affective domain, however as Krathwohl, Bloom, and Bertram (1964) explained, the individual is a whole being, and it is difficult to completely separate thinking from feeling and feeling from knowing. Therefore, before discussing the affective domain, it will be helpful to briefly discuss the cognitive domain.

Bloom provided six main levels of objectives. Each of the levels is additionally broken down into smaller more detailed objectives. Each level requires abilities in the lower classification levels. The main idea of each level is presented here:

1.0 - Knowledge - recall of information.

2.0 - Comprehension - explaining, summarizing, and understanding what has been communicated.

3.0 - Application - appropriate use of an idea which has been abstracted from comprehension.

4.0 - Analysis - break down of material to find smaller ideas or relationships.

5.0 - Synthesis - putting together ideas or elements to form a bigger idea.

6.0 - Evaluation - making judgments about the value of object, thing, or idea.

Using a classification of this type, the instructional designer can describe an objective in behavioral terms and additionally specify what evidence must be present in order to judge if the objective has been satisfactorily achieved.

Robert Gagné and Leslie Briggs' (1974) developed an instructional model which built upon the early work of Krathwohl and his colleagues. It is one of the more recognized, as well as, one of the oldest instructional design models (Reigeluth, 1983). It is an excellent resource for developers because it is not a complex model and can easily be used as a guide for the critical early decisions concerning analyzing content and formulating learning tasks.

Conditions for Learning

Gagné and Briggs provided a common sense approach to thinking about instruction. As Bloom acknowledged, Gagné and Briggs identify different types of learning and describe what performance we can expect to observe when the learning has been successful. They further identified both the internal and the external conditions which must be met in order to facilitate the performance.

A stepwise analysis of the desired outcomes of the instruction continues until all prerequisite tasks have been identified. These tasks are evaluated to determine if they are essential or supportive prerequisites. Continuing the analysis in this fashion, a prerequisite might have a prerequisite, eventually producing a learning hierarchy and providing the basis for the sequencing of instruction. This first things first strategy might seem to be common sense, however, without a complete analysis of learning tasks, the learner can be left to address their enabling objectives without the proper support, and the designer of the instruction is unsure of why the material was less effective than planned.

The Gagné and Briggs model helps the designer evaluate the desired learning and can be used effectively to conduct content analysis and sequencing of events. Once the

learning tasks are identified, it is time to consider the events which will be used in presenting the instruction properly to satisfy the necessary conditions of learning.

The Nine Events of Instruction

The design of instruction is not a casual process. It is important to recognize that the presentation of the lesson has a sequence and the sequence affects the success of the learner. An instructional presentation can be thought of as events within events within events. It is important to carefully think through what should happen first, what should happen second and so on. Gagné addresses this sequence by providing developers with another "first things first" list of events, more recognized as "The Nine Events of Instruction." This list identifies nine events which together can be used as an outline for the development of the lesson treatment. Gagné identifies events 1, 2, 6 and 7 as necessary for instruction, and events 3, 4, and 5 as appropriate, but not always necessary for the instructional environment (Gagne & Briggs, 1979).

1. Gaining Attention (necessary)

Gaining attention is the initial task in any instruction and should continually be addressed throughout the instruction.

2. Informing the learner of the objective (necessary)

This is a critical event in that it allows the learner to answer the question, How will I know when I have learned? It is always important to help the learner set clear expectations about the information the lesson contains and what will be asked of the learner when it is over.

3. Stimulating recall of prerequisite learning

If the learner is expected to use prior knowledge in the lesson, it is very helpful in a lesson to stimulate this knowledge and prepare the learner to receive new information.

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4. Presenting the stimulus material

   Directing the learners attention to the action or assignment is very helpful.
   Expressions such as: Here it is....Watch the development of .... or Click on
   a part of H. B.'s Body to. . . .keep the learner on task. The learner should
   not be wondering, "What should I do next?"

5. Providing learning guidance

   Provide a checklist or other devices to help the learner know how they are
   going.

6. Eliciting the performance (necessary)

   Ask the learner to perform the desired behavior.

7. Providing feedback about performance correctness

   A learner cannot make adjustments in their knowledge or behavior without
   information on their performance.

8. Assessing the performance

   Testing or otherwise evaluating performance

9. Enhancing retention and transfer

   Helping the learner connect information by providing linkages with other
   material or other areas where the new knowledge can be utilized can be very
   important.

The Affective Domain

Most educators are comfortable with objectives for which outcomes can be directly measured. We like outcomes that can be observed, demonstrated, counted, and replicated. It is an easier task to evaluate a student's knowledge in a subject area than it is to evaluate his/her "interest in" or "beliefs about" the same subject area. However, we often want to encourage emotions such as, "liking" a subject, "enjoying" a book, and "caring" about eating healthy. While there are many educational settings in which affective objectives can

be appropriate, Krathwohl (1964) and his colleagues point out that affective objectives are often avoided.

They propose the following reasons for a lack of affective objectives in the educational setting:

1. They are difficult to measure. While attitudes and beliefs can be measured, the process is often more involved than assessment of cognitive objectives.

2. Grading or otherwise rewarding an attitude may seem unfair. Students may display attitudes they feel will be rewarded rather than the attitudes which reflect their true beliefs.

3. The affective domain is personal. Some educators believe personal beliefs and attitudes should not be addressed in a public institution.

4. There is potential abuse if affective objectives are actively pursued in the educational setting. Some educators fear students could be indoctrinated rather than educated.

5. Results are not immediate. Interest, attitudes, and personalities develop over long periods of time.

While there are some cautions to be observed in working with objectives in the affective domain, there are many reasons that such work is valid. Knowing how to assess and evaluate affective behaviors increases the probability that teaching for these behaviors will be successful. Krathwohl (1964) and his colleagues point out that if we want to attain affective objectives, then we must provide appropriate learning experiences for those behaviors.

In the past, many educators have assumed that affective behaviors are a by-product of cognitive objectives. Krathwohl, et al., (1964) observed that this effect is not necessarily true. Knowledge and understanding does not guarantee proper response, satisfaction, enjoyment, or the internalization of a value. For example, knowing that

statistics validate the importance of wearing seatbelts for personal safety when we drive, does not guarantee we "buckle up." In addition, knowing that it is a law to "Buckle Up" does not guarantee that we will comply with the law. In each case, we have to be willing to respond to the information we have. If we are willing to respond, feel it is important for our personal safety, and value the opportunity to protect ourselves, our families, and our friends, we might even encourage or demand that those who ride in our vehicles also buckle up. If we become passionate about safety issues and seatbelts, we might lobby our local school board to install seatbelts in school buses, volunteer to hand out bumper stickers in local malls, or otherwise promote our beliefs. However, while knowing does not guarantee internalization of a value, we can see how such values can progress in a hierarchical manner. Bloom's Taxonomy of Affective Objectives provides the structure in which to evaluate this hierarchy.

The Affective Domain Classification (Krathwohl et al., 1964) orders the affective behaviors in the following manner:

1.0 - Receiving (attending)

    1.1 - Awareness

    1.2 - Willingness to receive

    1.3 - Controlled or selected attention

2.0 - Responding

    2.1 - Acquiescence in responding

    2.2 - Willing to respond

    2.3 - Satisfaction in response

3.0 - Valuing

    3.1 - Acceptance of a value

    3.2 - Preference for a value

    3.3 - Commitment (conviction)

4.0 - Organization

    4.1 - Conceptualization of a value

    4.2 - Organization of a value system

5.0 - Characterization by a value or value complex

    5.1 - Generalized set

    5.2 - Characterization

<u>Awareness:</u>

The lowest category, awareness, simply requires that the individual is aware of the stimuli. The category progresses when the individual is aware of a stimuli and is willing to attend to it, and progresses even further when the individual is alert and looking for the stimuli.

<u>Responding:</u>

In the lowest level of responding, acquiescence, the individual is basically following a directive to respond. A more engaged level of responding is when the individual shows a willingness to respond, and an even higher level response is when the individual finds satisfaction in responding.

<u>Valuing:</u>

An individual who reaches this category is beginning to internalize a belief. Their behavior is consistent in regard to this belief. The first stage in this category represents that the individual has accepted a value. As the levels progress, the individual shows consistent preference for the value and, finally, a commitment to the value.

<u>Organization:</u>

Once the individual has internalized a number of values, it becomes necessary to organize those values. In this stage of the taxonomy, the individual understands that they hold this value and can organize it in relation to other values which they also hold.

<u>Characterization by a value or value complex:</u>

When individuals respond consistently to value-laden situations with their set of interrelated values, they are acting with a philosophy. As we can see, the taxonomy provides exacting steps for which to evaluate our involvement with, or internalization of, information in the world. We can give it our attention, act on it, value what we know, and change our life based on our beliefs.

It is easy to understand how this taxonomy progresses as one moves from being aware (the seatbelt law) to the development of an integrated safety philosophy (always buckle up, smoke alarms in each bedroom, and always wear a helmet when you ride a bike). However, while it is easy to describe these levels of internalization, it can be more challenging to provide the appropriate learning experiences and even more difficult to measure successful outcomes.

While Bloom's Taxonomies of the Affective and Cognitive Domains are presented as separate tools, it is not possible to view them in isolation. Our mental processes of knowing and feeling are related (Bednar & Levie, 1993; Krathwohl et al., 1964). Objectives in one domain often have a companion objective in the other domain. It is commonly acknowledged that attention, motivation, and attitude are important conditions for learning (Brandt, 1988; Keller, 1983; Wittrock, 1986). "Obviously, motivation is critical to learning and thus is one of the major ways in which the affective domain is used as a means to the cognitive. Children are more likely to learn and remember material for which they have a positive feeling" (Krathwohl et al., 1964, p. 57).

A Model For Motivational Design

John Keller and Thomas Kopp (1987) identified attention, relevance, confidence and satisfaction as the four main components of their model for motivational design. Known as the ARCS Model of Motivational Design, Keller and Kopp (1987) "prescribe individual motivational strategies in a smorgasbord fashion to meet the individual

motivational requirements of the situation" (Reigeluth, 1987). "Our understanding of how to arouse and maintain student interest in learning lags far behind our knowledge of how to facilitate learning once the student has the desire to achieve" (Keller, 1983, p. 399). Strategies for including motivation in instruction are rarely addressed in instructional models, rather, attention is given to the design of instruction that is "effective and efficient " (Keller, 1983). Many designers have focused on trying to develop instruction that will produce "more learning in less time", this has been especially true in the area of multimedia development (Reeves, 1992b). Designers have assumed that if the instruction is of "good" quality, motivation will take care of itself. However, research does not support this theory (Keller, 1983). Motivating the learner is a more complex process than most researchers in instructional design have acknowledged (Reigeluth, 1983).

Motivation and ability are often confused. Keller explains that motivation refers to what a person will do and ability refers to what a person can do. "Motivation refers to the magnitude and direction of behavior. It refers to the choices people make as to what experiences or goals they will approach or avoid and the degree of effort they will exert in that respect" (Keller, 1983, p. 389). Effort can be used to measure motivation, and the factors which affect effort are the learner's values and expectancies. This inter-relatedness of values, expectation, effort and motivation is summarized in the expectancy-value theory, reported by Steers and Porter (1975). It states that a person will approach activities or goals that are perceived to be personally satisfying and for which they believe they will succeed. It is not surprising that learners avoid situations where they feel they cannot succeed.

Because *5 A Day Adventures* was not developed to be part of any required curriculum it was important to develop a project which had a high degree of motivation, and as such it was necessary that students could find it personally satisfying and could sense that they had a high probability for success with the program. In addition, because

the goal of the project was focused in the affective domain, developing a project that students "liked" and "enjoyed" in order to have them be willing to receive the message, was very important.

Rather than considering motivation as an embellishment to the draft design, motivation should be considered throughout the design process (Keller & Burkman, 1993). Keller's ARCS model provides the outline to facilitate this and was used in the development of the instruction for *5 A Day Adventures*. A brief explanation of each major category of the model follows. In Chapter 2, information on how these strategies were utilized in the design will be presented.

Categories of Motivational Strategies (Keller & Kopp, 1987)

1. Attention

- Perceptual Arousal

- Inquiry Arousal

- Variability

2. Relevance

- Familiarity

- Goal Orientation

3. Confidence

- Expectancy for Success

- Challenge Setting

- Attribution Molding

4. Satisfaction

- Natural Consequences

- Positive Consequences

- Equity

Attention:

Every theory of learning includes some assumptions about attention. Attention is a function of curiosity and arousal. There are many possibilities for arousing curiosity in a lesson. It is important to first grab the attention (perceptual arousal) which is usually an easy task. The more difficult tasks, sustaining the curiosity (inquiry arousal) requires a creative approach and often involves information seeking or problem solving behavior and lastly, it is important to interject variability. "To increase curiosity, use analogies to make the strange familiar and the familiar strange" (Keller, 1983, p. 403).

Relevance:

In order to sustain motivation, it is important that the learner perceives that important personal needs are being met. "Personal motivation will increase with increases in the perceived likelihood of a task to satisfy a basic need, motive, or value" (Keller, 1983, p. 407).

Keller (1983, 1987, 1993) identifies three values of interest to the designer, personal-motive value, instrumental value, and cultural value. To increase personal-motive value, Keller suggests that the designer provide opportunities for high achievement under conditions of moderate risk. Additionally, Keller acknowledges that designs which allow the user choice and responsibility with an ability to influence the instruction increase personal-motive value. Learners like to feel that they have a "say" in what they are learning and how they might construct their assignments or lessons. Instrumental values refer to the need to achieve an immediate goal in the hopes of reaching a future goal. Students are motivated to achieve a task if they feel it will bring them closer to a more important goal. Cultural values are those values which parents, peers and society value. "Individual motivation to accomplish a given task is increased to the extent that the activity is positively valued by the individual's cultural reference groups" (Keller, 1983, p.414).

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<u>Confidence:</u>

Parents throughout the ages have worked to instill confidence in their children. Keller validates their efforts. "A positive expectancy for success is the third requirement for motivating learners. Three things that a designer can do to increase confidence is: 1) make learners aware of performance requirements and evaluative criteria, 2) provide multiple achievement levels that allow learners to set personal standards of accomplishment and performance opportunities that allow them to experience success, and 3) provide feedback that supports student ability and effort as the determinants of success." (Keller & Kopp, 1987, p. 294).

<u>Satisfaction:</u>

For a learner to be motivated to continue in a learning experience, the outcome of their efforts needs to be consistent with their expectations for success. "The instructional designer has to be concerned about the sometimes delicate balance between fostering and maintaining intrinsic motivation and the appropriate and sometimes unavoidable use of extrinsic reinforcements" (Keller & Kopp, 1987, p. 294).

Keller (1983) maintains that the best strategy to maintain intrinsic satisfaction with instruction is to use unexpected, noncontingent rewards rather than anticipated, salient, task-contingent rewards (p. 425). Increased satisfaction is associated with allowing the learner to use newly acquired knowledge in real or simulated settings. Additionally, positive consequences in feedback and reinforcement are effective in sustaining desired behavior and finally, consistency in standards and consequences are required as fair treatment for the learner if satisfaction with the activity is to remain high.

Keller and Burkman (1993), offer designers a number of strategies in their chapter, Motivation Principles from Fleming and Levie's book, Instructional Message Design. Several of the strategies are documented here for later reference. To avoid confusion for

designers, the numbers used in Table 1 correspond to the numbers as identified by Keller

and Burkman.

Table 1:   General Motivational Principles: Taken from Chapter 1, Motivation
          Principles in Instructional Message Design (Keller & Burkman, 1993).

1.1	Changes in organization and presentation of content can stimulate the learner's attention and curiosity.
1.3b	Use facts that contradict past experience, paradoxical examples, conflicting opinions or facts, unexpected opinions, or humor to stimulate curiosity.
2.1	Strengthen the students motivation to learn by building relationships between the content and objectives of the instruction and the learners' needs and desires.
2.4a	Use personal language to stimulate human interest on the part of the learner.
2.5	Role modeling of the value, utility, and interest of the instruction can stimulate intrinsic motivation and personal goal setting.
2.5a.	The enthusiasm of an instructor or speaker can stimulate positive motivation from the students.
2.5b	Increase personal interests by including anecdotes or vignettes about noteworthy people in the area of study, the obstacles they faced, their accomplishments, and consequences.
2.5c	Increase motivation to change behavior by including learners as role players in role modeling episode.
3.1	Design the challenge level to produce an appropriate expectancy for success.
3.2	People are more confident in their likelihood of reaching a goal if they know where they are going.
3.2a	Describe goals and performance requirements to help learners set realistic expectations for success.
3.2b	Increase self-direction by providing ways for learners to set their own goals.
3.3b	Use design principles of internal consistency to build learner trust and confidence.
3.3c	Help students build confidence by providing confirmational feedback for acceptable responses and corrective feedback for responses that do not meet criteria.
3.4	Include learner options to promote an internal sense of control on the part of the learner.
3.4a	Allow learners to go at their own pace to increase motivation and performance.
3.5	Leaner confidence and efforts to succeed are increased in proportion to perceived credibility of source.
4.1	Use intrinsically satisfying outcome and positive rewards to produce continuing motivation to learn.
4.2a	Promote feelings of accomplishment by including, in the instructional materials, exercises or problems that require the application of the new knowledge or skill to solve.
4.3	Reward accomplishments by using positive feedback following success at a challenging task.
4.3a	To build learner satisfaction, use congratulatory comments for performances that meet the criteria for success.
4.3b	Stimulate the learner's feelings of pleasure by including enthusiastic comments which model positive feelings associated with goal accomplishment.
4.4a	Games with scoring systems can add an extrinsically motivational outcome to instruction.

Summary

Reigeluth (1983) defines instructional models as a resource which provides a

"complete set of strategy components which have better results than any other set under

given conditions" (p. 21). It would seem from Reigeluth's definition that instructional

models are similar to magic potions. If this were true, instruction would be more effective than it currently is. So, what is the discrepancy? It is important to keep in mind that when researchers are writing about their own research, they may feel comfortable making absolute statements concerning the scope or value of their research that an observer of their research would not make. "Many of the systematic instructional design models, as described in the literature, represent a series of mechanical or linear steps rather than the complex and rigorous analytical and cybernetic process required for effective application to instructional design" (Andrews & Goodson, 1991, p. 150).

While some models of instructional design are valuable tools for designers, the reader should be cautioned not to think that instructional design models are formulas for success. Even the more complete, validated models are not necessarily "perfect fits" for the instructional needs of any given project. They are more closely related to blueprints than formulas.

Consider this. If I gave you a set of house plans that had received the highest architectural award possible, you would not be guaranteed of building your dream house. Just like the development of instructional materials, there are many variables which impact the success of the final product to meet the needs of the end-user. Your dream house would only happen if, I had correctly assessed your needs and, just as importantly, your style. In addition, we would have to be certain that the building materials were of the highest quality, the builder was properly skilled, the lot was correctly chosen for proximity, view, and safety, and the contractor was within budget. If only one item in this list were unsatisfactory, the entire project could be a complete failure, in regard to your satisfaction. If this were the case, we could not necessarily fault the plans.

Developing a project is very closely related to building a house. Many developers choose to strengthen their projects by pulling strategies from many models. Indeed, Keller (1987) acknowledges that his ARCS model discussed above is not a complete model. His

prescriptions are intended to supplement other models. The responsibility for selecting appropriate instructional strategies from the entire universe of possibilities and bringing them to life in a useful manner lies with the developer.

THE MEDIA MESSAGE

Most of the clients I work with desire a multimedia application because they believe a multimedia application will provide an appropriate platform for them to address the desired knowledge, attitudes, and behaviors they wish to modify. However, their beliefs in a multimedia solution are rarely based on research findings. Most often they have formed their opinion about the technology by attending a trade show, reading an article, or viewing a competitor's product. They want the success and the glitz that they have been promised in the trade magazines. They express, without reservation a confidence that if we add audio, video, 3-D graphics, and millions of colors that we will in some way gain a coefficient of effectiveness that is not achievable by other means.

While the client has great expectations concerning the power of the media, it is clear that researchers in message design and multimedia development have not reached a consensus on how to best reap the benefits of multimedia or even reached an agreement as to what are all the benefits. This discussion becomes important, not only in regard to effectiveness of the message, but also in regard to cost. Media selection greatly affects cost of a project and it would certainly be beneficial to know how media influenced the message. Many decisions in the development of *5 A Day Adventures* were made in regard to media selection, and some of the decisions were based on a belief that different media could be more effective in addressing different objectives.

Two differing points of view:

- "Research and experience indicate that use of multimedia leads to enhanced learning on criteria such as acquisition of content, development of skills,

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efficiency of learning, and satisfaction with instruction" (Falk & Carlson, 1992, p. 96).

- "The first purpose of this paper is to dispel the notion that interactive multimedia (IMM) automatically guarantees learning" (Reeves, 1992b).

Many people in the multimedia industry (hardware and software developers, and educators) continue to promote multimedia technology without reservation, while other designers, developers, and researchers struggle with the media to understand how best to use the capabilities (Clark, 1994; Clark & Salomon, 1986; Fleming & Levie, 1993; Jonassen, Campbell & Davidson, 1994; Kozma, 1994; Morrison, 1994; Reeves, 1992a; Reiser, 1994; Shrock, 1994). The fact that the multimedia field is growing at such a rapid pace indicates that many believe the technology offers promise as an effective educational strategy. " However, the production of effective interactive video [multimedia] is not an automatic or casual process; it is a matter of conscious, creative, and systematic design" (Reeves, 1990, p. 1).

The debate of media's influence on learning is an old debate. Thomas A. Edison observed in 1913, "Books will soon be obsolete in schools. Scholars will soon be instructed through the eyes. It is possible to teach every branch of human knowledge with the motion picture. Our school system will completely change in ten years" (Saettler, 1968, p. 214). Throughout the years, educators have replaced Edison's reference to motion picture with any number of technologies (videotapes, videocassette recordings, television, microcomputers, multimedia, the Internet). While all of the technologies have greatly changed the world, none of these technologies have impacted our schools significantly in what they do or how they do it. There is no question, however, that we are a society of visual learners. "Images in our world today cannot be overstated. We are influenced, taught, and manipulated by all kinds of visual information including television,

computers, signs and symbols, advertisements, body language, and motion picture films" (Hortin, 1994, p. 3).

While media surrounds us, the debate of media's influence on learning continues. Researchers disagree on the answers, and some disagree on the questions. Clark (1994) believes we should focus on the instructional methods and not media. He emphatically states that he is no longer interested in discussing media attributes as a design consideration. His now famous quote (Clark, 1983), comparing media to the delivery truck, implying that media simply delivers the message, continues to stir strong feelings. Clark's view is opposed by Kozma (1994), who acknowledges the instructional methods as valuable in the learning process, but believes that media can and does influence learning. He appeals to researchers to acknowledge the unique attributes of media and address the capabilities of media to influence learning. Jonassen, et al. (1994) suggests that the discussion should not even focus on media as the courier of the message, but rather on how media can be utilized to help the learner construct knowledge and influence attitudes. Morrison (1994) suggests that research should focus on the total presentation and not attempt to evaluate the effectiveness of the medium separate from the instructional strategy. Reiser (1994) is interested in the study of learner attitudes and how attitudes affect performance. Reiser suggests that if media affects attitudes then perhaps we should study this affect, believing there is more to be learned about media and its effect on learner outcomes.

Multimedia designers who are looking to the research for clear answers on how to best use media will find confusing reports. The researchers cited above are all recognized for their expertise in instructional technology; however, each of them has a different view on the role of/or opportunities for media's role in the instructional strategy. Part of the problem must be credited to the pace at which media capabilities and delivery environment change. However, if at minimum, we can acknowledge media as the courier of the

message, then perhaps we can agree with Jonassen, and focus on how media can be utilized to help the learner construct knowledge and influence attitudes.

MEDIA TO INFLUENCE ATTITUDES AND MOTIVATION

"It [multimedia] can be constructed from an array of media, each of which has particular strengths and limitations" (Schwier & Misanchuk, 1996). "The message designer needs to understand how message form and structure influence information processing" (Winn, 1993, p. 56).

Designing in an environment rich with many communicative resources can offer significant benefits for the learner. The designer can provide the learner with more than just a presentation of the material, they can create an environment to engage the learner. Much like a director who guides the characters in a play, a designer can direct the media to capture the interest of the learner, guide the learners focus on the material, provide instantaneous feedback, and in doing so, maintain interest and motivation. However, some designers still approach the challenge of media selection by a strategy known as reduction. As Schwier and Misanchuk (1993) point out, a designer determines what is the least expensive combination of media available to address the problem. "If print alone is adequate, why bother with more elaborate solutions?" (p. 148). While cost is always a factor in the development of instructional materials, the selection of media based solely on the cost of delivery fails to acknowledge any motivational or attitudinal properties of the media which serve as benefits for the learner.

Perception plays an important role in how we interpret a message. Even before conscious attention is given to the message, research has shown that we have "preattentively" formulated ideas concerning the message. Winn (1993) observes, "Great care should be given to the structural properties of messages that affect perceptual

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organization. These include, but are not limited to, the relative placement, size, and dominance of objects in the visual field, and the way the eye is "led" over the image by various techniques of composition" (p. 56). Winn's statement should not be limited to the visual presentation of the material, but also the auditory presentation. It would be just as appropriate to discuss the placement of audio, the amount of the audio message, the mood set by the audio, the dynamic range, the audio level, and the way the ear is "led" though a presentation.

Many resources from the area of message design are available to help the developer better understand how to effectively arrange the stage for the learner (Briggs, Gustafson & Tillman, 1991; Fleming & Levie, 1993; Jonassen, 1982, 1985; Moore & Dwyer, 1994). It is beyond the scope of this document to discuss usage guidelines, such as, text presented in ALL CAPS is more difficult to read that text presented in mixed case. These general principles are easily available to a developer and should be used to address the needs of the learner and the content. On a cautionary note, these principles are not laws, they are indeed principles, and should not be interpreted as black and white. Rather, we should view the principles in millions of shades of gray, appropriately selecting those which support the instruction and the motivation of the learner. Discussion of the decisions of media selection for *5 A Day Adventures* will be included in Chapter 2.

Most references that provide guidelines on the use of media in multimedia projects address the use of text, graphics, video, and audio. These media do not have innate characteristics that can guarantee a response, either cognitively or emotionally, from the learner. It is possible to have a message that could be delivered successfully in text, be unsuccessfully delivered, because of improper selection of color, size, placement, density, structure, or timing. Likewise, while video often provides a motivational factor for the learner, it can be a very negative and frustrating factor if it is of poor quality and does not

meet the learner's expectation for information or entertainment. The same is true with graphics and audio messages.

Music - Audio in a Unique Format

Each of above media do not have an ability to elicit a response simply by their presence, however, this is not true of music. The use of music in multimedia projects is rarely discussed in message design books. However, it seems to have properties which can elicit a response simply by its presence. This is noteworthy for a designer. "We respond to music by a complex mix of psychological and physiological reactions triggered by numerous aspects of the music itself" (Rosenfield, 1985, p. 56). Throughout history, musicians, playwrights, poets, composers, religious leaders, and politicians have all known that music had the ability to affect moods. Since the nineteenth century, hundreds of research projects have validated this belief (Bruner, 1990). The following discussion is provided because this material is not included in other message design references, and the use of music in *5 A Day Adventures* is significant and has been the media attribute most often referenced by teachers and students as being both educationally effective and motivational. The following discussion addresses music and it's utilization to effectively influence attitudes and deliver messages.

We are all aware that listening to and participating in creating music can be pleasurable, but the power of music goes far beyond the pleasure it can bring to the spirit. It has been used to relax the mind, as well as to energize and sustain the spirit. It has the ability to touch our innermost soul and act as a socializing agent (Simons, 1978). The tribes of Africa used music throughout the day to direct their work and sustain activity; the peasant cultures of Europe sang to unify their cause; and American slaves sang for comfort and strength (Slobin & Titon, 1984).

Music is indeed deep-seated in emotion. Before the Renaissance, no portraits depicting God existed; the presence of God was conceived as music, sound, and vibration

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(Giansante, 1979). The ancient Greeks believed that music was the foundation of the moral training of the guardians of the state. Plato observed, "musical training is a more potent instrument than any other, because rhythm and harmony find their way into the inward places of the soul" (Williams, 1975).

Music and The Affective Domain

"In the plainest language possible, we like music because it makes us feel good" (Burmeister, 1958, p. 221).

While most religions today rely on music to establish a feeling of love and compassion, some have been fearful of its affect on the individual. Early in American history we observe that our Puritan ancestors cautiously allowed music into their services and the Calvinist openly restricted its role even in worship (Davis, 1980).

This ability of music to elicit feelings of devotion has not always been used for the betterment of mankind. In Germany during the Third Reich, the Nazis relied on music to convert and pacify their people. The effect was dramatic. While music has always been a part of propaganda campaigns, some feel it was never used more successfully than during the era of the Third Reich.

"The use of music [for propaganda], often disguised as entertaining and recreational diversions, was capable of eliciting desired responses from the people [of Germany] almost on cue" (Moller, 1980 , p. 40).

The importance of music was so well understood in Nazi Germany that all musicians were exempt from fighting, but they were required to serve the state (Moller, 1980, p. 43). During the Third Reich, radio, theater, cinema and the entire music industry worked in unison to indoctrinate the people. Moller (1980) recounts:

Music was used to help create an atmosphere that raised murder of Untermensch (subhumans) to a service for one's fatherland and people. For the Germans music has always been an accepted and enjoyable part of life. To gain

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acceptance, the Nazis learned that a good tune, arranged in a pleasing manner and with an appropriate political text, placed the public in the proper frame of mind for indoctrination (p. 44).

Humans are not the only life form that is affected by music. Some researchers believe that plants grow better, cows give more milk, and bees produce more honey when their environment is filled with music. Peretti and Kippschull (1990) studied the influence of music on the social behaviors of mice. Using five types of music, they concluded that music did affect the social behaviors of mice. Mice exposed to classical music showed an increase in social activity, aggression, attraction, huddling and sexual behaviors, while mice exposed to easy listening music only showed an increase in huddling behavior. Additionally, country/bluegrass, jazz/blues, and rock and roll all affected the behavior of the mice in the study.

<u>Music and The Neurosciences</u>

While it is certain that music has an ability to affect living organisms, researchers in the neurosciences are just beginning to uncover how this effect is handled in the human brain. Sergent (1993) writes:

> Of all human cognitive functions, few appear as hermetic to scientific inquiry as musical faculties. Understanding the cognitive processes inherent in receptive and expressive musical functions, and identifying their neurobiological bases, are confronted with difficulties to which the study of other cognitive function is not exposed (p. 168).

It appears that music is a system of communication which is governed by rules unlike other communication systems (Sergent, 1993). Research on brain-damaged patients has shown that the loss of verbal function (aphasia) is not necessarily accompanied by a loss of musical functions (amusia) (Sergent, 1993). It is not uncommon for patients who have suffered strokes to be able to sing, even though they can no longer speak (DeBord,

1994). A similar situation can be observed with individuals who experience a "stutter" when then speak but no "stutter" when they sing. Mel Tillis, a well known country music singer, experiences this phenomena. While research continues, Sergent (1993) concludes, "there is incontrovertible evidence that the two spheres of activity, music and language, are mediated by distinctive neurobehavioral systems" (p.168).

Once we understand the neurological processing of music in the brain, we may better understand the importance of music to the total well-being of the individual.

Music in Marketing

Advertisers and public relations firms attest to the affective power of music in the commercial market place by making it an integral part of our environment. It flows over us in all directions. It comes to us from the traditional sources of radio and television, as well as the non-traditional sources of department stores, restaurants, airplanes and even the dentist's chair. The use of music in marketing is widespread, because those who market believe it is effective in helping to sell products. Music affects our moods, emotions, images, and our purchasing decisions (Bruner, 1990). The consumer translates these feelings for the components of music into feelings for or against products. Background music is used extensively in movies, TV and radio commercials, and in the market place. Background music can significantly affect the emotional response to television commercials (Bruner, 1990). If the background music is compatible with the preference of the viewer, the message is seen as more credible. If the background music is incompatible with the viewers preference, the credibility of the sponsor is considerably lower than if no music had been played in the background.

Music in Education

Music has a powerful effect on the individual. It is used to entertain the spirit, support the soul, heal the body, and to rest the mind. But, what is the role of music in education? While it has been and can be argued that the aesthetic and cultural objectives of

education are more than sufficient to justify music in the curriculum, educators have begun to investigate ways to utilize music to enhance the learning environment beyond traditional music education.

While much has been written about music education (training students to sing, play instruments, and learn music theory), little has been written about the use of music as an integral component within the curriculum to assist in the mastery of various subjects. This discussion will focus on those issues related to learning with the assistance of music.

The Educationally Challenged Student

Earlier we explored the use of music in therapy and discovered that the personal message of music was a very effective tool in working with children who were emotionally challenged. Similarly, we can see that music can be very effective with at-risk students and children who are educationally challenged (Collett, 1992; MENC, 1977; Reeves, 1978; Rejto, 1973; Rundell, 1978; Solomon, 1980; Uhl, 1969; Ward, 1976).

The practice of using music to enhance the curriculum of students with special needs can be documented as early as 1806 when Jean-Marc-Gaspard Itard used music to develop auditory discrimination skills with the "wild boy of Averyron," a student who suffered from a hearing and speech impairment (Solomon, 1980). Itard's method was so successful that music was incorporated into most programs for the hearing and speech impaired.

Throughout the history of educating students with special needs, music has been an effective communication tool, and this practice continues. The use of music to enhance the education of educationally challenged students may not be surprising, for we have already discussed the complexities with which the brain processes musical stimuli. As we learn more about the neurological processing of music in the brain, we may be able to provide enhanced educational opportunities to students who are experiencing difficulties with

traditional educational methods. It is as if music offers the learner an additional and alternative route for communications.

In evaluating the role of music in education, it is important to recognize that the sensitivity to music exists regardless of intellectual or cultural limitations (Ward, 1976). Students respond to the structural aspects of music such as rhythm, harmony, and melody. Educators report that these elements are successful in helping students organize thoughts and expressions. Summer (1985) explains, "In silence, one must rely on one's own capacity to stay organized and focused, but music can transform haphazard, chaotic and non-purposive expression into meaningful and organized expression" (p. 84).

When music is used in support of education, it is often used to enhance language development. Auditory discrimination factors are critical in learning to read, and music provides opportunities to teach students who otherwise have had difficulty with this skill (Collett, 1992; Rejto, 1973; Rundell, 1978; Uhl, 1969). Rejto (1973) reports significant positive gains made by children working with music in development of language skills. Auditory and visual perception abilities, sensory-motor integration, symbolic representation, and memory all benefit. Rundell (1978) supports these findings and reports on the success of using music to increase aural awareness, aural discrimination, and auditory memory.

Reeves (1978) presents five musical activities which can be used to develop language skills. They incorporate methods to help students feel the rhythm of a song, with the goal of enhancing the ability of students to feel the rhythm of language.

Songs have often been used as a mnemonic device to help students remember information. Most children have learned to sing the alphabet song and simple counting songs. This technique imposes organization on the rehearsal of information and can be very effective with students who lack organizational skills. Studies dealing with music as a mnemonic device have been conducted with children. Using music to help children

rehearse seems to be beneficial in some areas, including immediate recall of paired associates, spellings of words, recall of story events, and recall of verbatim text (Gingold & Abravanel, 1987).

The following study provides supporting evidence that most students can and do enjoy music. Jellison and Flowers (1991) report on a study entitled, "Talking about Music: Interviews with Disabled and Nondisabled Children." Interviews with both "disabled" and "nondisabled" children were used to assess how children felt about music. Jennison and Flowers report, "Perhaps the most notable outcome of this study is the similarity of responses between students with disabilities and their nondisabled peers" (p. 328). Of the 228 students, all but one reported "yes" to liking music. In all eleven questions, there were very few differences in responses. This study reminds us of the valuable opportunities to incorporate music into the learning environment as a support tool for all students.

New Opportunities

While researchers investigate the benefits of using music to enhance educational opportunities for students with special needs, others are calling for increased opportunities for music in the educational setting for all students. Billiter (1993) reports on research that indicates music serves as a very nurturing stimulus for the development of the brain and indications are that increased exposure to music can enhance intellectual capabilities.

The Learning to Read Through the Arts (LTRTA) incorporates the performing arts and visual arts to teach reading, writing, and thinking across the curriculum (Billiter, 1993; Collett, 1992). This program, originally designed for at-risk students, has been expanded to encompass all students. LTRTA uses music to teach strategies for analyzing, synthesizing, and evaluating. Collett (1992, p. 64) reports:

> . . . music instruction has been evaluated for its effect on both the attitude and the
>
> total achievement of the child. Students who participate in the program have

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demonstrated improved attitude toward reading, the arts, and learning in general, as well as substantial gains in achievement, sustaining growth for several years. . .

Many feel the use of music as a mental stimulus is the most important benefit to education. Music has been found to influence performance on standardized tests, creative tasks, reading, and on self-rating (Billiter, 1993; Peretti & Kippschull, 1990). Additionally, recent research indicates that listening to classical music can enhance abstract reasoning. Hotz (1993) reports on research that indicates there are certain neurological firing patterns that occur when people are doing high levels of abstract reasoning, and classical music appears to excite these same patterns.

While music in public education is rarely used specifically for mental stimulation, ongoing research in theoretical neurobiology may impact the future uses of music in education.

<u>Music in the Formulation of Values</u>

It is appropriate to identify various research which addresses the use of music in the formulation of values.

Bosompra (1992) reports on an "enter-educate" project implemented in Ghana in which music was used to inform the public about the HIV virus. The goal of the "entertaining - educating" project was to promote responsible sexual behavior. Songs were played on the radio and plays (musicals) traveled through the countryside to reach the people. Bosompra reports significant behavioral impact from the plays and the music. The study reports findings in regard to the music in three areas: awareness of the songs, the message of the songs, and the influence of the songs. "Participants generally agreed that the AIDS songs had influenced them to change their sexual behavior" (p. 335). Researchers concluded that the songs had provided important cues to action. Bosompra

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reports that this method has also been "successfully used to promote desired behavior changes in other parts of the world" (p. 318).

A San Francisco-based software company is designing multimedia applications which are intended to "teach values along with academic subjects" (Evenson, 1994). All lessons are supported by folk songs.

A musical analysis of Sesame Street (Wolfe, 1993) reports what most of us intuitively know, music is fun and children will attend to it. In each show "an average of five music segments are directed toward teaching academic skills and three music segments are directed toward social skills" (p. 224). On average, 28 minutes out of every one hour show is music. Songs used to teach important concepts or operations were original compositions with some repetition in both melody and words. The majority of the tempi of the songs is quick and upbeat.

Conclusion

It is difficult to discuss any media within a multimedia project in isolation. Unlike reading a newspaper, the learner is at all times involved with multiple media characteristics presented in a unique environment. While the above discussion focused on the underlying aspects of music which seem to empower it as a motivational tool to influence attitudes and help the learner construct knowledge, the discussion was not intended to lead the reader to believe that music should be presented as a "stand alone" instructional strategy, within the multimedia environment. If multimedia instruction is developed properly, the learner should not be focused on the media attributes which impact their learning. Much like tasting a gourmet recipe, the learner should not be able to pick out the one magical ingredient which "made" the dish, rather it is much more desirable that they be able to identify the dish as "tasty". In Chapter 2 and in Chapter 3 the reader will learn more about the media selection process for *5 A Day Adventures* and the reactions of the learners to the selections.

THE DELIVERY ENVIRONMENT

"While in the ideal world, instructional strategies would be selected based solely on their potential for establishing the very best conditions for learning, in the real world numerous environmental variables affect their selection" (Gustafson & Tillman, 1991, p. 175). Two of the variables which greatly impacted design decisions for *5 A Day Adventures*, were numbers of CD-ROM players available to teachers and information on how teachers were using technology in the classroom. With first consideration, it might appear that the number of CD-ROM players available to students might be the more critical factor associated with the impact of this product in the classroom, and thus the more critical factor affecting design. One might speculate that if one CD-ROM player provided X degree of effectiveness, that 2 players might provide 2X degree of effectiveness. Unfortunately, the formula for increased effectiveness is not so simple. While the amount of any technology available in the educational setting is an important factor in how it *can* be used in the instructional setting, availability does not guarantee usability. In addition to reporting on the number of CD-ROM players available in schools, the following discussion identifies other factors which impact the utilization of technology in the educational setting. This discussion will later be referenced in regard to specific design decisions.

Almost four years ago, when development began on the *5 A Day Adventures* program, my contract guaranteed Dole Food Company the placement of 2,000 discs into schools by the fall of 1993. I signed the contract even though that same year QED (Data, 1991) reported that a total of 1513 CD-ROM players were accessible to both students and teachers in public schools and leading professional development journal could identify only 50 titles suitable for use in elementary schools.

Today, four years later, the 1996 QED executive summary reports 34,480 CD-ROM players are available to students and teachers in public schools (Quality Education

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Data, 1996). Hundreds of CD-ROM titles exist for the elementary age audience and 500,000 copies of *5 A Day Adventures* have been distributed to schools or homes.

Between 1989 and 1992, the numbers of computers in schools increased nearly 50%, to reach a total inventory of 3.5 million according to the 1992 U.S. IEA Computers in Education Study (Anderson, 1993). The numbers of CD-ROM players has also grown significantly. CD-ROM players have been reported to be the fastest growing technology in the history of education (Quality Education Data, 1991). It is clear that schools continue to make significant investments in technology, spending roughly $500 million a year (Becker, 1994). While numbers such as these provide information on direction and trends, they fail to document the involvement of schools with the technology. Data on utilization of the technology within the school is difficult to locate, and in-depth descriptive studies of how the technology is being integrated into the curriculum are sparse. It is not enough to know that teachers and students have access to a product, we must understand how the product is used and under what circumstances it appears to impact learning.

In a recent report prepared for the Office of Technology Assessment, Henry Jay Becker (1994), provides an in-depth analysis of the new information technologies in our schools. In his effort to document the presence and use of technologies in American schools, Becker further analyzes data from five national studies. His in-depth look at the involvement of schools with technology leads him to draw the following conclusion:

> Merely because curriculum producers are making software and their school
> customers are acquiring their products and the hardware to allow them to be used
> does not tell us to what extent the daily lives and anticipated futures of typical
> school children and their teachers are being affected. We can easily envision small
> groups of children engaged in animated interactions in front of a computer. . . .but
> to what extent do activities like these occur on a regular basis? To what extent does
> the amount of technology and software acquired to date simply not add up to the

quality needed to affect the daily activities of the 45 million students in our nation's schools? Or, to imagine another scene, to what extent are computers and video being used instead, without imagination or thought, perhaps to keep students quiet and absorbed regardless of the intellectual worth of their absorption?

(Becker, 1994, p. 1)

The placement of computers and their supporting devices within the school directly impacts how they can be integrated into the curriculum. "The presence of computers in a school building does not mean that teachers and students have an opportunity to use them" (Becker, 1994). Becker documents that overall, 50% of all computers are located in computer labs and 35% are located in teacher classrooms. One-half of all teachers have at least one computer in their classroom. This tendency to cluster computers into computer labs has kept computers from being integrated into the day to day curriculum (Wilson, Teslow, Cyr & Hamilton, 1994). Schultz & Higginbotham-Wheat (1991) observe, "the most effective method of placement must be one that allows the classroom teacher free access to integrate computer usage into daily activities" (p. 201).

A primary teacher who has been a part of the Peakville Elementary School Study (Wilson et al., 1994) sums up the difference of labs and classroom placement of computers, "When I had a computer lab, students could only use computers during their assigned time slot, whether they had a real need for them at that time or not. Now, whenever they have an idea or a project that would work well at the computer, it is available" (p. 27).

Another important aspect related to the effective use of computers in the classroom is teacher training. Only 10% of teachers work in schools where they have access to a person designated to provide support for computer technology (Becker, 1994). Teachers see training as their number one barrier to using technology effectively in the classroom (Lamon, 1987).

If one investigates the adoption of educational technologies into the classroom it is easy to document that teachers play a significant role in the success of a technology (Havelock, 1970). Many researchers (Bork, 1987; Haynes, 1986; Hills, 1987; Wilson et al., 1994) have suggested that for a technology to be successfully implemented into the classroom it must not require major changes in the current curriculum or management of the class. Cates (1992) suggests that a successful approach to adoption is based on a belief in incremental or developmental implementation.

Even in situations where teachers and schools are provided the sufficient technology and support, change is incremental. Dwyer, Ringstaff, and Sandholtz (1991) identify five such stages: 1) Entry phase, often characterized by resistance and frustration; 2) Adoption phase, characterized by utilization of basic applications, such as, drill and practice and whole group lectures; 3) Adaptation phase, demonstrated by the use of technology in support of teaching methods, such as the use of word processors, databases, graphic programs, etc.; 4) Appropriated phase, characterized by the use of technology in innovative instructional strategies, such as the development of cross-curriculum and individualized projects; and finally 5) Invention Phase, recognized by the creative open mindset as to the role of technology in the classroom.

If we accept the findings in Becker's report (1994), that the primary use of computers in elementary schools is for drill and practice and has essentially not changed in the past decade, then we can conclude most teachers have only reached the second level of adoption. This information, the quantity and placement of CD-ROM players, and knowledge of teacher's attitudes and beliefs, impacted design decisions. The impact of this situation on the design will be discussed in Chapter 2 and the impact on distribution will be discussed in Chapter 3 of this dissertation.

EVALUATION FOR DECISION MAKING

Thus far, we have discussed, in general terms, many of the considerations associated with the development of instructional materials. It is now appropriate to discuss the specific evaluation activities and procedures used, in the development of *5 A Day Adventures*. These methods were utilized for the collection of information to "improve the decision making process" (Reeves, 1992 p. 252).

In this section, the types of activities will be discussed in general terms, in the next chapter the data will be discussed in specific terms. Three types of activities will be presented: 1) formative evaluation activities; 2) impact evaluation; and 3) external evaluation. Because all these activities were carefully documented and are incorporated in the archives of this project, it is appropriate to first discuss how and why artifacts, of this nature, are maintained in a project.

Artifacts Of Project Development

Each project manager must decide what materials related to the development of a project will be maintained throughout the development process and subsequently archived for later reference. The activities involved in this endeavor and the diligence under which they are conducted can vary greatly between projects where the designer/developer is also the client and projects where the work is being developed for a client who is external to the design team. It is unfortunate that project managers often make this distinction in their management of design documentation and communications when the work is being done to "please themselves". While many developers believe that detailed communication and design records are only needed in the development of external projects, the information and learning opportunities these records afford a design team in understanding and reviewing a project are extremely valuable. It is important that all designers are able to reconstruct why decisions were made and to understand how a design evolved such that this information can be applied to the improvement of later projects.

Early in my career as a project manager, I had the good fortune of hiring an employee who had formally worked as a librarian. Her leadership greatly influenced the manner in which my company keeps project documentation. In essence, every piece of paper, every conversation with a client, and every electronic file related to the development of a project is maintained. All hard copy materials are placed in binders under topic headings, for easy reference. If an e-mail message is received from a client, it is printed and placed in the notebook for later reference. If a client responds to a graphic design by marking changes on a printout and faxing the changes back. The fax is kept, even after the changes are implemented. If a phone conversation is conducted with a client, a written summary is filed in the notebook. All materials which are developed electronically are collected and archived on CD-ROM or tape backup systems. If a graphic undergoes five iterations before it is approved by a client, each version of the graphic file is maintained.

In regard to the *5 A Day* project, the master copy of the archived material occupies approximately eight linear feet of bookshelves and three large file storage boxes. It is from this data set that I have drawn materials to illustrate points or discuss issues which were addressed throughout the development process.

As a side note, I realize, that to some, this method of archiving artifacts of a project might seem excessive. However, this detailed activity has proven to be quite valuable. Almost daily, our archives are used to validate content, review client directions, or otherwise clarify communications. All original directives from clients must be accessible to protect the integrity of the project. In addition, former clients often return to have completed projects revised. The ability to open a project box or a notebook and review original documentation has allowed us to be responsive to these needs.

Formative Evaluation Activities

"Formative evaluation, first described during the late 1960's by M. Scriÿen, is specifically intended to gather information for the purpose of improving instruction as it is

formed" (Dick & Carey, 1991, p. 229). For reference of this document, I have chosen to expand the definition to also include the gathering of information for the purposes of refining the project as it is formed.

Formative evaluation activities differ from research activities in that they are not designed to study and document "the truth." They are designed to, in a cost effective manner, help the designer make better judgments concerning the product. And, in general, involve activities with representative members of the intended audience. The sooner the designer becomes involved with the reality of the situation, that is the learner, the environment, the disparity between "what is desired" and "what is", the sooner the designer can move forward with some certainty that the product will meet the needs of the end-user and the client.

Many different types of formative evaluation activities are possible. In regard to the development of *5 A Day*, numerous activities were conducted to better understand the goals of the project [needs assessment] and how to improve the treatments. For readers who are interested in learning more about the process, Dick and Carey (1991) provide a good review of these methodologies.

During the needs assessment phase of the project, as well as, during the instructional design phase of the project, formative evaluation activities were extensively utilized. These activities included: focus groups with both teachers and students, phone interviews and surveys with parents, evaluations conducted within the development environment, and evaluations conducted within the school setting.

All instructional design "how to" references identify needs assessment as the first step in addressing a problem. Often novice instructional developers make assumptions about the goals of the instruction without giving serious consideration to identifying as much information as possible about the content upon which the instruction will be based,

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the environment within which the instruction will be delivered, the knowledge and attitudes of the learner to the goals of the project, and the identification of the barriers to success.

Needs assessment, as discussed by Burton and Merrill (1991), involves three activities: identify the "goal state" or what you want, identify the discrepancies between the goal state and the initial state, and establish priorities for action. Because, the success of the project discussed in this dissertation was so important to the client and the "well being" of my career, extensive energy was expended to conduct a thorough needs assessment.

Focus Groups

"Whereas people interviewed or surveyed individually each provide their own unique perspective, a focus group often provides a perspective that goes beyond the summation of the participants' individual opinions" (Reeves, 1992, p. 527). While the practice of utilizing focus groups in the evaluation of educational materials is less common, it is frequently used in commercial enterprises when products are introduced to the public. In general, a small group of people (8-10) are brought together and allowed to respond to ideas or discuss a topic with the help of a moderator. The topic for discussion is very narrowly "focused". Many of the procedures that have come to be accepted as common practice in utilizing this methodology were established in the 1950's by Merton, Fiske, and Kendall (1990). Kruege (1988) provides an excellent resource for those who might be interested in learning more about this qualitative method.

Throughout the project definition and development of *5 A Day*, a total of nine focus groups were conducted. Three different locations were used for focus groups: Los Angeles, California; Athens, Georgia; and Minneapolis, Minnesota. The reason one would conduct focus groups in a number of areas is to assure the client that the idea or item being presented to the consumer has broad appeal.

Individual In-Depth Interactions

While focus groups provide information about the consensus of ideas, they can not accommodate individual in-depth interactions. There are many stages within the life cycle of a project when the developer can learn from observing a member of the target population interact with the product. No other activity can be substituted for this activity. Sooner or later, a developer must "show" their work to a member of the appropriate target audience. This can be done "in-house" or the evaluator can "take" the product to a setting which closely resembles the intended delivery setting. Both of these scenarios provide unique opportunities to learn about the product. While most developers wait until the product is almost complete, that is unnecessary. These activities can be conducted very early in a project, even before all the pieces are in place. I have allowed a user to move between screens of a program, while I stood behind them and read the directions aloud. These in-house evaluation sessions can help avoid costly mistakes, and help assure the developer that the content, the treatment and the interface are acceptable to end-users.

When the product is tested in the intended delivery setting, with members of the intended audience, it is usually at a more complete stage than when it is evaluated in-house. *5 A Day Adventures* was tested extensively both in-house and in a public school. The in-house sessions usually lasted for 1 hour and ultimately involved about 30 children. The in-school testing lasted for one week and involved 120 third grade students. This evaluation effort was critical in developing and refining the project.

Impact Evaluation

One of the roles of evaluation is to evaluate impact. We evaluate the impact of reform, the impact of new products, and we attempt to evaluate the impact of new knowledge. "While the [evaluation] methods available for goal refinement, documentation, and formative experimentation are relatively well-established, the methodology for assessing meaningful impact is still in its infancy" (Reeves, 1992). While Reeves (1992)

acknowledges that the traditional methods of impact evaluation have included testing, he calls for researchers to investigate the use of alternative methods, such as, real-world problem solving, participant observations, and self-analysis.

The effort to evaluate impact of *5 A Day Adventures* has involved many activities, including testing, but it has also involved many innovative methods. Dole has sponsored two e-mail addresses, one for teachers and one for students. In addition, teachers have had an opportunity to report on their observations of impact and many students have conducted their own self-analysis and reported on personal change. This data is utilized in Chapter 2, as it relates to design and is fully summarized in Chapter 3.

External Evaluation

There are times when an outside agency evaluates a product to better understand its appropriateness for a given objective or its potential for marketability. This type of evaluation is normally "out of the control" of the developer and might even be conducted without the knowledge of the developer or the sponsor. *5 A Day Adventures* was externally evaluated twice, once by Consumer Union, the publisher of Consumer Reports, and a second time by Apple Computer, Inc. In both cases, the evaluations provided important information which will be discussed in the next chapter.

Chapter 2

THE PROJECT

This chapter addresses the design and development of *5 A Day Adventures*. You will learn how each objective was addressed and how each of the six main program modules were developed. Additionally, you will learn how the findings of the evaluation activities introduced in Chapter 1 were utilized. However, before turning the clock back three years to uncover the process, it will be helpful for you to gain an understanding of the project as it exists today.

THE PROGRAM WALK-THROUGH

This narrative is intended to introduce you to the program and the design. Throughout this walk-through, graphic designs and scripts are supplemented with narrative addressing the intent of each.

As you view the graphics, review the scripts and evaluate the interactions, keep in mind that the target audience for this program was third-grade students.

The Opening

The opening screens of any project are important. In this application, the opening serves two purposes. First, it sets the tone of the program, and has the responsibility of grabbing the learner's attention. Secondly, it provides an opportunity for the sponsor and others who are involved in the development of a project to be recognized. The initial opening presentations must be short, or at least skippable, to allow the learner to move to the interactive mode as quickly as possible. *5 A Day Adventures* utilizes three screens in the opening sequence, as shown in Figures 1, 2, and 3. A click to any of the screens in the opening sequence will allow the user to skip ahead.
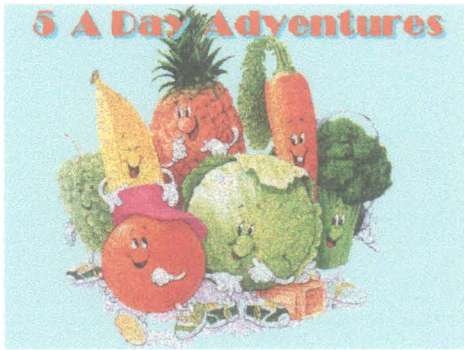
Figure 1. Title Screen

Title Screen

The title screen, shown in Figure 1, introduces the idea of fruits and vegetables as characters and presents the title. It might be interesting to note that the program was not titled until it was almost finished. A number of other titles were considered: 5 A Day Fun, Fun with Fruits and Vegetables, Fruity Dude Fun, 5 A Day Land, Fruit and Vegetable Fun. *5 A Day Adventures* was finally selected because it merged two very important messages we wanted to convey to the learner. First, it utilized the words, "5 A Day" in the title. At the time this program was released, from our own pre-test and focus groups, we learned that at most, 31% of the students, were aware of the national directive to eat five servings of fruits and vegetables a day. Using the words in the title provided a mechanism by which teachers and students would need to use the words, and in doing so, acted as a reinforcer for the message. Secondly, the word "Adventure" was finally selected because it symbolized the many ideas we wanted to convey to the students. Going on an adventure means: traveling, exploring, having fun, meeting new people, trying new things, sharing, and excitement. It is a motivational term. Just imagine how your interest in this document might change if the title of the program was, "Fruit and Vegetable Lessons: Knowledge for Cancer Risk Reduction."

Sponsor screen

The second screen in the opening (Figure 2) incorporates a Public Service Announcement (PSA) previously produced for television. Dole wanted to incorporate the PSA into the CD-ROM because it had been so well received by children. While it reinforces

the 5 A Day message, its style is significantly different from the rest of the program, and thus was placed "outside" the main Adventure. It can be skipped if the user chooses.

This screen also provides the backdrop for the sponsor to be recognized. The audio states, "This program was sponsored by the Dole Food Company." The actual words, are provided here, to illustrate that the recognition for Dole is minimal. Everyone involved in the program development agreed that the material should not contain any commercial messages. The only recognition for Dole in the entire program is the opening statement.
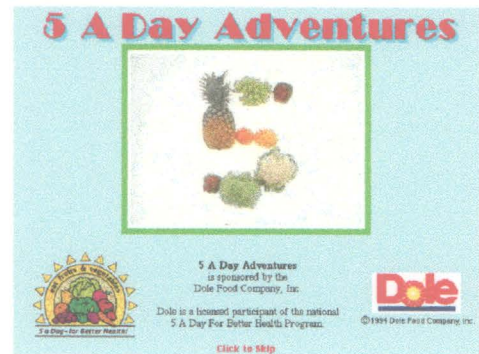
Figure 2. Sponsor Screen

Most companies do not graciously accept a low profile within their sponsored educational materials. In the report released in 1995 by Consumer Union, entitled, "Captive Kids," the authors state, "[we] believe that commercialism in US elementary and secondary schools poses a significant and growing threat to the integrity of education in America" (p. 1). Their report includes evaluations of sponsored educational materials and identifies that most "contain outright plugs for a company, or its product, or worse, biased information" (p. 3). *5 A Day Adventures* was one of the 111 programs evaluated in the Consumer Union's Study. It was found to be, "non-commercial, basically complete and objective. . . . No corporate or product logos on student handouts, and no Dole brand names are shown in the interactive modules" (p. 50). It was one of only eleven sets of material identified in the study of 111 sponsored educational projects to receive their best review in regard to presenting a complete and objective program in a non-commercial manner for the public education setting.

Credit Screen

The third screen in the opening gives credit to the Society of Nutrition Education (SNE) for validating the information and to Interactive Design and Development (IDD, Inc.) for designing and developing the product. The information is presented both visually and in spoken audio (Figure 3).
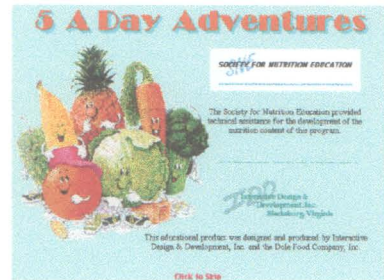
Figure 3.   Credit Screen

The Sign Post

Following the three opening screens the first decision point is encountered, the Sign Post, as shown in Figure 4. The Sign Post was chosen to support the travel theme, and to
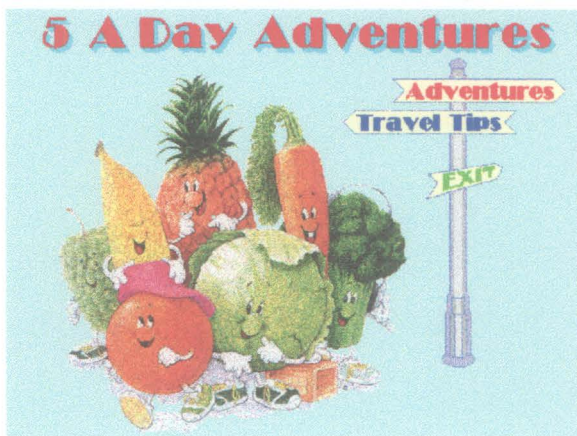
Figure 4. Sign Post

symbolize the decision that needed to be made at this point in the program. A click on *Adventures*, sends the user to the Town of 5 A Day, and a click on Travel Tips allows the learner to pick up a few pointers on how to use the program. In Travel Tips the students learn to look for places in the program where the cursor turns from an arrow to a hand. Also, Travel Tips provides an opportunity for the learner to investigate all the many icons that will be encountered in the program.

Banana Boulevard: Main Menu

It was the client's desire that the banana be given the most prominent role in the program. Bobby is the most visible character, and is used to welcome the learner (Figure 5).
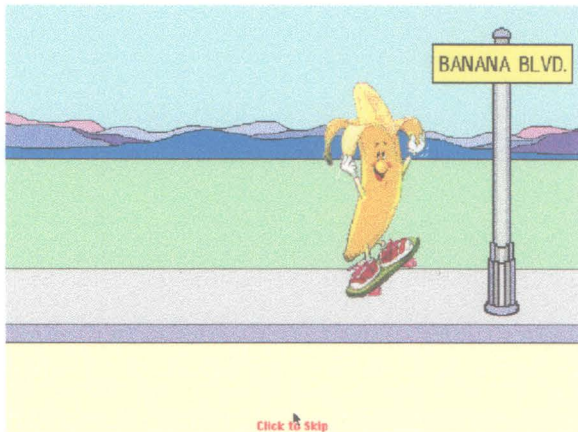
Figure 5. Bobby's Entrance

Bobby is a skater and a "real cool dude." He skates onto the screen and completes a couple of 360 degree turns before speaking to the learner. His opening lines were authored with the goal of providing just enough information to gain the interest of the student. From focus groups we learned that it was important to have characters who were not too authoritarian, or preachy. He speaks, "Say, hey there dudes, like I'm Bobby Banana. I'm so glad you could drop into our town. It's like really - like really great to see ya!" As quickly as Bobby appears, he disappears and the student finds themselves in the town of 5 A Day.

Town of 5 A Day

The Town of 5 A Day provides the main menu for the program, as shown in Figure 6. Throughout the program, content menus are designed to encourage investigation, rather than to convey to the learner details of the upcoming lessons. Keller (1987) reminds us that perceptual arousal, or grabbing the learner's attention is easy, he acknowledges that inquiry

Figure 6. Main Street

arousal is more difficult to achieve. Menus throughout the program were designed to address inquiry arousal. The exception to this is in areas of the program where a traditional,

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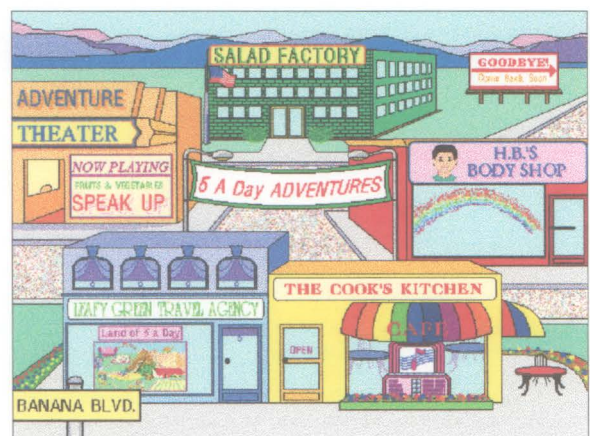
listed menu of items mimics real life. This situation can be seen in the Juke Box and the Copy Center. See Figures 23 and 34.

Bobby delivers the directions to the learner, however he is no longer visible on the screen. Important to the design beliefs of this author is the theory that learners do not have to be forced to engage in learning activities. They should be invited. In scripting Bobby's audio to introduce the main menu, there were three considerations: 1) do not provide any information to the student that would give hints of the activities contained in the buildings, 2) do not provide the learner with any information on the nutrition lessons contained in a building, and 3) to increase motivation, allow the student to be in complete control (Keller, 1983 #162). Most eight-year olds do not have the opportunity to control their movements around a town. They go where they are told. The Town of 5 A Day is different. It is the goal of the program to empower the student to make their own decisions in investigating the material.

Bobby's invitation was scripted to incorporate three message points: 1) this is a "neat" town, 2) you will want to explore, and 3) it is easy. Bobby delivers the message in a matter of fact way, "You know, Banana Boulevard is one way cool place here in town, but I know you'll want to check out everything, so click on any of the building doors and get started."

In reviewing the Town of 5 A Day, we see a theater, a salad factory, a health club, a cafe and a travel agency. In the store front of the cafe we can see a juke box. The town is set on a small plateau surrounded by blue ridged mountains. The buildings provide a familiar analogy for most children. Keller (1987) speaks to the motivation of familiarity and the confidence we feel when we are in familiar surroundings. Public stores and theaters are places we go inside and see what is going on, even factories are familiar.

While students may not have seen a Salad Factory, it is believed that the idea of a factory, where things are assembled, is familiar to most children.

Throughout the program hidden "hot spots" are active to reward the student who explores the graphics. These are considered positive consequences for exploring, and in Keller's model (1987), support intrinsic motivation. On the main street, a click on the flag flying outside the Salad Factory will start the National Anthem, a click on the lamp post will turn on the street lights, there are sounds of busy people in the kitchen and the sign on top of the travel agency will start up jet engines in preparation for a flight.

We will now discuss each of the buildings, or educational modules, in a clockwise fashion, beginning on the west side of town, at the Adventure Theater.

<div align="center">Exploring Around Town</div>

<div align="center">The Adventure Theater</div>

Figure 7. The Adventure Theater

Inside the theater (Figure 7), Pamela Pineapple is on stage to provide the welcome, "Welcome boys and girls! I'm Pamela Pineapple! Today in the 5 A Day Auditorium, we have an exciting program planned for you. Some of the most popular fruits and vegetables are waiting right off stage to tell you their fascinating stories!" This section relies heavily on personal language, role modeling, and credibility. Each character will to tell their "own" story, they don't need anyone to speak for them. The information is in their own voice, and reflects their point of view. Keller and Burkman (1993), remind us that these design attributes all contribute to increased motivation for the student to interact with the content and attend to the message, see strategies 2.4a, 2.5 and 3.5 as referenced in Chapter 1 (p. 25 and 26) of this dissertation.

The adventure theater has two main objectives, they are:

1) Engage students in learning about fruits and vegetables in such a manner that they will feel they "know" the fruit or vegetable "personally."

2) Teach students how fruits and vegetables grow, where they come from, why they are good for us, and how they fit into 5 A Day.

The Adventure theater provides an opportunity for each character to teach about themselves by providing factual "chunks" of information. It is very empowering for a young child to have knowledge that an adult does not have. Much of the information provided by the characters is not common knowledge, and students enjoy adding it to their "I bet you didn't know" collection of facts. For example, do you know how the pineapple got it's name? Have you ever seen canned pineapple canned? Did you know that one can of pineapple contains the fruit from at least three different pineapples? Pamela will tell you all this and more, when she takes the stage.

In allowing students to hear personal stories of each character, the student has an opportunity to "like" the character, even though they might not like to consume the food

which the character represents. Fear is often based on the unknown, as this seven-year old acknowledged in his e-mail to Courtney Cauliflower.

> Dear Courtney.
>
> I would like to try Cauliflower soon. I have been afraid to try it. I will remind my dad to bring some cauliflower [to the campout].
>
> Your friend Christopher (personal communication, March 13, 1996)

Many e-mail messages and letters from students have shown that they feel the characters are almost real. In Chapter 3, Observations, these findings are reported in more detail.

Once a student moves inside a store, there are several cues to remind them where they are and what options they have. The status bar provides students with the title of the module as well as options to: return to the main menu, ask for help, move to the glossary, access the juke box, and check their progress in collecting tokens. On the far right of the status bar is an icon that will allow them to call for the challenge when they are ready. A complete discussion of the development of the icons is provided later in the chapter.

Inside Adventure Theater

Figure 8 shows the first set of characters waiting to be chosen for their opportunity to speak. Arranged alphabetically, the 36 characters represent the most popular fruits and vegetables identified by consumption reports and evaluated for their "nutrition story." Foods which have no significant nutrition story, such as iceberg lettuce, are included because of their high consumption. Other foods which are less popular, but have a
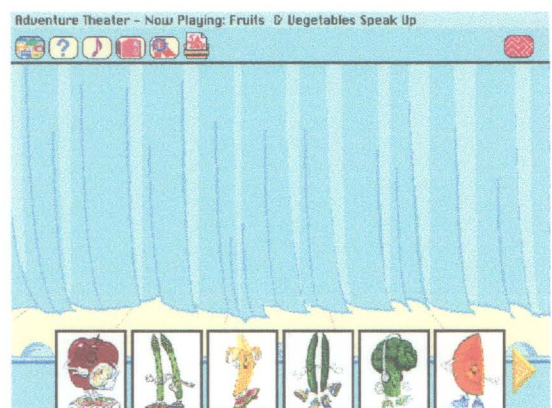
Figure 8. Selecting a Fruit or Vegetable to Speak

significant nutrition story, such as the sweet potato, are included to expose students to new foods. Each character has an alliterative name, and speaks in a unique character voice.

Want To See My Movie? When a character takes the stage, eight new icons appear beneath the stage. From left to right they represent: 1) Facts and Figures; 2) When was I Discovered?; 3) My Movie (Figure 9); 4) Who in the World Produces Broccoli [this item] for Import to the US?; 5) Which States in the US Produce Broccoli [this item] for the
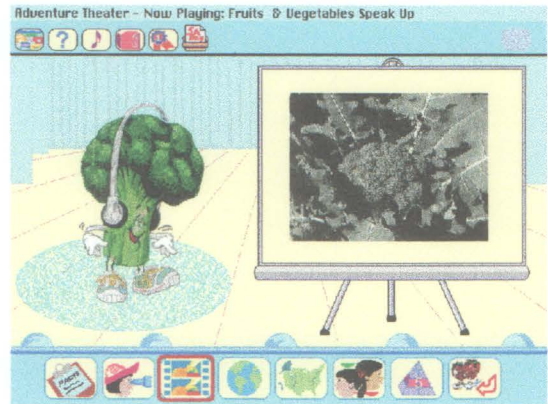
Figure 9. Barney Broccoli Showing His Movie

Market Place?; 6) Why am I Good for You?; 7) How Can You Fix Me Up and Fit Me In?; and 8) Good-bye. When the students indicate they wish to return to the list of characters, an audio statement reminds them of the "main" character message. Each activity on stage provides an opportunity for the character to speak and show information.

The development and testing of these icons and the icons on the status bar will be discussed later in the chapter.

Where Am I Grown? "Almost all broccoli produced in the United States comes from California. It might also come from another major producer, such as Washington, Maine, or Wisconsin."

When the US map icon is selected, a US map drops down on stage (Figure 10) to display the state which is the number one commercial producer of the food, as well as,
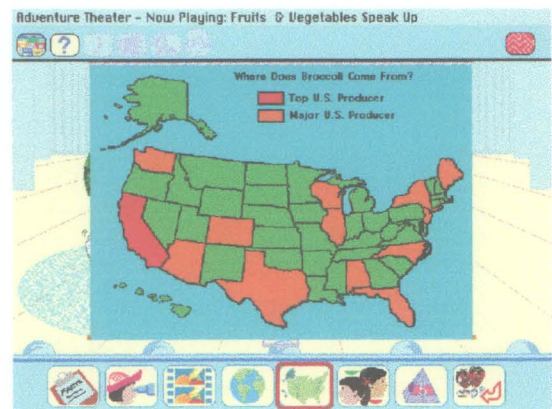
Figure 10. Which States Produce Broccoli for the Marketplace?

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any other state which produces at least 10% of the food supply for this item.

Following the first time the learner sees the US map in a session, an invitation is issued to interact further. "If you click on any State, I'll tell you the name of that state.... is there a state you would like to know?" This activity was added to increase the educational and the motivational value for both the students and the teachers. It is a piggy back activity and is available each time the US map is open on stage. Learning the names of states is often a third-grade objective, this activity provides instant positive feedback and has been reported by teachers to increase the students' confidence by allowing them access to a very easy rehearsal method. More on this activity will be reported in Chapter 3, Observations.

The Salad Factory

Figure 11 shows the Salad Factory's main lobby. The objectives for this section are:

1) Children will learn to make salads that are high in Vitamin A, Vitamin C, Fiber, and low in Fat.

2) Students will demonstrate an understanding that not all fruits and vegetables contain the same nutrients.

The Salad Sisters welcome us to the salad factory. They sing a few bars of their signature song, then speak to the learner, "Welcome to our factory. I will help you learn to make salads that are high in Vitamin A, Vitamin C, and Fiber and low in Fat. Click on the bowl when you are ready to get started." This opening audio addresses Gagné's (1989) first and second event of instruction: gain the learner's attention, and inform the learner of the objective.

Inside the Salad Factory

"We will have some fun today. Just start by selecting what you like best and the gauges will help you with all of the rest. Have Fun!"

Figure 11. The Salad Factory
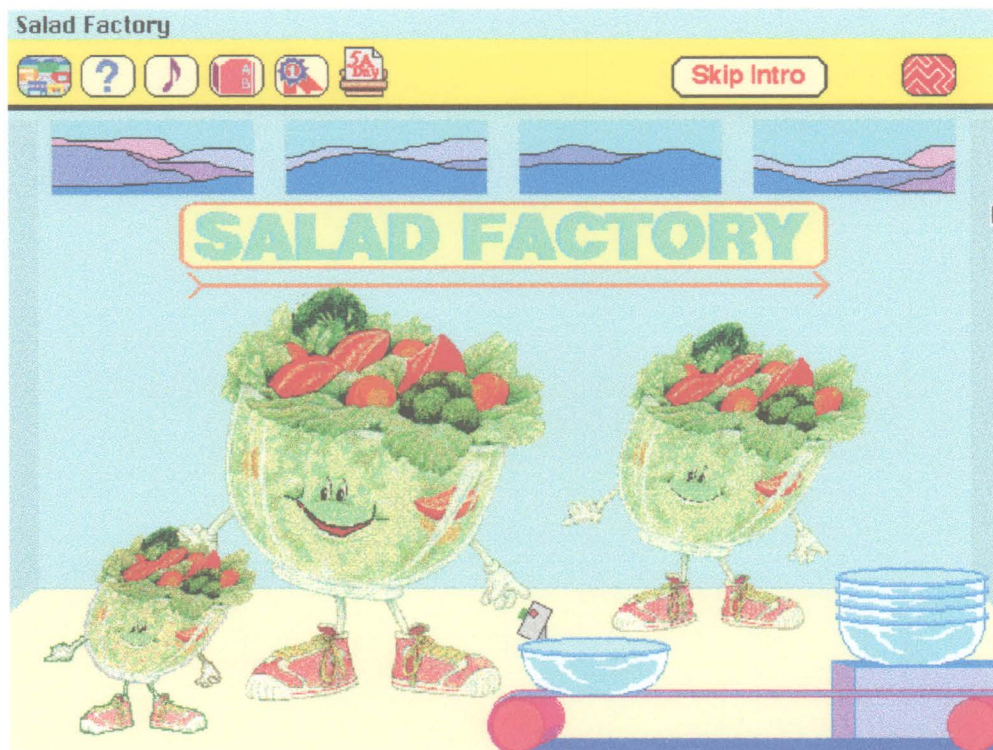
As shown in Figure 12, once inside the factory, the stimulus material is presented and the student is directed to make a selection. The factory noises direct the attention of the student, as selections are made and gauges become activated. The gauges, without being judgmental of the student's choice, provide information upon which the student can act to make adjustments. The gauges provide both learner guidance, as well as feedback to the students.
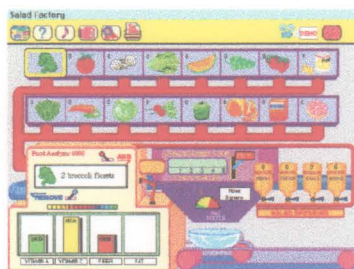
Figure 12. Inside Salad Factory

Figure 13. Salad Analyzer

Figure 14. Cafeteria

In Figure 12, notice that the items are evaluated individually as they pass through the food analyzer. However, in Figure 13, the salad is evaluated as a unit in the Salad Analyzer. In addressing the second objective for this module, it was important to demonstrate that the total nutrient value can actually be better than the nutrient value of one item. It is possible to add items, such as iceberg lettuce, which have no nutrient value, and still make a very nutritious salad. Ratings of super, great, and good are given for each salad.

In the cafeteria (Figure 14) the nutrient value for all items on the salad bar is shown in chart form. This chart is used to remind the students what their salads contained, and it enhances retention of the nutrient values of the fruits and vegetables by allowing the students to view the differences in these values simultaneously. In addition, learning to chart data in this form was found to be a third-grade objective in several of the target states (Minnesota, Texas, Georgia). And finally, by moving the students out of the factory into the cafeteria, the focus is shifted from making salads to eating salads, one of the goals of the program.

H.B.'s Body Shop
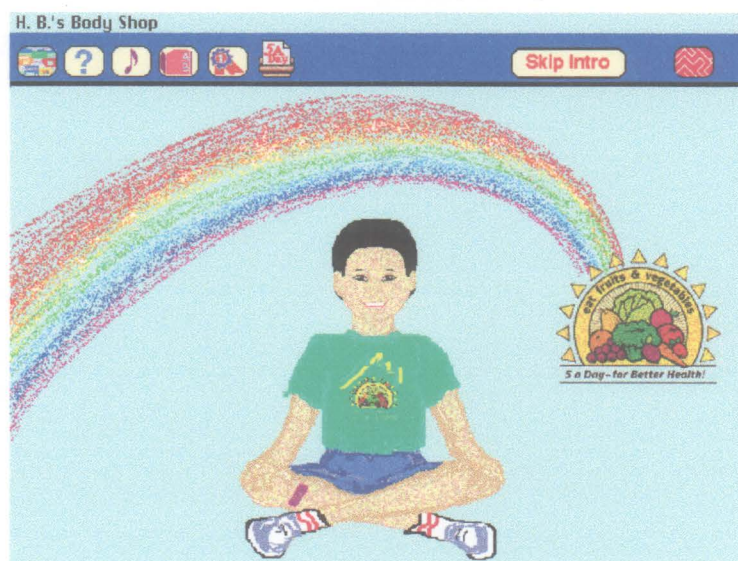
Figure 15. H.B.'s Body Shop

Objective:

1) Students will learn why Vitamin A, Vitamin C, and dietary fiber are important to building healthy bodies.

2) Students will be able to state at least one nutritional benefit for each of the 36 fruits and vegetables in the program.

3) Students will learn the relationship between what we eat and how it benefits specific parts of the body.

H.B., as shown in Figure 15, teaches students how fruits and vegetables are important to good health by allowing students to click on parts of his body to reveal the "underlying" story of nutrition. Nine areas are available for investigation. They are: eyes, hair, teeth, skin, blood, bones, intestines, cuts and scrapes, and muscles.

Inside H.B.'s Body Shop

Following a click on H.B.'s eyes (Figure 16), he comments, "I saw that! And you know what helps me see the light, especially at night? It's vitamin A! Lots of fruits and vegetables have vitamin A. Just take a look for yourself." H.B. becomes surrounded by the "Vitamin A Gang." Each
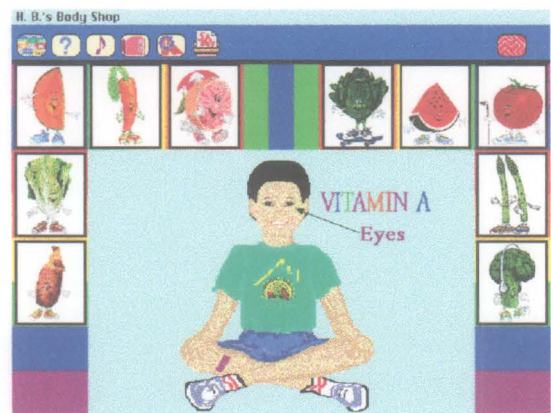
Figure 16. Vitamin A is Good For Eyes

character in the lineup is selectable. When selected, they proudly announce their name, and remind students why they are a good source of vitamin A.

Figure 17 shows the results of a click on H.B.'s leg. He acknowledges by saying, "That's my tibia. Did you know that? It's kinda neat to know the names of your bones. Well, did you know that vitamin C is one of many vitamins and minerals that help our bones stay strong. Here, take a look. . . .Which one will you have today?"

Whenever possible, the message contains elaborated information. In this case, H.B. tells students the name of his bone rather than just the fact that bones need vitamin C. This supports relevance of the information and increases the likelihood that the student will relate to the message.

Figure 17. Vitamin C is Good for Bones

It has been observed in formative evaluations when working with groups of children, that clicking on H.B.'s intestinal area is very appealing to third-grade students (Figure 18). They are not certain what H.B. will reveal, and often encourage each other to "do it." However, he reveals only his intestines. He comments, "Those are my intestines. That's where my body takes the nourishment out of what I eat. To keep my intestines healthy, I have to eat plenty of foods that have fiber. I'll show you lots of fruits and vegetables that have fiber."

Figure 18. Fiber is good for Intestines

The Cook's Kitchen

Objective:

Give students access to recipes which are easy to make and meet the 5 A Day standards.

Ray Raisin welcomes the learner to his kitchen, "Hello there. I'm Ray Raisin and I'm here to help you find some new ways to get your 5 A Day. Take a look at the recipes I

have here in my kitchen. Remember, be sure to wash your hands and food before preparing anything! Go ahead - click on one of the appliances" (Figure 19).

Figure 19. The Cook's Kitchen with Host, Ray Raisin

Again, Ray Raisin's introduction provides several events which are necessary and important for instruction. As he speaks, he is flipping a little raisin, with the goal of gaining the attention of the learner. He informs the learner of the objective: [you will learn] new ways to get your 5 A Day, and he provides the directive to investigate the appliances. In addition, he provides prerequisite information concerning cooking. He reminds us to wash our hands and food before getting started.

Appliances were used as the menu convention to invite children to investigate the kitchen without revealing what type of fruit or vegetable was included in the recipe. The intention was not to allow students to avoid a recipe because it contained something they did not think they liked. The arrangement of the kitchen counter and appliances is such that the section menu is never removed from view, even when a recipe is open. See Figures 20

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- 21. It has been observed, across many projects in which this designer has been involved, that a menu structure which allows the learner to keep "in view" all options, increases use of the module (Miller & Lambur, 1988).

In addition to recipes, other fun aspects of the kitchen are selectable, to support exploration: the sink runs water, the blinds go up and down to provide a view of the yard with a cardinal singing, and the message board reminds students to think, "Have you had your 5 today?"

Inside the Cook's Kitchen

Whenever an appliance is chosen, students have access to the total recipe card set associated with the appliance. In Figure 20, the user has selected the blender. They can view the safety video on using a blender, view a movie on how to make this recipe, or flip the card to show the graphic version of the recipe.
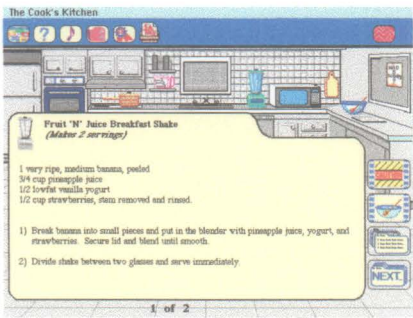
Figure 20.   Fruit and Juice Breakfast Shake
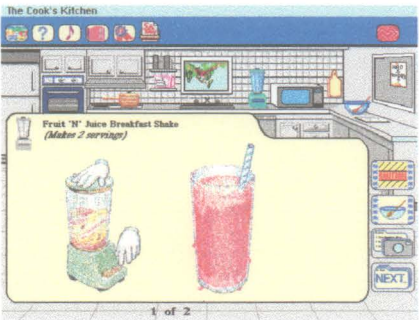
Figure 21. Graphic of Fruit and Juice Breakfast Shake

Each card provides a graphic of the finished recipe (Figure 21). The graphics were included to support use of the program by younger children and to provide the additional motivational factor of seeing what can be made. While the program was designed for third-grade students, it is used extensively in K - 4. Teachers report that students enjoy interacting with the modules even though they may be non-readers. Usage will be further discussed in Chapter 3.

Four of the most popular recipes in the kitchen contain a "how to" movie (Figure 22). Each recipe is demonstrated by a child. This is the only part of the program where children deliver the message, in their own voices. Keller and Burkman (1993) address the importance of role modeling, and report that role modeling can be used to stimulate intrinsic motivation and encourage the learner to set similar goals. The idea that if "you can do it, I can do it," is exactly the message presented in the recipe videos.

Figure 22. "How To" Videos

The Juke Box: 5 A Day Top Tunes

Figure 23. The Juke Box. 5 A Day Top Tunes
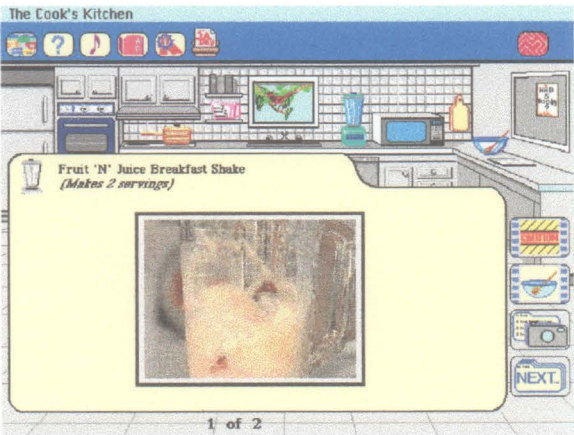
Objective:

Provide students with nutritional messages set to music.

The top tunes, as shown in Figure 23, were developed to reinforce the objectives of the program in a fun manner. They deliver their message using a variety of musical styles, including: country, rap, blues, folk, and rock'n roll. Each song provides the opportunity for children to sing along by showing the words on the screen as the song plays.

Inside the Juke Box

The objectives of the Vitamin A song are:

1) Help students remember to look for the color of the fruit or vegetable.

2) Reinforce why Vitamin A is good for the body.

Figure 24. The Vitamin A Song

3) Reinforce recall of fruits and vegetables high in Vitamin A.

Four of the movies in the Juke Box are produced as action videos: Vitamin A (Figure 24), Vitamin C, Fiber, and 5 A Day. These songs were selected for full production because each one had an objective related to the recall of fruits and vegetables high in the

nutrient represented by the title. Recall can be facilitated by the use of visuals. (Ashcraft, 1989; Flemming & Levie, 1993; Moore & Dwyer, 1994)

Figure 25 represents the Juke Box after the Broccoli Rap has been selected.

Figure 25. The Broccoli Rap

The objectives for this rap included:

1) Teach students why broccoli is good for you.

2) Teach students ways to eat broccoli.

3) Teach students how to spell broccoli.

4) Provide a fun activity with Barney Broccoli.

Of the 36 fruits and vegetables only three characters were selected to have their own songs: Broccoli, Cauliflower, and the Banana. Broccoli was selected because it is a good source of Vitamin A, and it is a high source of Vitamin C, and Fiber. In the terms of this program it is a "super" vegetable. If only one vegetable could be promoted to children, Broccoli would be an excellent choice. Not only is it a good candidate based on its nutrient value, it is a good candidate because it can be eaten raw, and children can fix it for themselves. In addition, one of the original objectives of the program (as discussed in the next section of this chapter) was related to spelling. A rap provided a natural rhythm to make each message point stand out, and acted as a mnemonic to facilitate children learning how to spell Broccoli. Tiffany's letter supports this idea. This letter is one of the 150 letters received from children during the observation period as discussed in Chapter 3.

> Dear Sir,
>
> I'm a third grader at Cooke Elementary. Last week our class
> worked with your "5 A Day Adventures" CD. My favorite is the
> broccoli song because I learned how to spell broccoli. Thank you.
>
> Love, Tiffany (personal communication, October 11, 1995)

An analysis of the 150 letters received from children during the observation period is included in Chapter 3.

Figure 26 highlights the Juke Box after the selection of "Just Try Us." The objective of this song is to encourage children to try more fruits and vegetables.

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The title and development of this song followed interviews with children who reported being influenced to try a new fruit or vegetable when someone said to them nicely, "Just Try It." A more detailed discussion of this finding is included in the second half of this chapter.

Figure 26 Just Try Us: The Song

The Land of 5 A Day

The Land of 5 A Day, as shown in Figure 27, provides the backdrop for teaching the many objectives associated with the 5 A Day guidelines. While the lands appear to be quite varied, they fit together educationally because of content, and they fit together emotionally through fantasy. Keller and Burkman (1993) remind us that images and situations which appear to provide the unexpected, including contradictory aspects, such as pyramids and vineyards together, often increase the motivation of the learner to interact with the material.

This menu, like previous menus, is designed to invite the learner to explore. One of the goals in putting together all the lands into a "mother land" was to provide a sense of organization to the many associated, but distinct concepts. This menu, like others, contains associated rewards for exploring. Upon entering the Land of 5 A Day, the learner can hear Bobby Banana working as the disc jockey, broadcasting from WFIVE, the Voice of 5 A Day.

71
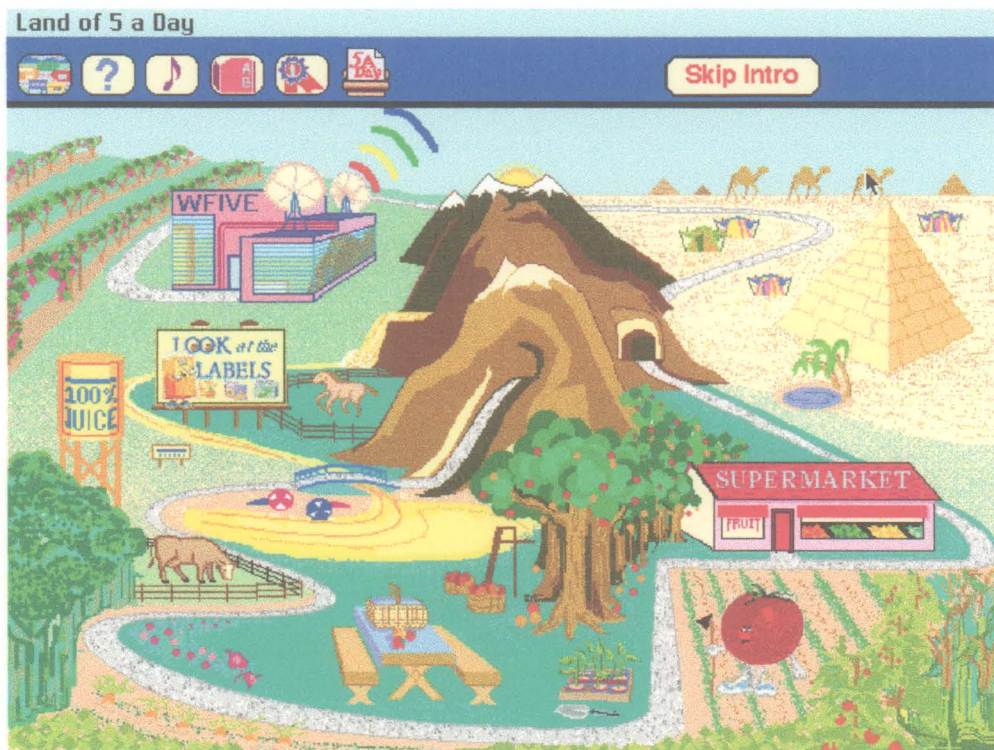
Figure 27. The Land of 5 A Day

Figures 28 - 33 illustrate the introductions to each of the five lands.

Inside the Land of 5 A Day

WFIVE Radio Station.

The studio of WFIVE, as shown in Figure 28, serves as the link of 5 A Day to the
rest of the world. There are three objectives for the radio station:

1) Teach students how to recognize the 5 A Day Logo.

2) Allow students to show us how they did their 5 today.

3) Encourage students to use the internet.

Figure 28. WFIVE: The Voice of 5 A Day

Pyramid Land, illustrated in Figure 29, provides the environment for students to learn about the Food Guide Pyramid and practice putting the Pyramid together. Understanding the Food Guide Pyramid is an important aspect of understanding the 5 A Day recommendation. When focus groups were conducted, prior to the development of the project, none of the 20 teachers involved in the discussions had classroom materials presenting the new Food Guide Pyramid.

Market Land.

In fulfilling the recommendation to eat 5 servings of fruits and vegetables a day it is important to remember that canned, frozen, and dried fruits and vegetables also count. The objective of utilizing a market (Figure 30) as the stage for the lessons, is to strengthen the carry over of the activities in Market Land

Figure 29. Pyramid Land

to the activities in a real market. Calvin Carrot hosts Market Land and teaches the students how to find fruits and vegetables in many sections of the store. In addition, as food is investigated in the market, attention is drawn to reading the label for key phrases. Again,

Figure 30. Market Land

the content is placed within the context in which it will be utilized.

Serving Size Land.

Figure 31 shows Stan and Sarah Strawberry in Serving Size Land on a picnic. The objective of Stan and Sarah's picnic is to provide:

1) a means to teach the serving sizes associated with 5 A Day in a grounded manner.

2) a mnemonic strategy to help students remember the rules for serving sizes for 5 A Day.

Stan and Sarah always talk in rhymes. In their rhyming nature they encourage the learner to "Click on the basket, there's more food inside. Set it out of the basket, don't let it hide." As each different item is removed from the basket, they provide a rhyme that will aide students in recalling the information. Using rhymes to

Figure 31 Serving Size Land

increase retention has been utilized since the times of ancient Greece when *The Iliad* and *The Odyssey* were recited from memory (Ashcraft, 1989, p. 193).

Label Land.

Reading food labels is an important aspect of eating fruits and vegetables which count toward 5 A Day. There are four main objectives (Figure 32) in reading packages that are taught in this section:

1) Choose frozen vegetables without
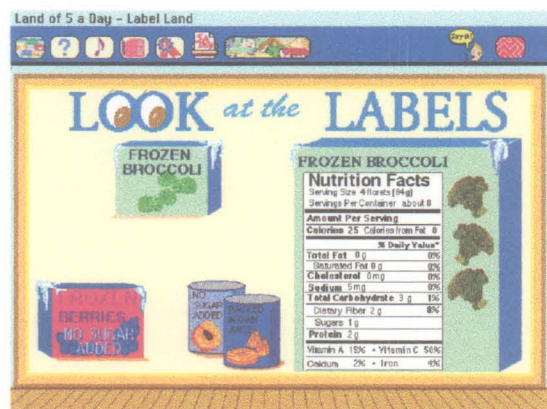
Figure 32. Label Land

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sauces or extra butter.

2) Select frozen fruit without added sugar.

3) Select canned fruits and vegetables packed in their own juice.

4) Read the food label to make good choices.

In Figure 33, one of the activities associated with learning to read the back of a food label is shown. To increase motivation in these detailed lessons, many gaming activities are incorporated, as well as George, an animated character who performs tasks in "pumping" it up for the learner.
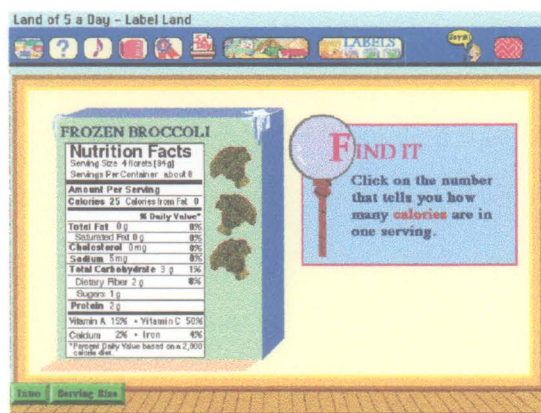
Figure 33. Reading the Back of a Food Label

<div align="center">Support Centers</div>

The Copy Center

Figure 34 shows Bobby Banana inside the copy center encouraging the students to print the recipes, the 5 A Day graphics, and the words to the juke box songs. The ability to print from within the program was added in version 2.0 in response to teachers reports that they could not find the material to print in version 1.0. In version 1.0 the material was available in the desktop window in a folder entitled, "Support Materials."
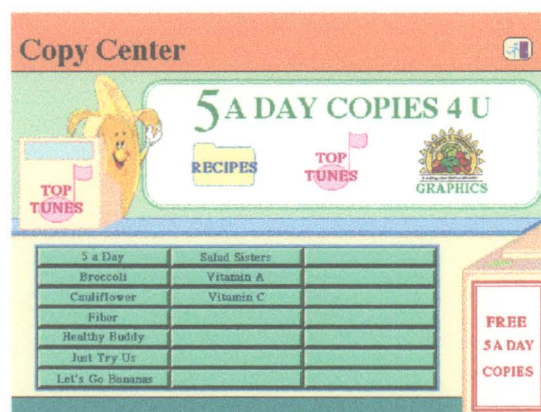
Figure 34. The Copy Center

The Glossary

Figure 35 shows the Glossary, which contains 94 terms. Students access the glossary from the status bar, by selecting the icon resembling a book. Students report using the Glossary infrequently, however, this usage may equate favorably with the use of any glossary. If usage is less than average,

Figure 35. The Glossary

the location of the icon may be a contributing factor. Words appearing in the glossary were selected because they were:

1) Suggested by teachers.

2) Associated with "legal" definitions for 5 A Day.

3) Government organizations or recommendations.

The Challenges

Figure 36 illustrates a question from the challenge associated with the Fruits and Vegetables Speak Up section. Every section of the program provides students with an opportunity to test their knowledge. While all challenge sections are different, the basic rules for design are the same.

Figure 36. Fruits and Vegetables Speak Up Challenge

The objective of the challenges is:

To Provide a safe environment for students to demonstrate their knowledge.

By safe, it is meant that:

1) The student decides when they are ready to engage in a challenge.

2) The student can exit the challenge at any time and keep any tokens earned up to that point.

3) The student can skip any question, without penalty, which they don't feel comfortable to answer.

4) Every question is evaluated as soon as it is answered, and the correct answer is presented if the question was answered incorrectly.

5) Questions are selected at random such that an element of chance exists.

6) All students are rewarded for effort.

Following these basic guidelines, the challenges have become popular with the students. While, one student has written asking for harder challenges, most report feeling like Annika and Jacki, who wrote:

> Hi Courtney, my name is Annika and my friend Jacki says Hi to you too. We are in the third grade and we are both 8 years old and we like cucumbers!! Our favorite thing on 5 A Day is the challenges!!! Our favorite one is the theater one where you have to guess who the character is. Annika (personal communication, May 23, 1995)

One question from the challenge Annika and Jacki like the best is shown in Figure 36. The learner is asked, "Do you know who I am?" Each of the four clues that are revealed provides more details on who the character is. While the student may guess at any time, the risk of failure is low if they request all clues before guessing. Cornelius Corn is the mystery personality to be identified in Figure 36.

In Figure 37, one of the questions in H.B.'s challenge is shown. The student is directed, "Click on the fruit or vegetable that is a good source of Vitamin A". Of the characters shown, the good source of Vitamin A is the carrot. Questions in H.B.'s

Figure 37. H.B.'s Challenge

Challenge are of two types: 1) find the fruit or vegetable high in a nutrient, or 2) find the part of the body that benefits from this nutrient.
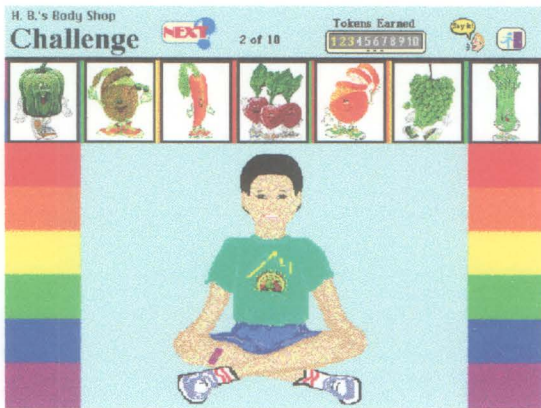
Figure 38 illustrates one of the challenge questions in Market Land. Students shop around the market to find the answers to the questions. Here, they are asked, "Calvin Carrot pointed out that in one part of the store you need to read labels to avoid buying packages with sauces or butter. Show me that part of the store." If the student selects the frozen food case, they will earn a token and a box of broccoli for their shopping cart.

The Token Summary

The Token Summary, Figure 39, provides a record of all tokens earned in a session. Students may review their progress at any time in the program by selecting the award icon

Figure 38. The Market Challenge

from the status bar. In this case, a student has earned a number of tokens from different sections of the program. If the student fills up the Token Summary, all tokens turn to a 5 A Day Symbol and fireworks are "displayed" from the castle. Because the tokens are not stored on the computer for students upon exit, they are encouraged to review their token summary and to update their graphic print out of the token summary screen before leaving the program.

Figure 39. The Token Summary

Summary

This overview of 5 A Day Adventures has introduced the main sections of the program and provided background to the rationale involved in the designs. In the following section, the reader will have the opportunity to more thoroughly investigate various aspects in the development of the program.

SECURING THE PROJECT

Introduction

Now that you have had an opportunity to review the main program sections, the foundation is in place to learn more about how the current project emerged from an initial idea. In conveying "a piece of the story" there are a number of factors that must be woven together. There are people, events and activities which affected what the project is today. If I presented a textbook story of design, I would be failing to address some of the more interesting observations of the project. I have struggled with how to best interweave these activities with the development process. While there is some benefit to discussing people and events in isolation, I have decided it would be best to report activities close to the order in which they occurred.

Before I continue, I would like to provide some background observations on stakeholders and identify my role as a stakeholder. While other stakeholders will be identified throughout the narrative, I feel this general discussion is appropriate at this time.

The Stakeholders

In managing a project with so many people involved, it is critical, early in the project, to identify all of the stakeholders and attend to their expectations. Every activity, every project, every development task has stakeholders. When describing stakeholders, we often talk in terms of players. It is helpful to answer the question, "Who are the players and what do they have to win or lose?" Unless the project is being developed for an individual who will pay all the bills, be the sole user, and not care what anyone else thinks, the number of stakeholders is probably larger than one might assume at first glance. There are the primary stakeholders, which are relatively easy to identify. They are visible. They usually have names and faces and everyone involved with the project is, at the very least,

aware of them. While they are the front-line stakeholders, they usually represent other, secondary stakeholders.

The secondary stakeholders are not actively involved in the day-to-day decisions of the project, but they view it out of the corner of their eye. They are always aware of it. They have established a "necessary" degree of success, usually articulated only in their minds, which must be met, in order for them to feel that their money, time, or reputation was properly utilized. Secondary stakeholders might ultimately answer to tertiary stakeholders, and so on. At each level there is an expectation from the project. Unless all this information is disclosed early in the project, which would be most unusual, many unexpected pitfalls can be encountered. I feel it is critically important for the person who has the responsibility "to make it all happen," to learn who the stakeholders are, and to understand as much as possible about their "expectations."

While some clients come to me with well thought out goals, most do not. Many have trouble answering the question, "What are your goals for this project?" While this was not the case with the 5 A Day project, it is frequently a problem. Thus, if a client, or a stakeholder, cannot articulate goals, I simply ask, "What has to happen with this project such that, when it is over, you will believe it was a success?" Unlike the goal question, I always get a very telling response. Most important to note about this activity, is that what defines success for one stakeholder does not define success for another.

I am always concerned that the client [stakeholder] be able to articulate realistic goals to be achieved in a realistic timeframe. The success of a project can be dependent on factors outside the normal scope of control. In this case, the project involved the utilization of an emerging technology, and was dependent on third party's cooperation for implementation (schools, principals, and teachers (each a stakeholder)). Additionally, the client expected to see outcomes which indicated behavior change. It was critical that a

realistic timeframe be established. I would not knowingly take a project that had unrealistic expectations in an unrealistic timeframe. However, without clearly understanding what is expected by each stakeholder, we can only guess what the expectations are. Not knowing is always worse than knowing, in addition, it is foolish.

Throughout the development of 5 A Day, stakeholders' expectations played a significant role in the design, or better stated, the re-design or adjustment of the project. These activities are identified throughout the narrative.

Mary Miller: Stakeholder

First, let me remind you that I am a primary stakeholder in the success of *5 A Day Adventures*. As soon as it was evident that we would begin the project I had a discussion with my development team (each one a stakeholder). I reminded them that we had to succeed on a number of levels in order for us [the company] to be successful. First, we had to manage the project resources in such a manner that we did not go broke developing the project. This was a challenge because we wanted the project to be "well received," and at times lost focus of the fact that we could only do good work, if we stayed in business.

Secondly, for us to be successful, we had to do everything possible for all stakeholders to succeed. The program had to be well received by teachers, children, and parents. It had to do so at such a level that it would be nationally recognized for its efforts. In addition, for me to be successful with the project, I knew that my efforts had to be positively reviewed by my peers in the field of instructional design. I have had, and still have, a great deal at stake in the success of this program.

I ask the reader to keep in mind that this story is told through the eyes of a stakeholder. While I have made every effort to be honest, I am certain that if any other stakeholder told this story, it would be different.

The Initial Idea

In the summer of 1992, I went to New York to brainstorm an idea with a Public Relations (PR) firm with which I had previously done business. I had no knowledge of who their client might be. I was creating ideas about how I would "hypothetically " reach children in the primary grades with a nutrition education message. All of my suggestions involved technological solutions. The PR agency began to ask good questions about schools and technology: What kind of technology is in the schools?; How many kids really have access to CD-ROM players in their classrooms?; How does integration of CD-ROM players shake-out by state?; How robust is the technology?; How receptive would teachers be to a nutrition project?; How long would it take to develop?; Would it capture their imagination?; and How much would it cost to develop and distribute?

Cost

First, I would like to address the cost question. While in reality, my New York clients were very understanding when I told them I could not estimate the cost until I had more information, it is noteworthy that this question is almost always one of the first questions asked by a client. While the question is understandable, it is, none the less, impossible to answer in the early stages of project discussions. We can not cost-out imagination and problem solving the same way we cost-out widgets. While we might be able to estimate the production, given the design, it is difficult to properly estimate the cost of creating the design. After five years of commercial development, I still find myself grappling with trying to calculate the cost of creativity.

Before the objectives or scope of the project have been defined, most clients want to know the cost. However, every project is different. Since the mid 1980's when multimedia technology began emerging on the educational scene, there has always been someone trying to place a dollar value on an hour of instruction and creating confusion in

the process. When we ask, "What does an hour of instruction cost?", why do we expect the answer to be the same across projects? It is not the same across "traditional" curriculums. I feel certain that it is more expensive to educate a chemist than a mathematician. Additionally, I hypothesize that it is more expensive to deliver an hour of instruction on how to develop instructional technology than it is to deliver an hour of instruction in World History. My point is that as developers of instructional materials, we have an obligation to present a realistic picture of the development process.

No client offers me greater challenge in understanding the real cost of developing a multimedia project than one who has just come from a multimedia conference in which they attended a presentation delivered by an academician, who was sponsored by a large hardware company. These credible "fellows" often deliver two messages: 1) anyone can do this, and 2) it has become "incredibly cheap." If you believe either clause in the previous sentence, then this dissertation may not be for you.

Simply put, the more you know about the project, the better you can cost it out. As you might have guessed, we delayed the cost question until I could better define the scope of the project. Understandably, I can not disclose any actual contractual dollar figures in this document. However, I will point out a few of the money issues and the challenges we faced in managing the cost.

Even after one gains an understanding of the project's scope, it is impossible to estimate cost without some basis for the estimation. It is impossible to estimate costs accurately, unless you have a history which represents a similar situation. Two problems arise when estimates must be created and there is no history upon which they can be based: first, team members tend to underestimate how long it will take to accomplish given tasks, and second, managers often overlook some of the costs. I have first hand knowledge of both of these problems.

While I had significant experience developing large multimedia projects within a university setting, when I began the development of the *5 A Day* disc, I did not have significant experience developing large multimedia projects in the business world. Within a university, many of the costs associated with developing projects are hidden, or at the very least, are not the daily focus of the project manager. Frequently at a conference an academician will report that a given multimedia project was developed for a very small amount of money. The figure they report often reflects a small grant intended to cover the cost of a graduate student for the academic year, or it could be enough money to purchase a computer and employ two graduate students. In any case, it rarely reflects the real total costs of development. Most often, their own salary is not even included in the cost calculation, not to mention their overtime hours, rent, phones, lights, heat, water, insurance, business licenses, supplies, and legal fees. Even though my university development work did include managing many of the previously mentioned costs and I had records of time on tasks, I still underestimated the hourly cost of development and overestimated how much we could accomplish in a given timeframe.

It was my accountant and my business advisor who insisted that each employee must keep an hourly time sheet. My accountant warned that, most often, when a business changed practices in regard to tracking time on tasks, that at least one employee would object to the new procedure and eventually resign. He was right. Even though I explained to my employees the rationale for tracking time, it was viewed by one of my employees as a measure to control activity rather than as an instrument to understand current activity. Within three months of implementing the tracking system, one employee resigned, for this reason. Today, my employees have no problem with this policy. It is a given when they are hired, and everyone views the procedure as necessary for a profitable business.

The historical records of development provide data upon which budgets can be constructed. In addition, the actual records of time on tasks help each person make adjustments to their own projected time estimates. Shortly after implementing the tracking system, we learned that our initial estimates often represented about half the actual development time. That is to say, if an artist estimated that the work would take 10 hours, it often took 20, and if a programmer estimated that a section would take two days, it often took four days. In discussing this information with my business advisor, I learned that it was common practice to multiply projected estimates provided by employees by a factor of 2.0 or 2.5, before calculating costs. Today, three and one-half years after implementing the tracking system, I still multiply estimates by a factor of two before calculating budgets. While I am pleased that we are slightly more accurate in our estimates, I find it interesting that we still have an ability to overestimate what we can accomplish. I think it must be human nature. At least I have the needed information to adjust for the underestimated values.

In regard to time on tasks, Geer (1991) reports that 80% of time spent on a project is spent in consulting time, while only 20% of the time is spent in actual development. Geer (1991) defines consulting to include: meetings, brainstorming, analysis, quality assurance, data gathering, and testing (p. 322). In comparison, the historical records of my company indicate that 75% of our time is spent in consulting activities and 25% in actual development activities, or the creation of graphics, audio, and code. It is important to note that a much larger percentage of time is spent in planning and testing than in implementing. It has been my experience in discussing development with students that they actually think the reverse is true. This misconception, left intact, can be problematic in estimating a project. It is a valuable exercise for anyone to track their projected and actual

time on an authentic instructional development project. More than likely, they will gain understanding of both tasks and the relationship of the tasks to the total project.

An understanding of the tasks involved in the development of a project and the percentage of time spent in each activity is important in calculating the proper cost. The question of who will be involved on the project is an important one. In most cases, all employees do not earn the same salary. If incorrect estimates are made in planning, understandably, it can result in negative impacts on the budget.

The cost of a project can be calculated to be the sum of: direct labor cost plus direct burden costs, subcontract costs, and the general and administrative costs during the time period of the project. While it is relatively straight forward to calculate salary cost, the burden cost of each employee is more complicated. The burden cost reflects the cost of maintaining an employee. Burden includes such cost as equipment, space, and a percentage of the total operating expenses for the business, including insurance and license fees.

In addition to actual cost of developing a project, it is important that an appropriate profit be calculated, such that the business can continue and prosper. While it is beyond the scope of this dissertation to investigate costs further, it is important to note that the reason for many of the mistakes I made early in my business career in preparing budgets were related to this discussion. Anyone thinking that they can budget projects in a casual manner should investigate the area more completely.

After my return from New York, and once the cost question was addressed, I began to gather the information to answer the questions concerning the distribution of technology in the schools. I was asked to focus my energy on evaluating ten states which the PR agency had felt would be of high interest to their client.

Warming Up for the Pitch

Securing a project is very similar to securing a grant. It requires research and an understanding of what the sponsor is most interested in funding. It is important to present a proposal you believe in. If by chance the project is funded, you will be much happier doing the work. The presentation of ideas is equally important to the ideas themselves. A winning presentation conveys an honest belief that the ideas will work. In addition, it conveys a true excitement for the possibilities of making it work.

In order for my company to obtain the project, I had to demonstrate an understanding of the PR firm's needs. In addition, I had to demonstrate that I had an understanding of their client's needs. While I knew very little about who this project was ultimately for, I knew quite a bit about the goals.

I knew I had to demonstrate that an innovative, educational, nutrition project could be developed for elementary school and delivered in such a manner that it clearly had both educational value and PR value. The PR value of a project, is the ability of a project to promote a favorable relationship with the public. I knew that if a corporate sponsor produced a product with high educational value and provided it to schools free of charge, the project would have high PR value. The more I spoke with the PR firm about the project the more I felt that this could be a win-win situation.

Quality public relations are a concern of all companies. There is nothing wrong with a corporation receiving credit for filling a need. I knew that if the potential sponsor of the project had a positive nutrition story themselves, that their sponsorship of a nutrition education CD-ROM would be newsworthy. However, I also knew that there were corporations associated with the food industry that would not have been credible sponsors for a nutrition education program. This client, as I soon learned, was the world's largest shipper and marketer of fresh and packaged fruits and vegetables. Indeed, their product

had a positive nutrition message and the potential grew for a newsworthy educational program.

In addition to feeling that the project could be educationally sound, having previously developed several CD-ROM projects, I believed the CD-ROM technology offered opportunities for the client. I believed that by the time the project was completed we could easily place the targeted number of 2,000 discs into classrooms. However, the numbers I was able to report back to New York, in preparation for our presentation to the client, were not very impressive.

Numbers concerning technology in education are always reported one year behind. In times of high infusion of a technology they can be very misleading. It was 1992, and the most recognized CD-ROM titles were Grolier's Encyclopedia and Mammals: A Multimedia Encyclopedia, developed by National Geographic. QED reported that during the school year 1991-1992, the ten states, targeted by the PR firm, reported 1513 schools with CD-ROM players available to students. I was disappointed in the numbers. I did not know what "magic" number of CD-ROM players they were looking for in order to take the idea forward. So, when I reported the data, I did not total the columns. I thought the figures looked stronger reported only by state. Table 2 shows the data, as I sent it to New York.

In addition to these numbers, the following information was presented in personal communication to the PR agency: "Grolier's Encyclopedia reports, to date [summer, 1992], a total distribution of 200,000 copies; National Geographic reports, to date [summer, 1992], a distribution of 100,000 copies of Mammals. CD-ROM Professional, a trade magazine, reports that 50 CD-ROM titles are now available for ages 5 - 10."

Table 2

Number of Schools in Key States Reporting CD-ROMs Available to Students During the 1990-1991 School Year			
California	394	New York	244
Georgia	111	Pennsylvania	29
Illinois	21	Texas	279
Massachusetts	72	Washington State	80
Maryland	189	Wisconsin	94

At the time, I believed the numbers reported by Grolier's and National Geographic were high, however I used them. They had been given to me directly from each agency and they supported my case. I did believe that the numbers showed a trend in the industry. I knew that most CD-ROM players were being packaged with Grolier's, so I admitted that the numbers might have been larger than I realized. However, at the very least, all indications were, that the industry was about to experience substantial growth.

"Timing is everything. When you are working on new technology and trying to transfer it to an actual application [or setting], you can be too early, too late, or if you are really lucky, just at the right time" (Whitten, 1993, p. 37). I truly believed we were presenting this idea at just the right time.

Within a month, the pitch (a PR industry term) had been prepared. I became aware that the client was Dole Food Company. I was invited to travel to San Francisco to help deliver the "big ideas." I was asked to bring a multimedia demonstration. While I had several CD-ROMs, which I had developed, my major video projects were all videodisc based systems. Without a second thought, I prepared to ship four large pieces of equipment to California and I looked forward to my first Corporate meeting with Dole.

Homework

I have come to understand that homework is not just a part of a formal education, it is simply a part of life. I believe that it is critical to understand as much as possible about the client and the client's needs before the presentation of ideas. While I always conduct my own library research on a company, I asked the PR firm for as much background information as possible, and I was impressed with what I learned. The key individual who would manage the project for Dole, if it was funded, had a very impressive Vita. Equally impressive was her commitment to making a difference in the quality of people's lives by means of nutrition education. In addition, with her leadership, Dole had established a 5 year commitment to educating children about the 5 A Day message.

Director of Nutrition and Health

In 1991, Dole hired a nutrition educator who was nationally recognized as a leader in the field of nutrition education. As Director of Nutrition and Health for Dole Food Company, she provides the leadership for the corporate nutrition program and all nutrition public educational efforts. She is co-author of the first book to offer dietary recommendations to reduce the risk of cancer. It has currently sold over 3 million copies. Prior to joining Dole she worked for the State of California's Nutrition and Cancer Prevention Program and gained national recognition for her work as a principal in the development of California's "5 A Day for Better Health" campaign, which later served as the model for today's National *5 A Day for Better Health* program. In addition, she served as a faculty member at the University of California, Berkeley, for six years.

I share her credentials, so the reader will understand that the individual serving as the visionary for Dole's nutrition education efforts was and remains knowledgeable and passionate about reducing cancer risk through diet. She has spent her entire professional life in delivery of this message. Thinking in terms of a stakeholder, the reader should

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understand that when dealing with people who have a "passion" for their work, everything is more intense. Expectations for success are usually quite high, but so is the energy to make it happen. However, extra challenges can arise if many people involved in the development of a project are passionate about their work. The development process is one of compromises. Passionate people can be so involved in pursuing their goals, that compromise is sometimes more difficult.

<div align="center">Why 5 A Day</div>

In 1989, the US Surgeon General reported (DHHS, 1988) that many cancers and other chronic diseases were directly linked to diet. The link between diet and the leading causes of death in Americans is suggested by research which reveals that diets high in fat, saturated fat and cholesterol and low in fruits and vegetables significantly increase a person's chances of developing cancer, heart disease, and other chronic diseases. There is a consensus among nutrition experts and national health organizations that the American diet contains too much fat and not enough fruits, vegetables and whole grains. Therefore, The US Department of Agriculture / US Department of Health and Human Services and The National Academy of Sciences recommend that Americans eat five or more servings of fruits and vegetables every day. The Department of Health and Human Services, in their report, "Healthy People 2000" (DHHS, 1991) state a health objective for this recommendation. Health objective number 2.6 states: "Increase complex carbohydrate and fiber - containing foods in the diet of adults to 5 or more daily servings for vegetables and fruits and to 6 or more daily servings for grain products." In addition, the report provides baseline data for Americans at 2.5 servings of fruits and vegetables a day. On average, Americans eat half the national recommended amount.

The *5 A Day for Better Health* program is a collaborative effort between the National Cancer Institute and the Produce for Better Health Foundation. The goal of the

National 5 A Day program is to increase the per capita consumption of fruits and vegetables in the US from the current 2.5 servings to 5 servings per day by the year 2000. 5 A Day objectives include, increasing public awareness of the importance of eating more fruits and vegetables for better health, and providing specific information about how to turn these recommendations into dietary practices. However, the educational efforts of the *5 A Day for Better Health* program are focused only on adults.

Dole's Educational Effort for Children

When Dole's Director for Nutrition and Health was hired, they established a direction for their nutrition education efforts in support of delivering the 5 A Day message to children. While national efforts were underway to educate adults about the 5 A Day message, no one was addressing the importance of teaching children good eating habits. However, the research seemed to support the idea of taking the message directly to children. "People who have formed the habit of eating fruits and vegetables early in life are more likely to consume more as adults. When long term fruit and vegetable consumption habits are examined, it is apparent that many of those who currently eat the most fruits and vegetables have done so since childhood" (DHHS, 1988, p. 37).

As discussed in Chapter 1, affecting attitudes in such a manner that behaviors are modified requires more than casual exposure to facts (Krathwohl, 1964). While statistics, such as 35% of all cancer deaths may be prevented by changing the typical American diet, are alarming, they are rarely effective in promoting behavior change. It was clear that Dole's commitment to develop 5 A Day educational materials for children would have to involve many educational aspects.

Prior to my involvement with the Dole account, their educational efforts had been directed towards the development of a Public Service Announcement (PSA) which aired on Saturday morning television beginning in March of 1992 and was developed in response to

the critics who noted that all Saturday morning food advertisements promoted foods with low nutritional value. Their PSA was endorsed by the American Academy of Pediatrics and received recognition for innovation in reaching children with a positive nutrition message.

In preparation for the development of their PSA, Dole engaged the services of a company which specialized in children's focus groups. They conducted three focus groups in the Los Angeles area. Their objective was to learn more about the construction of messages which influence children's attitudes towards fruits and vegetables.

The groups involved eight and nine year old students. Two of the groups were all male and the third was all female. A number of findings from these PSA focus groups were subsequently given to me as guides in the design of *5 A Day Adventures*. These were:

- Make It Fun - in general the students did not feel that learning about fruits and vegetables was "fun."

- "Don't Preach" - the students did not want anyone telling them they had to eat certain foods in order to remain healthy. They wanted to feel that they could make up their own mind.

- Emphasize Taste - sweet and crunchy were preferred over cooked and "mushy."

- Use Music - while these particular focus groups were involved in rating other public service announcements, it was clear that "messages with music" were viewed favorably.

The San Francisco Presentation

In San Francisco, the PR firm presented the big ideas, and I acted in a supporting role with demonstrations of multimedia. The presentation went well, even though there was a little skepticism concerning the endurance and availability of the technology. While the program, as presented, was never developed, pieces were incorporated in the final product. From my experience, this is not unusual. Once the decision has been made to go forward with a project, many clients, after buying the idea, as presented, want the opportunity to participate more fully in the project definition. This is appropriate and can sometimes work to the advantage of the developer, as long as the changes happen early in the design process. Re-definition after a project has begun, however, can be expensive in both time and money.

I wish to note that during my multimedia presentation, I made a mistake that would later haunt me. As part of my presentation, I showed video from a laserdisc. The video was full screen, full motion, full color. I misread the stakeholder's knowledge of the technology. Even though I explained that QuickTime movies were not the same size, quality, frame rate or available in as many colors, my presentation was obviously more impressive than my words, and I established, in the mind of one of the stakeholders, expectations for the video that I would later have to dispel.

As a side note, you can assume that I no longer make this same mistake. When working with new clients, I very quickly try to determine their knowledge of technological solutions. I position myself to provide them with materials to increase their knowledge of what is possible and what is practical, for their audience. I operate under the theory that the more my clients know about the opportunities and limitations of the delivery platforms, the better I am positioned to help them establish realistic expectations of performance. Also, it is important to note, that no matter how much knowledge you might have, a good magazine

article does a better job than you can, of convincing your client of any limitations. It is a standard operating procedure in my company to collect such articles to use when the need arises.

The Follow Up

After returning home, I waited. I received a request for more data to convince the client that the project was feasible. I collected more data, but I also wrote the following on August 26, 1992, to the PR firm:

> As I indicated yesterday on the phone, I am concerned that we are coming
>
> up with numbers to try and "over sell" this idea. The truth is, this idea does
>
> not need to be oversold. It is a good idea and I feel certain that it could
>
> make a difference. . . . Also, we should remember that the material will not
>
> be quickly outdated. The product will live for quite some time. The
>
> numbers of players are growing. It is "perfect timing" for us to start this
>
> project now.

DESIGN AND DEVELOPMENT

By mid-September, within a month of having traveled to San Francisco, the project was underway. There were now three major groups of stakeholders: Dole Food Company, the PR Agency in New York, and my development group. There seemed to be a good understanding of roles among the stakeholders: Dole's nutrition expert would provide the objectives and the content; IDD, Inc. would provide the leadership for the design and development; and the PR agency would remain in the communication loop for all designs, with their focus on the planning of PR activities related to the program.

Table 3 shows the major activities related to the development of the project and reports both the projected and actual developmental timelines. The six month difference between the projected and the actual development of the project was due to the fact that the scope of the project grew during the design phase and an advisory board was created to validate the material. The addition of the advisory board assured validation of the content material, but extended the "turn around" time for all aspects of the project.

Table 3 also shows that many activities were being conducted simultaneously during the development period. Because the remainder of this chapter is focused on these development activities, it seems appropriate to discuss the team which conducted these activities, as well as, teamwork in general.

Table 3. Major Activities Related to *5 A Day Adventures* Project - Projected and Actual

Projected Development Time

	1992					1993											
Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	

Project Startup
High Level Design
Analysis
Low Level Design
Screen Design/Graphics
▲ Focus Groups
Animation
Programming
▲ Beta Disc
Video/QuickTime Production
Testing   Testing
Audio Production   Revision   Revision
Final Delivery ▲

Actual Development Time

	1992					1993											
Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	

Project Startup
High Level Design
▲ Corporate Review
▲ Focus Group Minnesota
Analysis
▲ Nutriton Advisory Board Formed
Athens Focus Group ▲
Low Level Design (Scripts)
Animation   Animation   Music Animation
Screen Design/Graphics
Prototyping   Programming   ▲ Beta Disk
Video/QuickTime Production   Testing in Schools
Testing   Revisions
Audio & Music Production
Final Delivery Feb 15th

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The Project Development Team

As discussed in Chapter 1, many people were involved in the development of this project. While people had names, faces, and titles, it is more important to talk about the team than the individuals. It wasn't a perfect team, but it was a good team. We were a young company and everyone understood the opportunities the project afforded us to develop new capabilities and to build a broader reputation. Because the team had only seven full-time members, each one of us had to wear many hats. Four of us had worked together for three years prior to beginning this project, and we had a good working relationship. We knew each others' strengths and respected each others' capabilities. The other three team members had been part of the team for over a year before the project started.

What is Team Success?

If I had to identify one word that is needed in teamwork, it is respect. A team cannot be put together, it grows together. As respect for one another grows, the team grows. When an individual is more interested in their personal success than the success of the team, there will be conflicts. Decisions are guided by what the individual values. If personal success is more highly valued than team or project success, it will become evident to the team. When this happens, trust and respect are compromised. In this case, by respect, I mean respect for the role the person is playing in the team rather than respect for the person.

In college courses, students engage in "group work" which is very different from "team work." In class assignments, the bottom line is the personal grade. It would be almost impossible for a "group" to become a "team" given the constraints of the current grading system within universities. In addition, in a university course, the "group" understands that they only have to cooperate with one another for ten or fifteen weeks.

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They don't even have to speak to one another, once the project is over, and sometimes they don't. This short-term involvement does not represent the real world, where team members cannot so easily be discarded. However, when I interview students, they often believe their experiences in "group" work represents the reality of team work.

I have been involved in directing multimedia project teams for the past eleven years. I know, for certain, that not everyone is capable of being a good team player. This is not to say that everyone should desire to be on a team, however, if an individual aspires to work on a development team, they should, at the very least, understand the expectations.

University systems are "star" systems. What is rewarded in a university is the ability to stand out and be recognized in your field as a "star." This is true for both students and faculty. The bigger your star, the bigger your reward. There are few rewards in a university for team successes. This does not reflect the reward system in the business world. In industry and business, the success of the team is almost always the most critical factor. While the failure of one individual can bring failure to the project, it is not true that the success of one individual can guarantee the success of the project. The success of the space shuttle program hinges on a stellar performance from hundreds of individuals who must properly accomplish their tasks, while keeping the big picture in mind. However, the failure of one single individual could be deadly to the success of an entire mission.

This is also true in the multimedia development environment. It is imperative that a team member be able to work on the details while always envisioning the big picture. This is not always easy. If, for example, the artist produces a beautiful graphic, but if it does not properly communicate the design, it is worthless. It may be lovely to look at, but if it doesn't serve the role it was intended to serve, it can't be implemented. Similar analogies can be drawn concerning the design, the code, the packaging, or the installation

procedures. Every piece is critical, and every piece must work together to compliment the whole.

The only way to succeed in project development is to avoid failure. I am convinced that, unless you can articulate all the ways you can fail, you are taking unnecessary risks. It is a valid and useful exercise to write down all the ways a project can fail before you begin. The first way to guarantee failure is to start with invalid content. If a project has a premier instructional design, interpreted effectively to the screen, delivered with outstanding performance, but the content is inaccurate or weak, it is guaranteed to fail. In project development, the development team should not play the role of content expert. Even though the team might have significant knowledge in a subject area, they should not have the final word on content. I tell clients, "It is your job to make certain that we always provide accurate information, it is our job to determine how to effectively deliver the message."

Even when a designer start with accurate information, it is possible to alter the facts by the time they are interpreted in a graphic or a script. This was a very real concern in the development of *5 A Day Adventures*. Many nutrient descriptive terms have legal definitions. For example, if we say a fruit or vegetable is "high" in a nutrient, it means it contains at least 20% of your minimum daily requirement. If we say that a fruit or vegetable is a "good" source of a nutrient, it means that it provides at least 10% of your minimum daily requirement. It would have been easy to misuse "good" in the description of a nutrient value. Thankfully, we had many reviewers looking over our shoulder every minute, checking every word, to make certain that we did not take any poetic liberties with legal terms.

Team Communications

During the development of *5 A Day Adventures*, every Tuesday morning, we had a staff meeting which usually lasted for 4 hours, sometimes it lasted all day. We would talk through the section currently in the design phase. Everyone participated in brainstorming ideas. In addition, we would report on progress or problems, and evaluate the next step. Detailed plans were made for the current week and long range plans were updated to reflect the current progress.

You might wonder why the meetings were on Tuesday and not Monday. It has been my experience over the years that Monday morning meetings sometimes catch people off guard or not focused. The strategy is to get into work on Monday, focus, get on top of all that is happening, and then to meet together on Tuesday. In this case, it worked well for us.

On Fridays, everyone submitted a 15 / 5 report. In theory, this report should take the employee 15 minutes to write and the boss 5 minutes to read. I'd like to properly credit this idea to its originator, but I don't know the original source. Although I think it may be associated with a well known management style, it was my sister, herself a business woman, who passed the technique on to me. In any case, it worked. The report contained three items: 1) major accomplishments for the week, 2) major plans for the next week, 3) questions for the boss. With this type of tool, a project director can see when someone is "covered up" with work, or if they are ready for more assignments. This reporting system made it easy to compare expected progress to actual progress. It also afforded everyone the chance to express concerns or identify problems in a somewhat safe environment. While face to face communication was necessary and ongoing, the 15/5 reports were important in managing the project assignments and anticipating our next moves.

Making It Happen

When many different pieces must come together to "make it happen," they need to be carefully coordinated. While I directed the project on a day to day basis, I did not necessarily direct the team on a day to day basis. Three assistant project directors, each focusing on one section at a time, kept the project on track. Scripts had to be refined, refined, refined, and finally copied in five sets to be sent out to the review committee. Someone had to meet with the freelance artist and convey our current needs. Someone had to travel to the sound studio in Roanoke to work with the recording artist. Hundreds of analog audio files had to be digitized and named. Graphics had to be picked up and formats had to be changed before they could be passed to the programmers. Programmers had to have someone making sure that all the right versions of the files were in place such that they could be programmed. Letters had to be written to obtain content materials and facts had to be ferreted out of pages and pages of responses. In-house testing for coding errors had to be conducted and reports had to be written informing the programmers of problems. Students had to be locally identified to participate in formative evaluation efforts, and test discs had to be sent out to other sites for hardware usability tests. The details in the project were staggering. The details in any large project are staggering.

Those of you who have never been involved in the development of a large multimedia project probably find it hard to conceptualize the details to which I have referred. It is more complicated than building a house. In a house, it is enough to say that this wall should be made of two-by-fours, and covered with sheet rock. In a project, each two-by-four in the wall must have a name that tells everyone involved with the wall what position it occupies in the wall and what nail is to be driven into it. In addition, the nail must have a name and the room has to be built in such a manner that after the sheet rock is hung, it can be quickly changed if the client doesn't like the size, the shape, or the color.

Just imagine that every item involved in the construction of a house is named, such that by looking at the name, it will be clear what room it goes into, and why it is needed in the room. In Appendix A, one page of audio scripts shows the scheme that was used in the project. By looking at the names, it is possible to know the section of the program and the reason for the audio statement. For example, a file with the name "Sfyouhaveforgotten.aud" represents the audio, "Have you forgotten to make your salad?" This audio would be used in the Salad Factory under two situations: 1) if the student tries to mix a salad and no salad is in the mixer, or 2) if a student tries to add salad dressing to the mixer before placing salad ingredients in the mixer. This detailed naming scheme was very effective and it saved countless hours of effort in developing the project.

Unfortunately, we did not enforce a similar standard naming scheme for variables used in the programming code. An intern, working for the summer had programmed a section of the salad bar code. After he returned to school, a value for one of the variables needed to be changed. A second programmer, went into the code and made the change. He adjusted the wrong variable. He was looking for the variable representing grapes. The first variable he found was "gfruit," he made an assumption that "gfruit" was grapes, when in fact it was grapefruit. In making the change and not checking to see if the correct value was recorded in the program, we ultimately delivered a project with two content errors, grapes displayed the wrong nutrient values and grapefruit also displayed the wrong nutrient values.

We were liable for the errors. It cost the company $15,000 to replace the beta discs with corrected discs and a week's delay in the testing schedule. I share this mistake with you because it points out the potential for disasters in very small places. While we did many things right, because we were in a hurry, we did this one wrong: 1) the variables should have been properly documented in the original code; 2) knowing that it was not

properly documented, the second programmer should have validated that the proper variable was being changed; 3) following the change, the application should have been viewed to be certain that grapes indicated the correct value in the analyzer, however, this was not done; 4) the actual procedures used for implementing the change and testing, or not testing the code, should have been conveyed to the team. What was conveyed to the team was that the "problem" with grapes had been fixed. This was not true.

No, the team was not perfect. The project did not always go as planned. We did learn from our mistakes and implemented safety features for last minute changes to avoid such mistakes in the future. Today, at the last minute, the programmers do not alter the code by themselves. Two people sit together and validate a last minute change, and a third person checks it. It may sound excessive, but it usually costs less than $15,000.

Individual Responsibilities

Seven full-time people worked on this project. One was the office manager. In addition to handling the phone and the mail, she worked in a support role to the development team: She edited scripts, she copied, and she learned to digitize audio. Two of the team members were programmers. Their focus was on learning Authorware, and implementing designs. Three of the team members conducted the detailed day to day activities discussed above. They managed the actual development schedules for each section. I was the project manager, and ultimately responsible for the project. In addition to being the liaison with the client and the advisory committee, I was the primary instructional designer, and developed most of the treatments, scripts and songs. In addition, because of my role in design I directed the formative evaluation activities throughout the project.

As you read the remainder of this chapter, I use the pronouns, "I, we, and they." "I" refers to my thoughts, my actions, and my beliefs. "We" refers to the team, and the

actions and decisions of the team. "They" refers to all the individuals, external to my team, who were in a position to direct our efforts. While many of the pronouns in the next sections relate to my activities, I in no way wish to lessen the contribution of the other team members. Everyone involved in this project played a significant role.

Before the project was complete, two of the full time individuals would decide that working in a small company, producing multimedia, was not for them. While this created new challenges for the remaining team, the project had to be finished. . . . and what follows is the short story version addressing some of the highlights associated with making that happen.

<div align="center">The Objectives - September, 1992</div>

The Director of Nutrition for Dole, developed 27 objectives (Appendix B) for the program and sent them with a large box of content material. Even before we had a contract in place, our first activity was to evaluate the objectives and present ideas on how we would address each one.

While most of the objectives focused on nutrition, it is important to note that the objectives related to learning about the production of fruits and vegetables were included by Dole's President. In approving the budget for the development of the project, he shared with the Director of Nutrition his desire to have children more aware of the agricultural production of fruits and vegetables and the importance of agriculture to our economy. Throughout the project development cycle I knew that I wanted to make available to Dole's President the progress on the agricultural section. I did not want any surprises or disappointments at the end of the project.

In working with novice instructional designers, I realized that it was important to clearly give stepwise assignments. If I had assigned someone to evaluate the 27 objectives, I would have suggested that they start by sorting them by learning task. Gagné's

taxonomy would be useful in this case. Was the objective related to verbal (stating), intellectual (procedural), cognitive (problem solving), and / or attitudinal (changes in actions)? In contrast to this step by step methodology, I realize that I no longer function in this manner. There is no document indicating that I broke down the objectives based on Gagné's classification.

While I don't consciously use Gagné's model, I do automatically sort objectives into four categories: facts, procedures, concepts, and attitudes. At the same time I am thinking facts, procedures, concepts, attitudes; I am thinking resource allocation. Usually aware of a budget range, I am trying to calculate, almost automatically, what it will cost to teach this fact, procedure, or concept. As Clark (1994) has asserted for years, one of the real differences in media is the range of costs associated with developing and delivering the different forms. Because all budgets are limited, as soon as I begin to discuss the goals of a project, I immediately begin thinking about efficient use of resources.

Teaching facts can usually be accomplished more cheaply than teaching procedures or concepts, but that is not always the case. Also, as I am thinking about resources, I am thinking about organization. Which of the objectives can be grouped together? What are the relationships among the objectives? Are some of them higher order objectives from the others? When given a large set of objectives, such as the original set from Dole, I always first cluster them, to determine which ones can be treated together, before I break them apart to determine what has to happen step by step to teach the learner.

So, literally, when the first set of material arrived from Dole, I spread it all over the conference room table, wrote the objectives on small pieces of paper, and began making piles of supporting materials with objectives. Objectives relying on the same material were clustered together.

The analysis of the objectives indicated that five objectives required the learner to be able to state a fact and thus would be considered verbal information. Fifteen objectives required some type of intellectual skill, such as the ability to discriminate or demonstrate a concept. Seven objectives required the learner to demonstrate an attitude towards fruits and vegetables and/or consumption of them.

In communicating with the client, I expressed concern in regard to developing a program that could guarantee the success of the proposed seven attitudinal/behavioral objectives. As discussed earlier, it is important that the client have realistic expectations to be accomplished in a realistic timeframe. While I felt confident that the program could address the verbal and intellectual skills, I did not want to pretend that the program could guarantee that students would make a behavioral commitment to change their life styles. In negotiating with the client, we changed the attitudinal objectives to goals and they remained associated with the project.

This analysis of objectives produced a description of the deliverable which was attached to the contract. It defined the program as containing six learning modules and identified how the 27 objectives were associated with one or more of the following modules:

1) Five A Day Lessons

2) The Food Pyramid

3) The Healthy Body

4) Fruits and Vegetables Speak Up

5) Fun with Fruits and Vegetables (eating in and eating out)

6) Look It Up: A glossary of terms and facts

Having been introduced to the completed program previously in this chapter, you might recognize that some of the modules described above never materialized as planned.

Specifically, The Food Pyramid was placed into 5 A Day Land and the Fun with Fruits and Vegetables section was divided to become The Cook's Kitchen and The Salad Factory. The glossary was developed but not placed on the main menu, and the Juke Box was established as a main menu program section. Surprisingly, as the first draft of ideas, the attachment to the contract was on target in describing the final product.

Figure 40, shows a conceptual layout of version 2.0 of the program. Because the sections were purposely designed to be explored in any order, the main menu actually connects six distinct nutrition education programs. The development of each of the six programs followed the same project development model as the entire program. The program and each section underwent: analysis, design, development, evaluation, redesign, and redevelopment. While instructional designs for each section were developed in a sequential fashion, graphic development and programming were being conducted in parallel. Each of the three project managers focused their attention on the development of one section at a time, and the graphic artist and programmers worked sequentially as the sections were prepared.

As soon as the initial content had been reviewed and prior to addressing any designs, we prepared to conduct focus groups with third grade students and teachers.

During the negotiations for development, the client explicitly identified Atlanta and Minneapolis as the two areas of the country in which focus groups were to be conducted. It was decided that the Georgia focus groups would be conducted prior to designing the program and the Minnesota focus groups would be conducted after the high level designs were in place.

Figure 40. Conceptual Layout of 5 A Day Adventures showing the major decision points in the program.

Focus Groups, Clarke County, Georgia - October , 1992

Working through the College of Education at The University of Georgia, we were able to gain permission to hold focus groups in the Clarke County public school system.

The Students

The focus group involved twelve children, half female and half male, six African American and six Caucasian. Three students were selected from each of four third grade classes by their teachers to comprise this group. Each child agreed to maintain a two day food diary prior to attending the focus group. Two different types of food diaries were utilized. Each student's parents agreed to participate in a phone interview within the week following their child's participation in the focus group.

The students met immediately after school and were offered fruits, vegetables, and juice as an after school snack. The variety of foods offered to the students were selected such that observations could be made concerning the student's choices. Each student received $10.00 and a large canvas shopping bag filled with fruits and vegetables as compensation for participating in the activity.

The focus group was designed to learn more about students' attitudes with: 1) technology, 2) fruits and vegetables, and 3) eating habits. The entire activity lasted 2 1/2 hours and was conducted in three parts: the snack time, the discussion time, and the time spent with an existing multimedia program.

Focus groups are conducted in a casual manner to help the participants feel at ease. It appears that the leader of a focus group is simply "talking" to the participants. However, preparation is far more rigorous. While the scripts were not followed verbatim, they are included in Appendix C to demonstrate the strategy utilized to obtain the information from the participants.

The following observations were made:

- In general, students enjoyed all fruits and vegetables presented for consumption during snack time. While most fruits were familiar to students, the prunes were not. With prompting, all students tasted prunes and reported liking them. Prunes were included in their "take home" bag.

- Students had a very positive attitude about fruits and vegetables.

- They reported "liking to try" new fruits and vegetables.

- In response to the question, "How would you get a friend to try a new food item," there was agreement that they would ask their friend to "just try it."

- They were interested in learning more about fruits and vegetables, how they grow, where they come from and how to fix them.

- In general, they reported that they liked to cook and try new recipes.

- They had a very high interest in salad bars. Their school cafeteria had a salad bar, however, they could lose salad bar privileges for "poor conduct."

- All students were familiar with the mouse and comfortable with the computer.

- All students enjoyed using "The Mammals," a multimedia disc. It was their first experience with multimedia and students demonstrated high interest in QuickTime movies.

- The recall food diary was more difficult for students to maintain than was the check-off food diary.

The Parents

During the week following the focus groups phone interviews with parents were conducted by this author. Parents were called at an agreed upon time and, with the parents' permission, phone conversations were recorded. Each parent received $20 for participating in the phone interview.

The goals of the phone interview were to learn: 1) what the child told the parents about the focus group, 2) how the parents feel about the national guideline for 5 A Day, 3) what type of information would be helpful to them concerning the 5 A Day national initiative, and 4) what barriers exist in the home concerning the consumption of fruits and vegetables. Each phone interview lasted approximately 15 minutes, with one interview lasting 30 minutes. The transcripts of each conversation were made available to the client.

The following observations were relevant to the design of the materials:

- All children had told their families about the National guidelines for eating 5 fruits and vegetables a day.

- Parents were surprised that their children were eating all the fruits and vegetables that had been given to them, including the prunes. Three parents explicitly asked, "How did you get my child to eat prunes?"

- The majority of parents reported being concerned about nutrition in the home, and expressed frustration about a lack of training in "today's" nutrition guidelines. One parent reported, "We grew up with meat and potatoes, I no longer know what a healthy plate looks like."

- Three parents requested suggestions on how to buy healthy snacks that their children would eat.

- Five of the parents requested information on how to fix vegetables so that they would be more appealing to their children.

<u>The Teachers</u>

Seven third-grade teachers from schools throughout Clarke County were involved in the focus group. All teachers were female, three were African American and four were Caucasian. They were invited to participate by their principals. Each teacher was provided dinner, a $25.00 compensation, and a large canvas bag of fruits and vegetables.

Experience of teachers ranged from 2 years to 25 years, with the mean experience of 12.8 years.

Major findings of the focus group:

- Only two of the seven teachers were aware of the national "5 A Day" recommendation.

- All felt that their current teaching materials were out of date.

- Teachers were embarrassed not to have valid information to present to their class. One teacher had just taught the "basic four food groups" and was reprimanded the following day by a parent.

- Nutrition was currently being taught in the science curriculum and focused on the digestive system and vitamins.

- Teachers reported having never had a class or in-service training on nutrition.

- All teachers felt nutrition was important for both them and their students and expressed a desire to know more.

- Barriers identified for utilization of a nutrition based multimedia product were: 1) time to fit the material into the curriculum; 2) the technology (not enough computers) and 3) they wanted to know who would validate the material.

- Teachers were not as comfortable utilizing the technology as the children had been.

- Teachers reported having very little time to creatively find ways to teach nutrition, but indicated that they would be very happy to integrate cross-curriculum materials if such materials were available.

- All teachers reported a desire to become beta-testers of the product.

Summary of Focus Groups in Georgia

The focus groups provided the reassurance that the project could be well received if properly designed. Students indicated a strong interest in nutrition and provided a number of insights into how to design the material. The teachers indicated a need for nutrition education materials and were very supportive of the concept. It was evident that the design would have to provide opportunities for educators to integrate the materials into cross-curriculum activities and supporting material would have to be included with the student's module. Both students and teachers expressed very little knowledge about the national 5 A Day guidelines.

Design - November 1992

As soon as the focus groups were complete in Georgia, the initial assessment was concluded. We had the basic content for all modules and the majority of the finalized content for the kitchen module. Additionally, we had basic guidelines for development, as reported from the Los Angeles focus groups, and input from our target audience as represented by the Georgia focus groups. The first activity of the design phase was to establish the guidelines for presentation of the material and interactions with the learner.

Every computer program has two layers of design. First, there is the interface design, or the design that the user must go through to get to the second, or content design. Research is conducted in both of these areas. The first is related to the spatial layout of the screen and the second is related to the manipulation of content (Aspillaga, 1991; Bork, 1987; Keller, 1987). In addition, research has been conducted on screen density, or how much information should or shouldn't be on the screen at one time.

The basis for screen design research is in theories of perception, memory, concept formation and attitudinal change (Fleming & Levie, 1993; Moore & Dwyer, 1994). Many studies have been conducted to indicate that the learner appreciates predictability and

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organization (Aspillaga, 1991). The organization and presentation of the message can facilitate linkage to prior knowledge, provide strategies for encoding and support the learner in the selection of cognitive processes needed for knowledge gain (Knupfer, 1994).

Prior to the development of any instructional designs, a developer should address the designs which form the basis for the program's organization and interface. I refer to these designs as foundation designs because they provide the foundation for the learner to be able to predict what they can expect from the program in regards to support and interactions. To avoid screen design conflict with the instructional design, it is important that these foundation designs are identified and articulated as the first step in the design process. In this way, any decisions which impact the screen can be addressed before the instruction is addressed.

In the development of *5 A Day Adventures*, the basic foundation interface designs were articulated early in the design process. This list was communicated to the client to establish clear expectations as to how the learner would navigate the material.

Foundation Design Decisions

- Every screen will have the same basic design template. The status area at the top will contain the name of the section and provide room for the navigational controls. An area 64 pixels high will be reserved for the navigational controls.
- Each status bar will be color coded to the section it represents.
- Navigational controls will include, at minimum: access to the Main Menu, Help, Glossary, and the Challenge.
- Each navigational control will always appear in the same location.
- Subsections called from the status bar of the program (glossary, challenge) will only return to the program area from which they were called. The status bar cannot be called recursively.

- All "selectable" items will either "look" selectable (a button) or indicate selectivity by turning the cursor from a pointer to a hand.

- If a button or a selectable area is on the screen, it is active.

- Every interaction from a learner will be acknowledged with 1) a visual cue or 2) an auditory cue, or 3) both.

- The program will be designed for a 640 x 480 screen size.

- The program will be designed for 256 colors.

- The system pallet will be used for all graphic development.

Content Treatment Decisions

Additionally, global decisions concerning content treatment were formulated before specific instructional design treatments for each section were addressed. They were:

- There will be no required order to the presentation of the content sections. Each section must be designed so that it can stand alone in presentation.

- Audio will be used as extensively as possible in the program to facilitate successful use of the program by early or non-readers.

- Video will be used to show the processes of growing fruits and vegetables and making recipes.

- Each challenge will be designed such that every student can be successful.

- Each section will have one of the fruit and vegetable characters as the narrator.

- Icons will be used rather than words for navigation.

The High-Level Designs

The term "high-level design" refers to the design which provides the high-level view of the program. The high-level design addresses the screen layouts, the user controls and the content treatment. The term "low-level design" refers to the design document which contains the minute details of the presentation of the module. It identifies every

word that will be displayed or spoken, the scripts to the movies, and any other detail related to the presentation.

Following the analysis of objectives and content, the high level designs were developed. As a design team it is not efficient for everyone to be working on each module at the same time. A module can be designed, programmed, tested while a second or third module is being designed. Because some of the content was well defined (the recipes) when we received it and some content was identified but not yet in our possession (who produces fruits and vegetables in the US), it made sense to begin work with the modules for which we had all the content.

The idea of a spiral staircase can be used to visualize this process. The developer goes round and round moving towards the top (an objective), however the view at any given moment is often the same even though each step is unique. Communication between layers is facilitated by someone up ahead "yelling" down to those below. Everyone on the staircase can see one another, even though they are all at different points in the process.

It is good that all designs are not ready for programming at the same moment. Not only would this create a bottleneck for the programmers, it would not allow later designs to take advantage of knowledge gained in the implementation process of a design. *5 A Day Adventures* represented the first time my development team had programmed in the Authorware environment. While Authorware was chosen for its cross-platform capabilities, the new language required the programmers to learn coding as designs were being developed.

I am certain designers can create treatments which represent more than can, or should be, delivered by the language or the hardware. The design process cannot be conducted in a vacuum. As a designer, I should not specify that the screen should push or pull or pop, unless I know that this feature is available and that the performance of this

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feature will deliver the desired effect. In addition, when the code is complete, it should be tested on a class of machines equivalent to the machines on which it will be delivered. *5 A Day Adventures* was developed to operate acceptably on a Motorola 68020 based Macintosh computer with 4M RAM and on a MS-DOS, Intel 386sx-20MH based PC with 4M of RAM. Additionally, a CD-ROM with at least 150K/s transfer rate was required. It would have been foolish to develop treatments that would not operate effectively in these environments. Many times, after testing, the designs were adjusted to accommodate the lower performance machines. Not only was this disappointing, it added to the cost of development, because a treatment would have to be reprogrammed even though it had been finished.

Learning the capabilities and limitations of any new language is an added burden for a project. We were pushing Authorware to perform beyond its capabilities. At the time the project was released, many consultants with Macromedia believed that *5 A Day Adventures* represented the largest development effort, to date, with their language.

Development of designs began on some sections which had fairly complete content, and content analysis continued on others. The two sections which had well defined content were the kitchen and the healthy body. Because the "eating in" or cooking module was based on recipes that had already been developed by Dole, it seemed appropriate to begin with that section.

<center>Section Development</center>

The development of each program section went though many iterations. As I discuss this process, I am going to compress the timeline and discuss with you the critical decisions and lessons learned on a section even though they might have happened over a period of months. Before discussing development, however, you must understand how a

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new set of stakeholders became involved in the project, and the impact they had on development.

The Society for Nutrition Education (SNE) Advisory Board

While the project began in September of 1992, it was not until January, 1993, that I became aware that the PR agency and Dole Food Company had been working to gain endorsement from a professional organization of nutrition educators. The organization which became involved was The Society for Nutrition Education (SNE). Its mission is to enhance the ability of its members to help the public make informed food choices. SNE was an appropriate organization to provide technical assistance for the development of the program, however, by the time SNE became involved, the high level designs were already in place. Three members of the organization, and its executive director, were named as reviewers. Their role was to review all scripts and treatments for accuracy. SNE became the fourth major stakeholder, as indicated by their name on the cover of the product.

Without question, the review of the material by this organization was important to the success and validation of the project. In focus groups, teachers had indicated a concern as to the validity of the material, given that it was being sponsored by an entity from within the food industry. I thought the involvement of SNE was a good idea, although, it greatly impacted the timeline and the cost of development. Both of these issues were addressed following a corporate review of the program in March of 1993, and a renegotiation of the contract was conducted due to the expanded timeline.

"Fun" with Fruits and Vegetables: Fun Fun Fun

I must interject a thought about the word FUN and compromises. FUN was "the word" that the children in Los Angeles suggested when asked how to teach about fruits and vegetables. They said, "make it fun." As the developer, I was interested in making the interactions fun, however, I did not plan to use the word in every sentence. On the other

hand, my client wanted the scripts to be full of the word "fun." While I think the scripts, in the current program, work well, I am convinced that the word FUN is the most often used descriptive word in the program. We point out that specific foods are fun to make, fun to eat, fun to share, and fun to crunch. We tell kids that the songs are fun to sing, tokens are fun to earn, and making salads in the factory is "just plain fun." With all the "fun stuff," no one has ever pointed out that the word seems overused. In retrospect, it might not be overused. My client might have been correct in inserting it into all the scripts. The word "fun" is simple and it speaks to children of all ages. It can mean many different things to different people. It seems to work in the program. As you will see in Chapter 3, it is often used by children to describe the program.

I share this to remind us all that project development is full of compromises. When you are in the middle of development, it is always a good idea to ask yourself if "this issue" is something you can compromise on. There are so many issues in the development of a program that it is not a good idea to get caught up in small ones. Learning what is a critical issue and what is not a critical issue comes with more and more experience. Everyday, I continue to learn more about critical issues and compromises.

Fun with Fruits and Vegetables: Eating In

As indicated above, the initial idea for providing access to the recipes was to present them as one part of a two part module promoting having "fun" with food. This never happened. Figure 41 shows the original design idea for the Fun with Fruits and Vegetables section. At the risk of getting ahead, the development of the salad bar section eventually took on a high priority, and was moved from a sub-menu of Fun with Fruits and Vegetables to a space on the main menu. Thus the kitchen had to stand alone. However, at this point in the project development, it really didn't matter how the learner would access

Fun with Fruits and Vegetables

Main Menu   Help   Glossary   Music   Check Status   Check Out   Challenge

In

Out

Fun with Fruits & Vegetables

Fun with Fruits & Vegetables
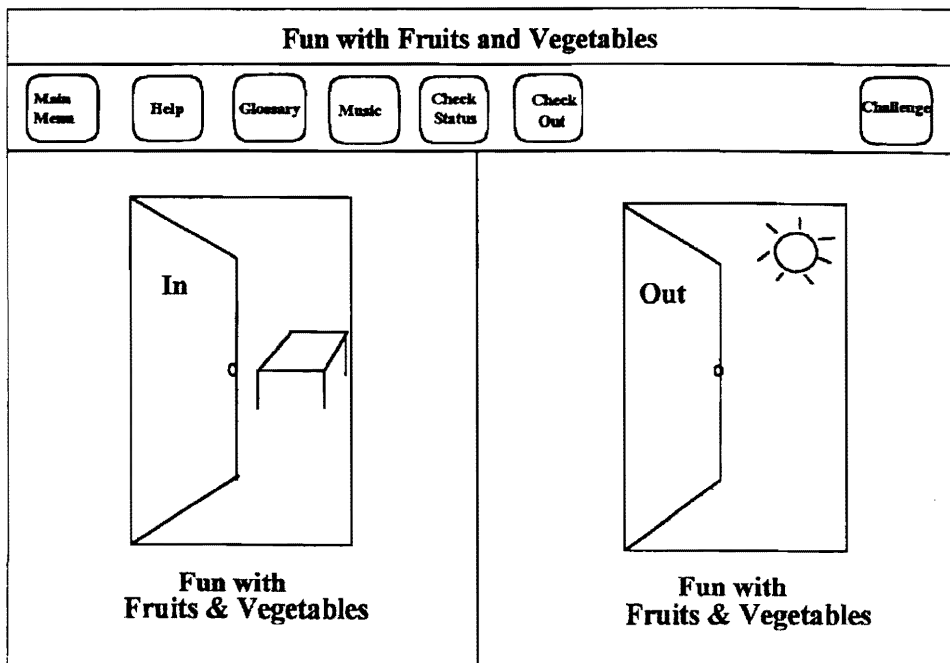
Fun with Fruits & Vegetables
(Recipe Book & Salad Bar)

Figure 41. Fun with Fruits and Vegetables, Original Design Idea

this material. Unlike prerequisite material, each section in this program had to be independent.

After the analysis of the recipes, the decision was made not to organize the content around a meal, or an ingredient. As discussed earlier in the chapter, and illustrated with Figure 42, the organization of the material was based on kitchen appliances. The goal was to entice students to explore in the kitchen.

Two items concerning the development of this section are worth noting. First, the cost of the graphic background, and second, the reaction to the graphic by the SNE advisory board.

First, if I were to disclose the cost of the kitchen background graphic, most of you would be surprised. It is the single most expensive background graphic in the program. While I like all the graphics in the program, and I think the artist did a terrific job, my own

inexperience in dealing with a freelance artist created a number of challenges for the project.

Most contracts for the development of multimedia projects are fixed-price contracts. Therefore, when services are purchased, it is important to be able to anticipate the cost accurately, and to have some controls in place not to let any one budget item get out of hand. If I had this project to do over, I would have contracted the graphics for a fixed price, or I would have brought the development in-house. However, at the time this particular graphic was purchased, I did not have a need for a full-time artist. This was the first full-screen graphic assignment we had given to our freelance artist, and we had no idea how many hours it would take to develop. Because the work was being done off site, there was no way to know how much time was represented in the finished product, without asking. While I am sympathetic to the unknowns in a creative endeavor, I would suggest to anyone considering a freelance artist that a top-end figure be agreed upon for each graphic.

Figure 42. The single most expensive background graphic in *5 A Day Adventures*

In the frenzy that seems to come with the development of a project, some critical information can slip between the cracks unless a methodology is in place to capture it. Unfortunately, we did not originally require an hourly report with each graphic that was returned to us. Our freelance artist wanted to be agreeable to work with, and my assistant was happy to be receiving graphics we liked. I remember, I kept saying, "That's nice, how much did it cost us? My assistant said, "I am not sure yet, we haven't gotten the bill." When the first bill finally arrived I was in sticker shock, and we had to make adjustments.

I share this story because it might help someone in project planning or management. My business advisor has taught me that you aren't managing the project, unless you are managing the cost. As previously discussed, we were not doing a very good job of managing the cost when we first began developing *5 A Day Adventures*. However, this situation has changed. I remind you that today, I track all time on tasks. I can look at a weekly report and tell you how much time it took to develop a screen, or program a section. I now have information upon which I can base decisions.

After the design of the section was complete, the SNE advisory board became involved with the project. They expressed concern that the kitchen was too upscale for most children, and they wondered if it should be redesigned. After having read the above discussion on cost, you might imagine that I wanted to implement the current graphic rather than spend more money on a second version. In addition, I did not feel that the size and manner in which the kitchen was furnished was a real issue. Eventually, after testing the product with children in two different parts of the country, I was able to convince the SNE advisory board that children did not react negatively to the graphic. Indeed, their focus was on access to the appliances and the recipes, as I hoped it would be.

Having said this, I do not want to dismiss the concerns of the committee lightly. I am concerned that the learner is able to identify with the material. I do not want to place a

learner in a situation where they would feel uncomfortable. Most of us do not have a kitchen that looks like Ray Raisin's, but does that make it less effective as a presentation menu for the section? The kitchen was designed to utilize the upper half of the screen as a menu while the lower half provided room for the placement of the recipe cards. The light color, versus dark wood cabinets, was selected, not to look high-tech, but to provide an unobtrusive background, allowing the learner to focus on the recipe cards in the foreground. I tested the screen by observing numerous children using it. I noted both their reactions and their comments. Not a single child commented that the kitchen did not look like "theirs." However, I realize that these observations do not give me a clue as to what they might have been thinking.

While I feel the kitchen accomplishes its goals effectively. It may be to its advantage that it is from a make-believe town with a raisin as its caretaker. Children may not expect to identify with the kitchen any more than they identify with the inside of the salad factory. However, this discussion does bring to the foreground the many design decisions facing developers who are providing material for multicultural communities, with diverse socioeconomic backgrounds. I think it is an area that could benefit from additional research.

You should also note that the kitchen was designed to be a personal kitchen, not a public restaurant, as it is currently portrayed on the main menu. This situation occurred because the theme for the main menu was not decided until very late in the development of the program. When I am working on a project where each section can stand alone, it is not unusual for the design of the main menu to occur late in the project. It is my personal preference not to address the design of the main menu until each section has completely developed its own "personality." While this sometimes requires a stretch of a section to fit into the theme of the main menu, it is less offensive than designing the main menu first and

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finding that the entire section is constrained because one screen has already been designed. Thus, what was designed to be the personal kitchen in the home of Ray Raisin became a public establishment on Banana Blvd. known as The Cooks Kitchen.

<u>The Healthy Body</u>

The content to support the development of the healthy body section was provided early in the development process, and thus it was the second section to be designed and programmed. The goals of this section are related to verbal tasks. Students should be able to tell what vitamin is good for what part of the body and what fruits or vegetables contain that vitamin. This is the information normally taught in elementary school nutrition curriculums, and so it is somewhat familiar to both teachers and children.

The section became known as H.B.'s Body Shop. The H.B. started out meaning the "healthy body" but it became "healthy buddy" to increase the personal value of the message. While actual children can be seen making recipes in the kitchen, H.B. is the only "human" character in the program. We wanted to allow the students to relate the material to a specific part of their body, and we wanted H.B. to serve as the model.

Once it was decided to use a graphic representation of H.B. long conference calls ensued focused on what he/she would look like. Extensive discussions were conducted concerning the gender of H.B. One of the SNE advisory board members felt strongly that young girls would accept a young boy as an expert, but the reverse was not true. While we never had the research to back up this assertion, it was accepted by the other

Figure 43: Which is the Universal Child?

advisory board members. Thus, rather than try to develop a non-gender person, it was decided that H.B. would be a young male: a "universal" young male. The term "universal child" became the description of the child we were to create. However, no one could direct us to a definition of a "universal child." When we asked for examples of universal children, Figure 43 is the graphic we received from the SNE committee for guidance in this regard. The child who is circled, was circled by a member of the committee. While the child is a female child, they felt she had universal qualities. In actuality, the graphic provided us with very little direction.

It is difficult to hit a target when you don't know what the target looks like. In project development these challenges arise when the client asks for something that they themselves can't describe. Rather than participate in a hit or miss activity, the strategy we use is to produce something, present it to the client, and make them tell us what they like or dislike about it. It is not sufficient to allow someone to say, "I don't like it," without requesting further explanation. In this situation, you must say, "Tell me what you don't like." If they can't answer the question, it is important to help them break apart the attributes. For example, it would be appropriate to say, "Do you like the eyes? Do you like the hair? Do you like the lips?" This is how we conducted our development of H.B.

Figures 44 - 46 show a number of iterations for the design of H.B. You might study them and determine which one you think most closely represents the "universal child." They were presented to the client and the advisory group and evaluated in the step by step manner discussed above, until a clear direction for change could be established.

To provide some assurance that the design would be accepted, the graphic, as shown in Figure 46, was presented to over 60 children and their reactions were recorded. When given the graphic, and asked, "What do you think about H.B.?" The most frequent response was, "He looks like John, " or the name of some other child. In groups of

children there was often a consensus on who H.B. looked like. Not a single child ever commented that H.B. looked different, unfamiliar, or otherwise expressed concern. The reactions were good enough to provide a level of assurance that students would not have a problem relating to H.B. While we spent weeks refining his looks, it is hard to

Figure 44. First Version of H.B.: Universal Child

know if we did just enough, or too much, to make him a credible source of information.
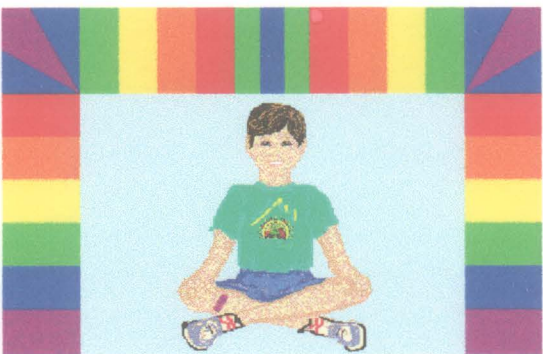
Figure 45. Second Version of H.B.: Universal Child

In addition to H.B.'s physical presence, his voice presented the project another challenge. The child who did the voice over for H.B. was from Roanoke, Virginia. His southern accent became a point for discussion by the advisory committee and the PR agency. Some felt that his southern accent would lessen his credibility. Earlier, I spoke of compromise in script development. As I said, it is to your advantage to

compromise whenever possible in case there are more important issues on which you do not wish to compromise. H.B.'s voice was one such issue for me. I feel it was wrong to discriminate against H.B. because of his accent. To assume that someone with a southern accent was less credible was very
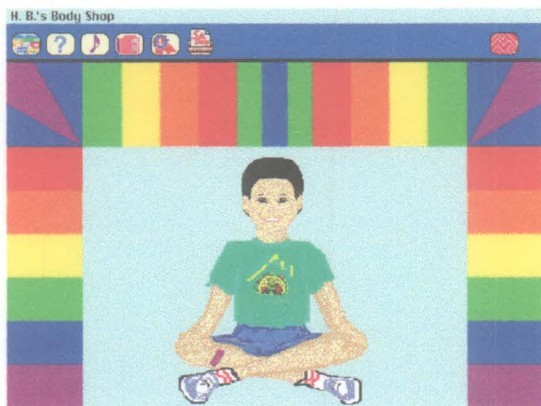
Figure 46. Final Version of H.B.: Universal Child

offensive to me. While I did not go out of my way to find a child with a southern accent, I had one, and it seemed unwise to spend resources to fix a problem that I did not think existed. If H.B.'s dialect was difficult to understand, or his script had been inaccurate, I would have felt differently. H.B.'s script was accurate, and he presented it very clearly. I was determined to maintain his voice in the program, and I did. He has a southern accent.

With the large distribution of discs and the many channels of communication which teachers, students, and parents have used to express their feelings in regard to the project, it is interesting to note that only one child has ever mentioned H.B.'s voice.

Dole received this letter by standard US mail. It appears that for Dominique, H.B.'s voice is a motivational factor.

> Dear Sir,
>
> I am a third grader at Cooke Elementary. Last week our class worked with your "5 A Day Adventure" CD. I love the body shop. The boy talked with a funny accent. I like listening to him. I got fifteen tokens in the challenge. I liked the songs too. They were cool. I kept listening to it.
>
> Sincerely, Dominique (personal communication, October, 1995)

<u>Fruits and Vegetables Speak Up</u>

This section of the program was relatively straight forward in design, as described earlier in the chapter, and shown in Figures 7-10. The objectives are verbal objectives. Students can learn "the story" of each fruit or vegetable. Moreover, this section provides educators with a good opportunity for more rigorous investigation, involving high order objectives. If a teacher wants to ask investigative questions concerning observable trends in growing requirements, weather conditions, imports or exports, there is the opportunity for students to develop these relationships from the data in the section. If students want to chart information, concerning when items appeared in our food supply, or who was

responsible for introducing the item, the content in the section will also support these activities. The supplemental support material provided on the disc includes a number of lesson plans focused on using this content more extensively to solve investigative questions.

It would be easy to look at this section of a program and completely underestimate the amount of effort required to bring it to life. While the design is rather simplistic, development of the section was very labor intensive. Each of the 36 characters have six scripts and a movie. The content for each script came from many individuals and agencies. After finding the basic material, each script was written in an appropriate tone for the fruit's or vegetable's personality (see Appendix D for personality profiles). In house we called this dialect, "veggie speak". Once a script had been written in veggie speak, it was sent out to the advisory committee for review. Because five different individuals (the client and four advisory committee members) had to agree on each word in the program, many iterations were involved before the final scripts were sent to the studio for recording. The section required the full-time attention of one assistant project manager for over three months.

Each US map and World map was created individually for a fruit or vegetable. One design decision that I would like to change concerns the red and orange colors used on the maps. Other colors would have offered better contrast. To be honest, I cannot report how the colors were chosen. At some point in the development process, I became aware that we were using red and orange. By that time, it was too late and too expensive to redo all the maps. The person working on coloring the maps was a graduate student working evenings as a freelance artist. She came into work at 8:00 p.m. or 9:00 p.m. and would work until midnight. The computer she was using at night was being used during the day by a programmer. Her work schedule was being managed by one of the assistant project

managers and I did not request to see her initial progress. I did not review her work until the maps were almost complete. Sometimes we have to live with our mistakes, and this is one of them. I point it out to remind you that each detail is important, and left unspecified, can create problems.

The section was additionally challenging because it involved the characters. The characters were owned by Dole, having been originally created by artists in New York. While Dole owned the characters, they did not have the rights to alter the characters. Thus, when someone looks at the program and wonders why a character does not move more extensively, the answer is two-fold. First, we did not have permission to modify the characters. Moving their mouths, their eyes, or a slight move of the hand was the extent of our alterations. Secondly, in a few cases when we did move an entire body, the performance of running the animation and playing the audio at the same time was unacceptable on the targeted delivery machines. All large movements were eventually dropped from the program to accommodate performance on the lower-end machines.

When we asked Dole for the characters to scan, they did not want to let us have the original watercolor characters. They had transparencies made from the water colors. This decision was understandable, but, the transparencies of the watercolors were not prepared with proper lighting and the color balance was incorrect. When we captured the transparencies, the colors on all the fruits and vegetables were less vibrant than the originals. We had not seen the originals and we were not aware of the color shift. We animated all 36 characters. We eventually took them to California for a project walk-through, and the colors did not meet with approval. Following the meeting in California, we obtained and scanned the original water color characters. While this method produced corrected colors, the animations no longer matched and each character had to be re-animated. The six week effort we had originally expended to animate the characters was

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wasted. The cost to the project was significant. While Dole agreed to pay for the rework of the characters, the time lost in production was also a major concern . If I had the same situation today, I would have scanned a single character and sent it back for approval, before moving onto other characters.

To increase the motivational aspect of the characters, they needed to portray a personality. Each character needed a name which could accomplish two goals: 1) it had to be a name the students could identify with as "real", and 2) it had to be "fun enough" that the students would want to explore all the characters to learn their names. We decided that alliterative names would be motivational for 3rd grade students.

There was great interest among the stakeholders concerning how the names would be selected to reflect the diversity of children's names in the country. Everyone in an advisory capacity to the program was asked to provide a list of 20 boys names and 20 girls names representing the diversity in their section of the country. While this seemed like a good idea, it did not work well. The names were very narrowly chosen and we still had the problem of deciding which fruit or vegetable was even a girl or a boy. With Dole's approval, I contacted the artists who originally created the characters and asked them for a character profile and a name for each one. The profiles, included in Appendix D, provided the direction we needed to describe the voice for each character.

The 36 character voices were produced by six individuals from the broadcast business. The names of the characters and the unique voice for each character do provide a strong motivational factor for the children. As you will see in Chapter 3, the students do not talk about a fruit or vegetable, they refer to them by name. To many students, the characters are very real.

One last challenge in the design of this section, was the color of the stage. Again, when looking at a finished product, a user, or a reviewer, has no way of knowing how

much time and resources are invested in a single presentation. Because the colors of the fruits and vegetables were so important to Dole, it was necessary to design a stage that allowed the characters to "look their best." Dark, rich colors looked good with some characters and terrible with others. Figure 47 shows Bobby Banana on a dark gold stage.
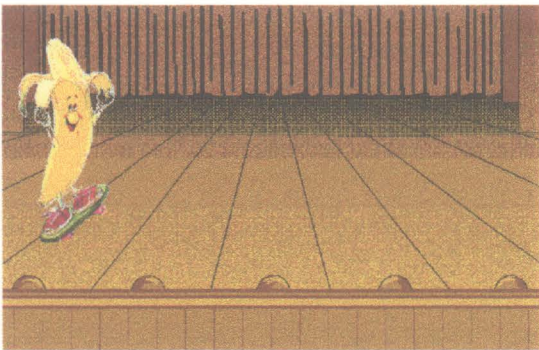
Figure 47. Bobby on Gold Stage

Figure 48 shows the second attempt to adjust the stage for Bobby. Finally, Figure 49 shows Bobby as he appears in Version 2.0 on the light blue stage.

Not only was the stage a challenge when the curtains were open, it was a challenge when the curtains were closed. Pamela Pineapple, the host for the section, stands in front of the closed curtains to welcome the students. Figure 50 shows Pamela on a blue and purple version of the stage. You might agree, that the blue curtains with the dark purple shadows were not complementary for Pamela. In addition to the color, the curtains appear striped, and the image has an unnecessary busy feeling. Figure 51 shows the final version of the stage with Pamela as host. The light color works well for the background and also works well when the characters are selected to go up on the stage to deliver their speeches.
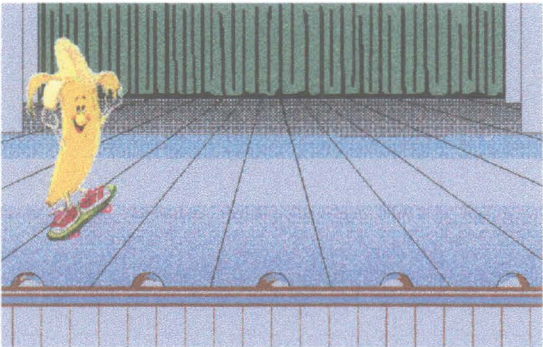
Figure 48. Bobby on First Blue Stage
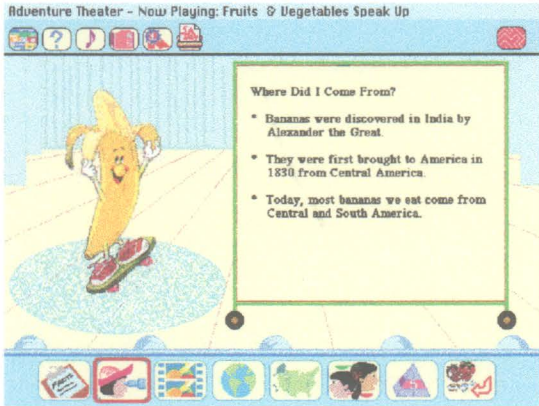
Figure 49. Bobby on Light Blue Stage: Final Version

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Because the characters are cut-out from their photo background, it is necessary to select a

light color to place them on to hide any edges from the cut-out process.
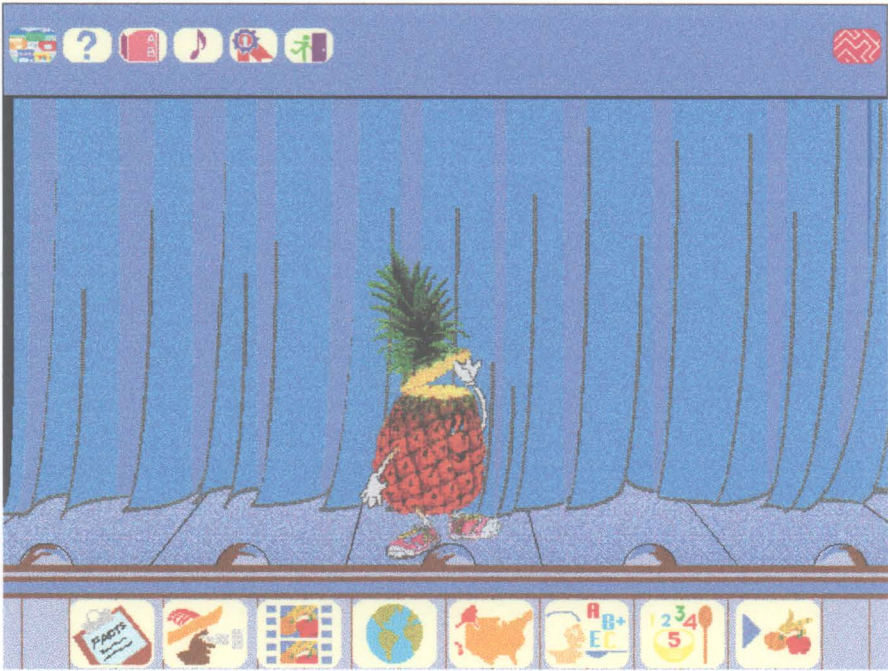
Figure 50. Pamela on First Blue Stage in Front of Blue and Purple
Curtains

Figure 51. Pamela on Light Blue State: Final Version

The Land of 5 A Day

The Land of 5 A Day contains the 5 smaller related program sections as discussed earlier in the chapter and shown in Figures 27-33. The development of any design is iterative, and often one idea leads to another. Figure 52 shows the first idea for the Land of 5 A Day. As discussed earlier, it was modeled after the board game Candy Land by Milton Bradley. In many situations, a designer must incorporate diverse ideas into a single menu. It was important that the menu convey meaning as well as the activities.
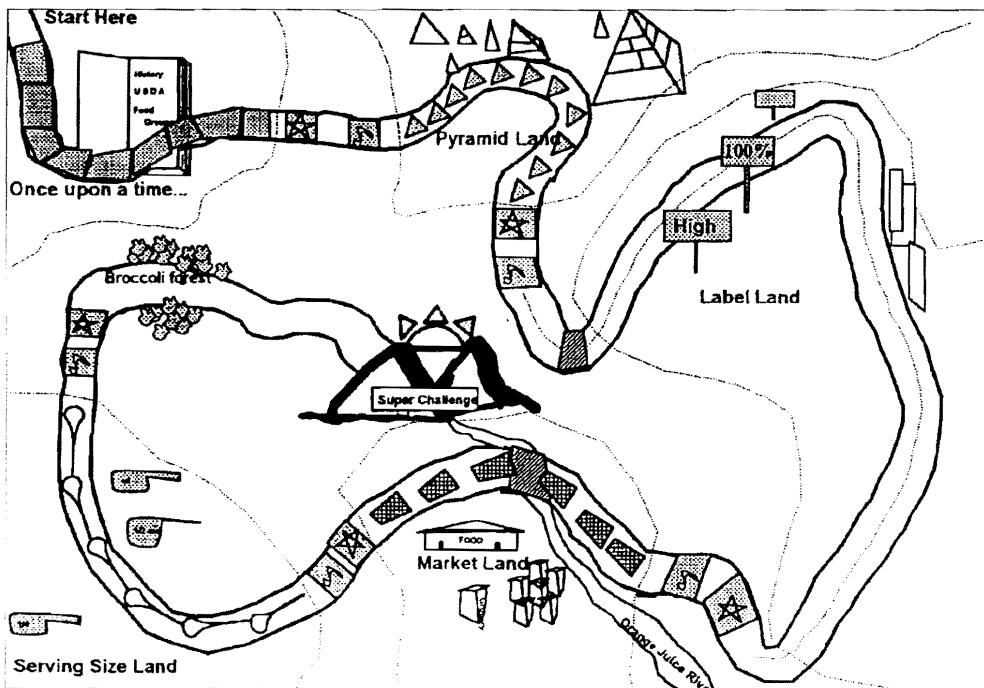
Figure 52. First Idea for Land of 5 A Day

At first, it seemed that a game board could provide a proper vehicle for students to interact with the material. Later, we determined that we did not want to require the material in a specific order, however, the diverse lands clustered together in one land conveyed the proper relationship of the material. Each land remains independent and provides its own challenge section. The challenges in the Land of 5 A Day each have only five tokens rather than the 10 tokens required in each of the other main sections.

In Beta Test we learned that students did not enjoy working with one of the lands within 5 A Day. Figure 53 shows a Once Upon a Time Land in the upper left corner. The objective of this land was to tell the students why the 5 A Day logo was important. It was a very minor land, in that it only addressed one objective.
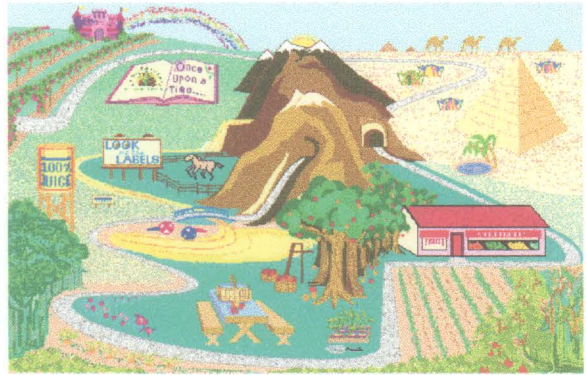
Figure 53. Once Upon a Time Land (Upper Left)

It provided a story explaining the importance of the logo. The story began.... "Once Upon a time in the Land of 5 A Day the boys and girls decided... " The 3rd grade students observed that the story must not be for them. They assumed the story was directed at younger students because of the "Once Upon a Time" beginning and the fact that Courtney read the story in her soft voice.

Following the beta test of the disc it was decided to change the land to a more high tech land. WFIVE, the voice of 5 A Day was developed. The new land while providing much of the same information as the original land, elicits the opposite feeling. Students report feeling that the land is perhaps for the "older" students, because it provides information on e-mail addresses.

The Salad Factory

Salad Factory was the section of the program which took the longest to design. Prior to the development of the design for the factory, focus groups were held in Minneapolis, Minnesota. One of the goals of the focus groups was to evaluate students interacting with a salad bar. It was February, 1993. The project had been in development for four months, most sections had a high level design in place, and some sections were being scripted and prototyped.

Focus Groups - Minneapolis, Minnesota - February, 1993

Through a colleague at the University of Minnesota, we were able to gain support for testing our product in the Minneapolis area. In February, 1993, two focus groups were conducted in a Minneapolis area school, one with teachers and one with students. In addition, parents of students involved in focus groups agreed to complete a survey on fruit and vegetable consumption within their families.

The purpose of these activities was to obtain reaction to work in progress and to continue to learn more about successful presentation of nutrition information to children. Examples from the Fruit and Vegetables Speak Up section, recipes in the kitchen, and some example QuickTime movies were ready to demonstrate. A single computer was used to "present" the material to the focus groups. The presentation allowed the students and teachers to "meet" the characters, and to explore their nutrition stories. All other sections of the program which were not demonstrated were presented to the teachers in a design document format, including examples of lesson plans for incorporating nutrition education in cross-curriculum activities. Teachers reviewed the scope of the program and were asked to address curriculum issues related to the material.

<u>The Students</u>

Students volunteered for participation in the focus groups and were ultimately selected for participation by their teachers. Twelve students, six males and six females, from the same school participated. In the groups were six Caucasian, four Asian, and two African American students. Each student was compensated with $10.00 and a large canvas bag of fruits and vegetables.

Students met after school and were offered an opportunity to serve themselves from a salad bar. This activity was intended to gain additional insights for the upcoming

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development of the salad bar module. Of particular interest were the types of foods the students would eat from the salad bar, and the amount.

Observations concerning the salad bar included:

- All students enjoyed the salad bar and were experienced salad bar users.

- Students consumed large amounts of food from the salad bar. In most cases the amount of fruits and vegetables consumed was equal to 4 to 5 servings when measured by the 5 A Day guidelines.

- Students consumed large quantities of salad dressing, including high fat salad dressings.

- Lettuce was not a major component of the salads made by students. Fruits appeared to be favorites followed by carrots and other vegetables.

- Students had difficulty talking in terms of "servings." Another serving simply meant another trip to the salad bar.

Students' Reactions to the Programmed Material

Students observed a demonstration of the Fruit and Vegetables Speak Up section. The following observations were made:

- They enjoyed the interactive nature of the program and responded very favorably to the fruit and vegetable characters.

- They specifically reacted positively to the names and voices of the characters and readily incorporated their names into the discussions and spoke about them as if they were "real."

- They enjoyed learning factual information about specific fruits and vegetables, and wanted to discuss this area in more detail. The children thought that having the characters "talk" to them about their history was especially "neat."

The Teachers

Teachers from the Bloomington, Minnesota area, volunteered to participate in a focus group. Ten of the third grade teachers who volunteered were selected to participate by their media specialist. All ten participants were women, with the group comprised of seven Caucasians, and three African Americans. Teaching experience ranged from 4 to 27 years with a mean of 14.3 years experience. Teachers were compensated with dinner, $25.00 and a canvas bag of fruits and vegetables.

Following observations:

- Most teachers were not comfortable teaching nutrition and only two teachers were familiar with the 5 A Day guidelines.

- Teachers attached great importance to nutritional education and considered the topic to be both timely and relevant. Currently, their schools were involved in a healthy heart program through the cafeteria, and all thought this was a positive endeavor.

- Reaction to programmed material was very favorable. Teachers felt the characters would be very motivational and that students would easily identify with them.

- One teacher expressed concern that none of the characters appeared to be "physically challenged" and wondered if we should portray a character in a wheelchair or otherwise to "equally represent children of all types and abilities." An in-depth discussion followed this comment. Most teachers felt that diverse representation was not mandatory for successful usage of fruit and vegetable characters with students.

- Teachers were especially in favor of suggested lesson plans on how nutrition could be integrated into math, science, social studies, and language arts.

- They expressed a desire that the program accommodate students with lower reading abilities.

- Suggestions for improvement centered primarily on teacher usage issues rather than on instructional content. Teachers expressed concern about:

  - level of difficulty in the challenge (quiz) sections.

  - a need to monitor students' progress.

  - a need to control student access to modules.

  - a need to control cost of printing.

- Access to technology varied greatly among teachers, however, most teachers reported having a computer lab in their schools with a computer specialist to manage the lab.

- Teachers expressed no concern that the project was being funded by a corporate sponsor, however, they wanted to know who would validate the material.

Parent Surveys from Minnesota

Ten parents completed the survey on utilization of and preference for fruits and vegetables in their homes. Comments indicated that all were concerned about their children's eating habits, and most felt that they needed additional information on nutrition and the new 5 A Day Guidelines. The survey consisted of ten questions. Four of the questions addressed the amount of fruits and vegetables eaten in the home and asked parents to identify whether or not vegetables and fruits were "in" or "out." Responses were in line with the national survey data indicating, on average, Americans eat 2.5 servings of fruits and vegetables a day. Two of the questions provided an opportunity for parents to share creative ideas, and were of greatest interest to this designer. All ten responses to these two questions are listed below.

Question 1: "What do you think would attract your child's attention in learning about fruits and vegetables?"

1) Education

2) My children are interested in fitness.

3) For them to learn more about the healthy aspect of eating them.

4) Learning where they are from, and how they grow. My children are very curious about foods.

5) Show children proof that it really is healthy.

6) Cartoons, my kids like cartoons. Also give them easy recipes.

7) Make a video that teaches, add music and make it fun.

8) Give them hands-on sessions. Let them learn through their senses. Teach them about their colors and what they mean.

9) Show them how they taste and how they are good for you.

10) Teach all of us about why we need them in our diet and also about new fruits and vegetables. How do you eat a pomegranate?

Question 2: "What do you do to encourage your kids to try new fruits and vegetables?"

1) Serve them with a smile.

2) I ask them to, "Just try it."

3) I show them by example that they should try new things.

4) Cut them up into little bits and make dips.

5) It is a requirement in our house.

6) I fix a new recipe.

7) We avoid battles at mealtime and we stick with vegetables they will eat.

8) We talk about where they grow, their color, shape and texture. We try to make it an adventure with food.

9) We tell them that their taste buds are always changing and that today they might like something that they did not like yesterday.

10) I bring home new items and we all try them together.

Summary of Focus Groups in Minnesota

The students, teachers, and parents, provided positive reactions to the material and to the concept of nutrition education. The students were very enthusiastic about making salads and ate a larger variety of items and more servings than had been anticipated.

The teachers were far more concerned about having access to lesson plans than they were about what content would be in the program and how it would be handled. Teachers were very enthusiastic about the opportunity to receive teaching materials for nutrition education, but expressed concern that the content materials should be validated by a credible source for accuracy.

Several of the parents made suggestions which echoed suggestions made by students, parents, and teachers in Georgia. While I have not yet discussed the development of the music, it is evident that the song, Just Try Us, as shown in Figure 26, was developed in response to the many comments from parents and students concerning use of the phrase "just try it" as a strategy to convince a friend or family member to taste something new.

The Development of the Salad Factory

Following the Minnesota focus groups, the design of the salad bar was revisited. This section was important to the program because eating salads is one of the most important strategies in the 5 A Day message, and the client wanted to promote salads to students. This was especially appropriate because many elementary schools now offer a salad bar to students for lunch. However, while most salads provide a healthy alternative, that is not always the case. Many salad dressings are high in fat. Salads covered with high

fat salad dressings represent a poor nutrition choice. The association of high fat toppings with salads creates a dilemma in promoting salad bars. The Director of Health and Nutrition for Dole was horrified to observe many of the children in Minnesota using their carrot sticks as "fat carriers." They dipped the carrot sticks in the dressing and carried the dressing to their mouths as if the carrot represented a spoon. It was evident, by watching the children eat, that the fat in the dressing, as well as the nutrients in their salads, would need to be evaluated if we wanted to teach how to make nutritious salads.

Given the importance of the salad bar, it seemed inappropriate to bury it in the menu under the section Fun with Fruits and Vegetables: Eating Out, as it was originally planned. To maximize the opportunity for students to access the material, we needed to move it to a position of importance on the main menu. In addition, if it had remained under a section titled "eating out," the entire section could have been criticized, because only one eating out option, the salad bar, would have been addressed. By moving the salad bar to the main menu we facilitated the opportunity for students to directly select the activity. By changing the name of Fun with Fruits and Vegetables: Eating Out to the Salad Factory, we more clearly communicated the activity for the student.

Titles play a role in setting expectations for the interactions of a section. The title "eating out" creates a different expectation for the learner than "salad factory." Salad Factory more honestly represents the focus and the activity of the section. Things are made in factories; in the Salad Factory, salads are made. When the environment helps learners set accurate expectations, the learners are more likely to be satisfied with the activity of a lesson (Keller & Burkman, 1993).

One of the initial steps in designing an instructional treatment, is to list all the functions which must be accomplished by the interface and by the code. In this case, the graphic representation of the salad bar section had to, at a minimum: 1) offer a number of

food items to put in the salad, 2) convey the nutrient value of each item; 3) convey how much of an item was being added; 4) convey the ongoing size of the salad; 5) provide a way to add salad dressings; 6) provide a way to analyze salad dressings; 7) provide an overall evaluation of the salad.
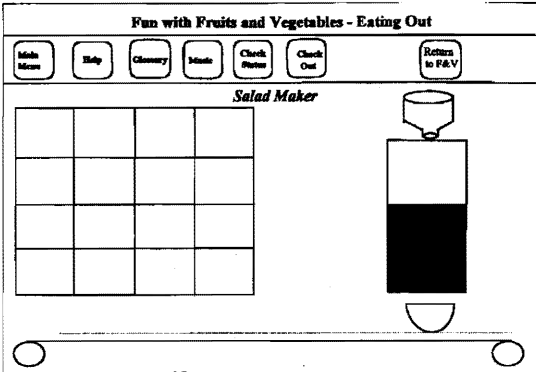
Figure 54. Salad Maker: First Idea
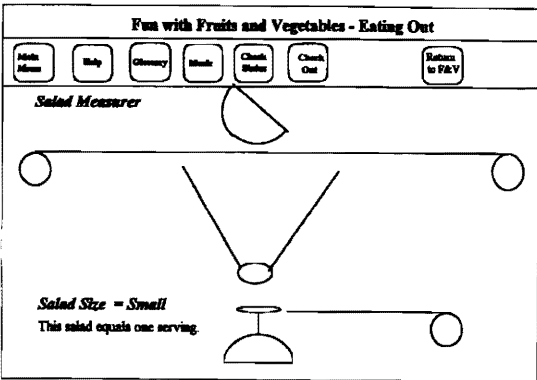
Figure 55. Salad Measurer: First Idea

The earliest designs of the section are shown in Figures 54 - 56. These three graphics represent the salad maker, the salad measurer, and the salad analyzer. These design sketches were used to determine how much information could be displayed. Draft boxes were laid out in proper proportion to the screen layout and sizes were evaluated to determine usability.

While the three screens provided the needed functions, the sequential nature of the screens were problematic. A student would need to move to another station in the Salad Factory if they wanted to know how much salad they had made. They would also have to move to learn the total nutrient value of their salad. In evaluating these three designs (Figures 54 -56), we decided to incorporate as many functions as possible into the initial Salad Factory screen.
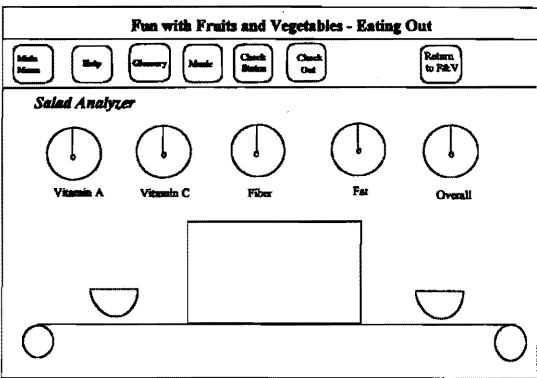
Figure 56. Salad Analyzer: First Idea

Our first concern was in evaluating how to display the food items on the salad bar. We initially endeavored to mimic an actual salad bar. We created small containers of ingredients, but they were not graphically appealing or graphically informative. They needed labels in order to communicate their contents. However, I was opposed to using labels because of space constraints and readability.

After struggling with the design in a reality mode, I finally decided to move into a fantasy mode. In a magical world anything can happen, and children accept it. Salad Sisters can dance and sing, and bins of items can always be full. Once we moved away from reality and into a factory, the space on the screen could be more efficiently utilized. In a real restaurant, salad bar items could never be placed above eye level, but, in a factory it might be appropriate, and even desirable to place bins of food items high. If the bins were above head level, the items could "flow" down into the analyzer. Figure 57 - 59 shows development of the Salad Factory from early drafts to the final version. Each graphic contains more detail and reflects adjustments to the machine functions and the nutrition message.

Figure 57 shows how the major functions described above could be incorporated into one screen. The food bins at the top of the screen would provide a means for the item to travel to the analyzer, then onto the mixer, where the salad could also be measured. Figure 58 is a more refined version of Figure 57. The bins have items, the vitamin gauges are in place, and the mixer has a window to display the serving size.

However, when the graphic in Figure 58 was tested with students several weaknesses were identified: 1) Students found it hard to read the graphic vitamin scales. The small arrows which moved up and down in the fixed fields on the vitamin scales did not represent a bold enough discriminator for students to immediately key on the change. 2) The salad dressing was added by bypassing the food analyzer box and the amount of fat

in the dressing was not being measured. 3) Students could not identify the raisin box, because the raisins were not in proper proportion to the rest of the items. 4) The color that was being used to indicate that an item was being selected was too dark and made the food look unappealing.

Figure 59 addressed the shortcomings of Figure 58. The most important change was the change made to the vitamin scales. Because the scales remain off until an item is selected, the change in the scales is immediately noticeable. While the value of the vitamin rating is not pointed out to the learner in audio, a small audio whistle sounds when

Figure 57. First Draft: Salad Factory

Figure 58. Second Draft: Salad Factory

the rating scales move up. It is very clear, from testing this activity with students, that they notice and react to the change in the rating scales. When the ratings are low they often make a disappointing sound and when the ratings are high, they are excited, even if they don't like the food (spinach).

The graphic in Figure 59 also provided a means for the salad dressing to move to the food analyzer where the fat content can be displayed. In addition, when salad dressing is placed in the mixer, the fat meter on the front of the mixer displays the total fat grams. The food analyzer was lightened to allow a better focus on the item in the mixer and the items
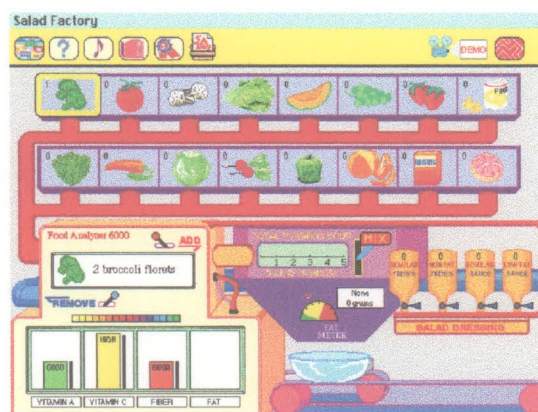
Figure 59. Final Version: Salad Factory

are outlined when selected, rather than filled. Each bin displays a small number in the upper left corner which reminds the learner if any items from this bin have been added to the mixer.

As you evaluate the changes between the graphic versions, in addition to noting the function changes as discussed, it is also interesting to note changes in how the food items were portrayed and their relative placement. The client and the advisory board were very interested in how the items were being represented. Obviously, the goal was to communicate to the learner in a very small space. This small graphic was supported by audio. In reaction to a click, one of the salad sisters identifies the item. For example, if broccoli is chosen, as the item is being moved to the food analyzer, the audio message, "Broccoli", is heard. If the item is further placed into the mixer, by flipping the "add lever," a salad sister says, "Adding 2 broccoli florets." As a design consideration, it is not necessarily a flaw to require the learner to make a selection to learn what an item is.

In this case, one of the objectives of the section is to reinforce the nutrient value of each item on the salad bar. When an item is selected, even if the learner only wants to identify it, the analyzer displays the nutrient value of the item. This is true, whether or not the learner decides to move the item into the salad mixer.

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Audio is used extensively in this section and throughout the program to provide confirmation and guidance to the learner. It is unfortunate that this dissertation cannot effectively communicate the impact of the audio reinforcement used within *5 A Day Adventures*. The multimedia environment is one which affords the designer many opportunities to communicate positive messages to the user. In the Salad Factory, every action the learner takes is rewarded with audio, animation or both. This reinforcement may contribute to the popularity of the section, as presented below and discussed in Chapter 3.

In the final version of the mixing screen many functions are available to the learner. While many options are presented, the screen is not confusing because the learner's eyes are pulled to action points by animations and sounds. The functions for the salad maker screen include: 1) select an item for the analyzer; 2) review the nutrient value of the item; 3) add the item to the mixing bin or remove an item from the mixing bin; 4) the item analyzer informs the student how much of the item is inside; 5) each bin indicates how many items from the bin have been selected; 6) the mixer always informs the student how many servings towards their 5 A Day goal are inside the bin; 7) select a salad dressing; 8) add or remove salad dressing; 9) review the fat content of the salad dressing; 10) review the fat content of the items in the salad bin; 11) receive a warning when the salad is considered high in fat; 12) mix the salad; 13) watch the salad being placed in the bowl. Through the many activities, the Salad Sisters confirm choices and root the learner on with comments like, "Spinach, Yes, Yes, Yes!"

Once a salad is made, it is moved to the salad analyzer for evaluation as a unit. Three of the design iterations for this machine are shown in Figures 60 - 62. While the factory was magical, it was important to build into the simulation a sense of realism. The salad moves into the analyzer on the conveyor belt to be evaluated.
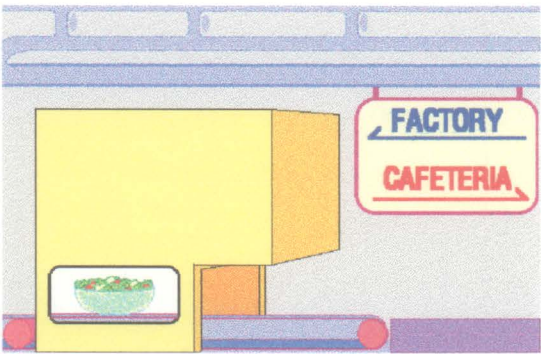
Figure 60. First Draft: Salad Analyzer
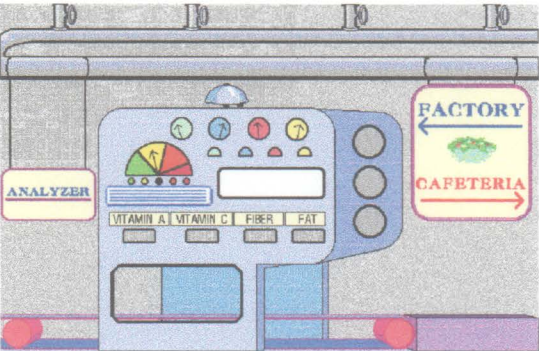
Figure 61. Second Draft: Salad Analyzer

While the rating lights for Vitamin A, Vitamin C, Fiber, and Fat are in the off position when the evaluation begins, it is possible to see what values will show if the lights are triggered. This feature allows the learner to know what rating is possible even if their salad does not trigger the rating. If the salad is rated as being high in fat, the analyzer encourages the student to return to the factory to remake a salad.
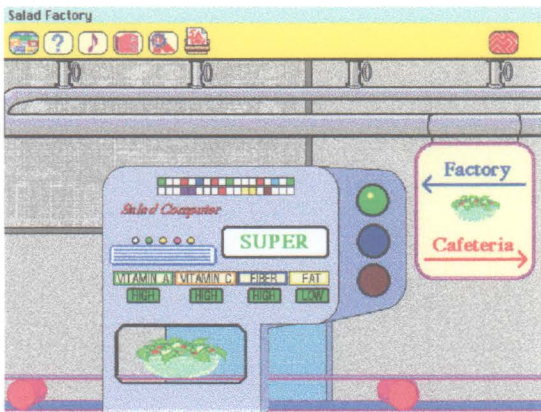
Figure 62. Final Version: Salad Analyzer

While the objectives for the cafeteria were discussed earlier in the chapter, several iterations of the design are shown here. Figures 63 - 64 show the cafeteria as it acquired the necessary details to make it "real."

The correspondence from students and teachers, indicate that the salad factory is very popular. It is favorably mentioned second only to the music in the program. One of the factors which may have added to its popularity is the fact that during development it was extensively tested with children. Their suggestions for sounds, and actions were often incorporated. In addition, the factory has the ability to make unique salads every day. This variability may have also added to the popularity.
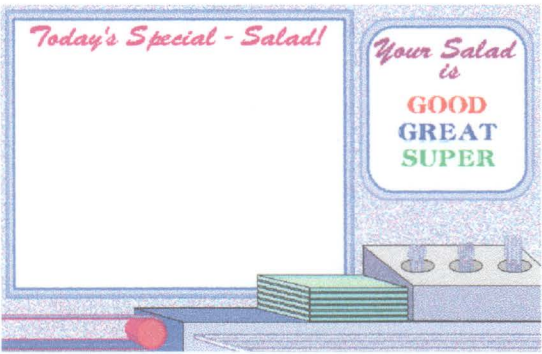
Figure 63. First Draft: Cafeteria
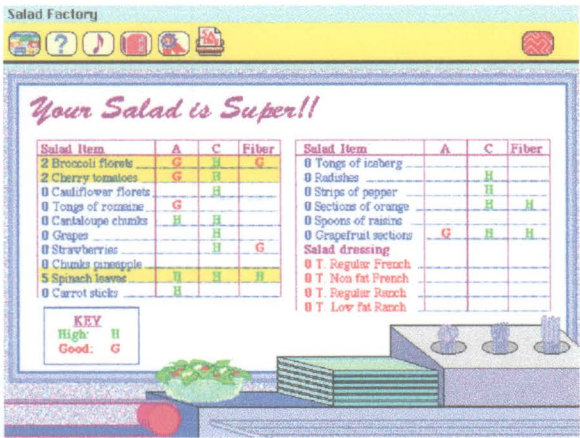
Figure 64. Final Version: Cafeteria

The Music

From the moment I read the objectives, I thought about music. Eleven of the objectives addressed listing or naming and spelling. In addition to adding a motivational aspect to the program, I knew that music could be used as a mnemonic device to help children remember which fruits and vegetables had vitamin A, vitamin C, or fiber.

I also knew that if I could get children to sing about 5 A Day that they had an even better chance of taking the message home. Of the original 27 objectives, eleven of them are directly addressed by the music.

When I said that I wanted to write music, at first my development group was skeptical. However, one employee who played the guitar actually started writing a little ballad of 5 A Day and played it for the group. Another employee had a friend in Nashville who recorded children's songs. The Nashville artist agreed to work with us to produce songs if we could get him rough drafts of ideas. Writing lyrics is just like writing poetry. I was able to write lyrics, and hum tunes, and so the music began.

Eight original songs were written to address the most important objectives in the program: 1) 5 A Day; 2) Vitamin A, 3) Vitamin C, 4) Fiber, 5) Broccoli, 6) Cauliflower, 7) Healthy Buddy, and 8) The Salad Sisters. The lyrics are included in Appendix E. These songs were written without prior approval of Dole. They were considered a treatment, but were not listed in the contract. By the time I went to California for the program review I had invested my personal money in the production of four of the songs, I was hoping to interest Dole in the music and ask for the funds to cover the production cost. The Director of Nutrition supported my actions. She had also hoped the program would have music, but she had not imagined that we would create original scores. However, she really liked the music and was certain that I should present the idea to her boss.

A Corporate Review - March 1993

In March 1993, six months after development had begun in earnest, I traveled to California to report to the division vice presidents within Dole on the progress of the program. Between twelve and eighteen people were present. Two of the people I had met in San Francisco the previous summer were present and the remainder I was meeting for the first time.

Overall, the group was very impressed with the program. However, their focus was not on the nutrition education material, they felt that was the responsibility of the Director of Nutrition. They were most interested in how the characters which represented their division were portrayed. This is in keeping with stakeholders goals. The people in the room were not nutrition experts, they were produce experts. Their focus was on promotion of their division. Even though this program was not a direct marketing piece, they knew that the user would draw conclusions about the produce. They had a sense that the project might be good for education, but their primary concern was how it made "their" fruits or vegetables look.

During this time period Dole had four main corporate divisions: Fresh, Dried, Canned, and Juice. Working with the Director of Nutrition, we had been careful, early in the design process, to give leading roles to characters from each division. Fresh, being the largest division, was represented with leading roles from the banana, the cauliflower, the pineapple, and the broccoli; Canned was represented with canned pineapple; Dried was represented with raisins and dates; Juice was represented with the 100% Pure Juice character.

Each division vice president was reviewing the movies from their characters when one of the woman who had been in the San Francisco presentation brought up the fact that

she thought the video should be larger: full screen, in fact. While I was able to provide ample information to address her concerns, I felt the discussion moved the direction of the meeting. Being very unfamiliar with computer technology, she began to object to how many colors were being used to present the oranges and yellows in the fruits and vegetables. She suggested that I should look to the print industry to learn how to incorporate more colors into the characters. I found myself in the middle of a technology seminar. As an educator, I know that you must deal with misinformation when it arises, or run the risk of even more misunderstandings in the future. My presentation and my comments on the technology were sufficient to satisfy the audience. However, her discussion of colors lead others to agree that maybe their characters should be brighter. When I explained that I would need the original art, it was decided that I should have it, in order to facilitate a "face lift" for the characters.

While Dole provided the resources to cover this expense, it was a setback to the project. The artist who had completed the animations was on a month's vacation in Europe, and a new animator had to be employed. We spent two months in animating the original characters, however the revised characters required three months because the new animator could only work part time. When the work was complete, it was obvious that the characters were slightly brighter and more colorful. The effort expended to achieve this effect may or may not have been necessary to the credibility of the program. It was, however, necessary to satisfy the major stakeholders, and therefore it was worth the investment.

In the same meeting I presented the music. Everyone loved it. However, it was not until later that I learned that the same woman who was not satisfied with the video, felt that I should not be compensated for the music. At the time she had a position of budgetary power and she did not want to support the music. I felt so strongly about the importance of

the music in the program, I later wrote an agreement with Dole allowing them to use the music on the CD, and to play it publicly, but I would retain the copyright to the music and I would market it separately, which I did. When version 2.0 was developed, Dole asked that I develop two new songs: one for the Banana and one to remind kids to "Just Try Us."

The music remains one of the most successful aspects of the program. It is used throughout the modules. In the original designs, the music was only available from the status bar, however, because of its popularity, it eventually was placed in the Juke Box on Main Street for easy access. In Chapter 3, many of the observations regarding the use of and the reaction to the music will be discussed.

More Designs

Following the meeting in California, we went back to the design board to address the overall structure of the program. At this point in the development, the main menu had not been addressed, no Town of 5 A Day existed. But, the ideas were evolving.

The Main Menu

Menus provide more than just a means to access the material. Every screen in a program speaks to the learner, and often the main menu is the most visible screen. It sets the tone for the entire program. When a learner sees a main menu for the first time, they establish expectations. Keller and Burkman (1993) remind us that helping the learner set clear expectations increases the motivation of the learner to interact with the material. Each component of a screen directs the learner's attention and can influence selection: organization can imply priority or hierarchy; colors can imply importance and show connectivity of ideas or clusters; size of selectable areas can also be used to indicate importance; and all of these attributes can influence the learner's choice.

In designing the main menu for 5 A Day, all of these factors were considered. The main menu needed to help the learner establish clear expectations for the program.

First, every section should be equally represented. We did not want to imply priority to the learner. Second, we wanted the menu to be built from familiar objects. Third, the menu objects had to invite the learner. In essence, we wanted to utilize the space on the main menu to "advertise" each section.

After many false starts, we decided to build a little town with colorful streets and buildings that provided information to the learner about the activities going on inside.

Figure 65. First Draft: Main Menu

Figure 66. Second Draft: Main Menu

Figure 66 shows adjustments to the original idea and Figure 67 shows the town as it is used in version 2.0 of the program. While the little subtle differences may not seem important, they were important to the client. There is a point at which changes no longer improve the instructional or

Figure 65 is the first version of the town. The title of the program was not yet firm. In anticipation of the word "fun" in the title, we hung the banner. Also, it was decided that the title of the theater might be too hard for children to pronounce. The 5 A Day logo at H.B.'s place and the Banana Blvd. sign were not prominent enough.
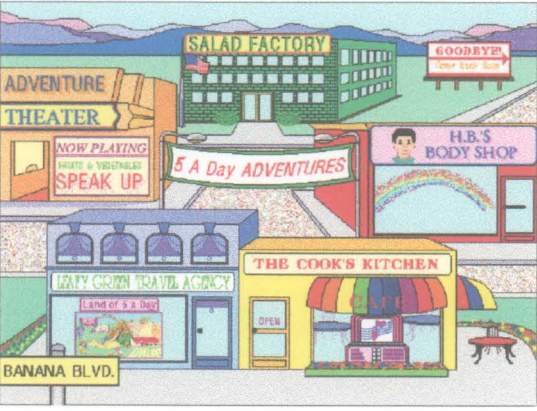
Figure 67. Final Version: Main Menu

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motivational value of the material. The challenge for a developer is to know when a design has been tweaked enough. It is not easy to know when to say "when" in designing.

As discussed in the introduction to this chapter, the town contains several hidden audio rewards for children who "explore around," and many more were planned. In fact, several animations were also planned for the town, but time and resources did not allow their implementation. Perhaps someday the bus will pull up to take students home when they request to leave the program, the airplane will take off from the runway behind the town when travelers choose to go to the Land of 5 A Day, and the shades in the apartment above the travel agency will go up and down showing life behind the scenes. Whether or not these additions will increase the motivation of the learner is not known.

Parallel to the CD project development, a number of other activities were underway in support of the program. Twenty-one lesson plans were being developed for teachers, a booklet was being designed as the disc insert, and the disc art was being developed. The development of the support materials was a significant undertaking. However, as can be seen by this e-mail message, teachers do appreciate and utilize the content, as they indicated they would in the focus groups. It is interesting to note that the following, enthusiastic correspondence, was received from a fifth grade teacher when, in fact, the project was targeted to third grade. The wide use of the program, across grade levels, will be discussed in Chapter 3.

> Hi! I am a fifth grade teacher in Indiana and just reviewed your 5 A Day
> Adventures CD-ROM...Wow!!!! It is the best piece of classroom technology
> that I have seen. I was so impressed by how thorough the unit was
> ....teacher resources, handouts, additional places to contact (which I
> did...). The student activities are so exciting and fun! I am in the

process of setting up a unit based on this CD. I can't wait for my students to explore such an awesome way to teach about nutrition! I have been talking about labels and students have been bringing in containers to compare.....

Thank you for this excellent asset to my classroom!

(M. Roth, personal communication, March 25, 1996)

In-House Evaluations

Three times during the development of the project. The development team solicited students from the Blacksburg, Virginia area to come into the office and interact with sections of the material. The students were obtained by calling "friends of friends" who knew of children in the 3rd grade. Each time a child evaluated material they were compensated $10.00 per hour. Usually, an evaluation session lasted 45 minutes to one hour. Parents were not allowed to observe students while they were "employed." Two evaluators were involved with each student. One to direct the student, and a second to observe and take notes. Videotapes were made of student interactions. In all, 20 different students were involved in the in-house evaluation of material under development.

While these activities were more casual than formative evaluation efforts conducted outside the office, they were no less valuable. At times the evaluation uncovered slight problems in the directions to the learner or with the interface. However, most often the activities provided an opportunity to validate the motivational aspect of the design. On occasion, students would provide excellent suggestions for enhancements. One of the students evaluating the Salad Factory provided excellent sound effects while he interacted with the program. We immediately added his sound effects suggestions.

The Development and Testing of Icons

Icons are frequently used in program interfaces. Because of their compact size and implied meaning, it is important to test them before implementing them into a program. *5 A Day Adventures* uses a number of icons on the status bar and within program sections. Figures 68 - 71 show the development of many of the icons used in the Fruits and Vegetables (F & V) Speak Up section and Figures 69 and 70 show the icons as they were being designed and evaluated.
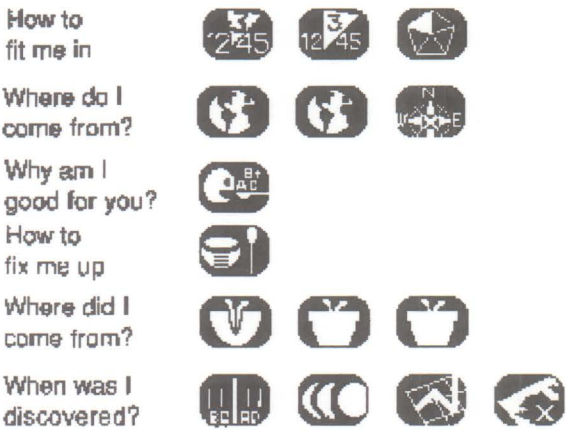
Figure 68: Initial Draft for Fruits & Vegetables Speak Up Icons

The development of the icons was of high interest to Dole and the SNE advisory team. While it is important for the designer to work through the development of icons until it is felt they imply the proper meaning, it is useless to try and evaluate them in an isolated setting. In isolation they are a graphic, while in context they communicate directions, opportunities, and progress. It is important to, as quickly as possible, place the icon in the proper context and show it to an appropriate user.
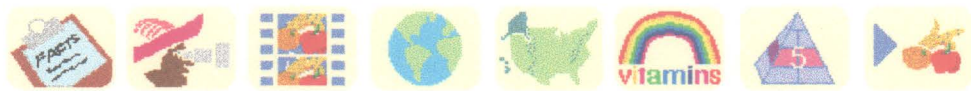
Figure 69: First Color Draft of Fruits and Vegetables Speak Up Icons

Figure 70: Second Color Draft of the Fruits and Vegetables Speak Up Icons

Standard usability tests were conducted on the final set of icons. The icons were shown to the students as part of the full user interface and students were asked to "think aloud" as they used the system to perform the tasks. This provided an evaluation as to the degree to which the icon would work well in the context of the interface as a whole. The tests were conducted as part of a full week of testing in a school setting.

Figure 71: Final Version of Fruits and Vegetables Speak Up Icons

Formative Evaluation - Clarke County, Georgia - May 1993

Interest in how the final product would "turn out" was high among the students and teachers involved in the original focus groups in Georgia. This interest prompted the principal to extend an invitation to return to his school to test the product within the third grade classes. In May, 1993, the product was about 80% complete and I returned to Clarke Country, Georgia in time to test the product before the end of the school year. Additional to this testing, teachers and students who had originally participated in the focus groups were invited to again share insights on the project. The focus groups were conducted in the same manner as discussed above, and teachers and students were compensated accordingly.

Four third-grade classes were involved in a week-long endeavor. Each day, one class participated in the testing. Small groups of three to four students were allowed to go to the testing area, located in the media center, and interact with the program. Time with the students was divided among the five main program areas. Each student cluster focused on one section. I interacted with the students and documented observations between groups. Most often observations lead to minor adjustments in the audio directions or

animations. However, a few observations lead to changes in how the material could be accessed. While the students appeared to be very motivated to interact with the program, this author acknowledges that it is always motivational for children to be allowed to leave the classroom to participate in a "special" activity. However, even adjusting for the novelty factor, the students appeared genuinely interested in the material.

In addition, the week-long testing brought attention from the media (Appendix F). It was the first indication that public excitement could be generated from a product promoting the healthy benefits of eating more fruits and vegetables.

The follow-up focus groups conducted with the students and teachers who had originally been involved in focus groups also provided a number of insights.

Observations:

- Students viewed the music very favorably. They attempted to sing along with the songs the first time they heard them. Some of the music videos contained the words and some did not. It was decided that all songs would display the words as part of the music videos, for easy access.

- Students wanted access to the music without interacting with a program section. It was decided to place a juke box on Main Street.

- Students had no problems associating meaning with the icons in F&V Speak Up. Those who could not verbalize a meaning for the icons, appeared not to be concerned. One student said, "If you want to know what they mean, click on them to find out."

- Teachers on the other hand, indicated more anxiety about using icons if they were unsure of the meaning.

- Students were anxious to hear the names and voices of the characters. It was decided to add voices to the characters when they appeared in H.B.'s Body shop to make their "star statement" and name more accessible.

- Students enjoyed interacting with the states in the US map. Students interacted with the map at each opportunity. Usually the student in control of the mouse would ask others, "Do you know what state this is?"

- Students began to act like characters. Barney Broccoli, the rapper, was a very popular personality. However, Bobby Banana, Amber Orange, and Calvin Carrot were also very popular.

- The agricultural movies in Fruits and Vegetables Speak Up were very popular. Students often viewed the movies multiple times. By the end of the week, students were giving suggestions to their friends for what to see. One student came to the group and stated, "Can we see how canned pineapple is made, first? Everyone says it is really neat."

- Students liked the challenges, often trying to take the challenge before interacting with the material.

- Large animations in the program were slow and it was decided to drop them.

- Teachers evaluated the lesson plans very favorably. Suggestions they made were implemented.

- Students in the focus group were very proud that some of their suggestions 8 months earlier had been implemented. Students thought the program was easy to use and fun. One student stayed after the focus group and did not want to leave. His mother allowed him to continue to interact with the program for an

additional 30 minutes. Following her insistence to leave, he said, "I wish that every teacher in this school could study this program. I like learning on my own."

Technical Issues

The technical development of the project offered a number of challenges. I feel it is beyond the scope of the project to discuss them here. The program, while not perfect, is very robust. In the past three years we have handled a number of technical calls for assistance. Most often the problems are associated with a hardware configuration or network problem. To aid in our ability to support the disc across platforms, we have developed a set of guide sheets to be used for support calls. They have been extremely helpful in allowing us to provide consistent advice to end-users who call for help. They are included in Appendix G to serve as examples for others who might experience similar situations.

Evaluation by Apple Computer

Apple Computer evaluated the disc as it was being considered for inclusion in a bundle targeted to teachers and families. Their evaluation identified a few inconsistencies in the presentation of graphics and made suggestions for improvement. The icon on the far right side of Figure 70 and Figure 71 is one of the icons changed as a result of Apple's evaluation. This icon is used to return the learner to the full list of fruits and vegetables in the theater. Apple's suggestion was that we change the icon to be more direct. The icon on the far right in Figure 71 was submitted and approved by Apple.

In addition to minor graphic changes, such as the one mentioned above, Apple was concerned about memory requirements. They wanted the program to operate on a 4M machine and their operating system had grown to the point that our program would not function properly. The program was subsequently evaluated for memory requirements by

section. It was discovered that in several places graphics in thousands of colors were being used in a layered mode with graphics in 256 colors. This situation strained memory. All graphics were reevaluated to identify those which had inadvertently been stored in thousands of colors. This corrected the memory problem.

It is not acceptable that little problems, like those described above, work their way into a program. However, it is understandable. Avoiding problems requires attention to every detail and a tenacity to check it twice. Checking it twice the first time requires extra time, but not as much as looking for the problem later.

Summary

This section provides only a glimpse into the design and development process of *5 A Day Adventures*. While some of the material presented is directly related to the decisions associated with the specific program, much of the material can be considered project independent. In developing any project, there are hundreds of details which must be addressed. It is best to methodically evaluate the objectives and formulate a design which meets these objectives. Minute decisions must also be addressed, or they will address themselves, much like the colors used on the map. Communication is key, both within the project, and external to the development of the project. Every project has stakeholders who are focused on their agenda. The more you know about their agenda, the higher the probability you can successfully help them meet their objectives.

5 A Day Adventures has been reviewed by the stakeholders as highly successful. Chapter 3 will discuss the project evaluation and observations which led them to their conclusions.

Chapter 3

PROJECT EVALUATION AND OBSERVATIONS

"While this dissertation is a descriptive and not an evaluative study, it would be unfortunate to discuss the development of the project without also providing the reader with information on "the rest of the story " (Chapter 1, pg. 5).

Thus far, this document has focused on models of instruction and motivation, relating this material to the design decisions, development strategies, and activities involved in the management and development of an educational multimedia project. This chapter focuses on data collected from January 1993 to March 1996 [1]. This data is both rich and thick in its descriptions and details concerning the use and impact of this application in classrooms. While it was not the goal of this dissertation to research the impact of *5 A Day Adventures*, it is valuable to report on the evaluation activities which have produced significant sets of data. When this data is considered in combination, it substantiates some of the design decisions previously discussed in this document.

Evaluation

"Evaluation can be defined as a disciplined inquiry to determine the worth of things. . . . evaluation need not generate new knowledge. . . . evaluation is used to make decisions or form a basis for making decisions. . . . evaluation is a judgment of worth. Evaluations result in value judgments" (Kifer, 1991, p. 354).

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[1] The data for this chapter was collected by the Dole Food Company, Inc. and is used with their permission.

Do children have a positive feeling about interacting with the *5 A Day Adventures*? Are students motivated to attend to the message? Have children begun to value, or internalize a belief concerning healthy food choices? Are the goals and objectives of the program being met? Do children consume more fruits and vegetables?

In this chapter six evaluation activities are summarized and adoption data is discussed. These activities include: evaluation data from beta test participants, results from a Hawaiian Department of Public Health assessment, 255 E-mail communications, 150 letters, teacher surveys, and the Consumer Union's Evaluation Report. In addition we will look at the adoption statistics and discuss trends.

Knowledge Gain Assessments

Independent Evaluation

From the onset of the project, two stages of development were planned. The disc was developed in the first year and a three month beta test was conducted in five cities, including: Atlanta, Dallas, New York City, San Francisco, and Minneapolis - St. Paul. The PR firm contracted with an independent evaluator to develop the evaluation materials. Following the test period the design of the disc was reevaluated, changes were implemented and version 1.0 was released to the schools in the Spring of 1994.

Throughout the development period, identification of schools and teachers who would participate in the beta testing was ongoing. Difficulty in identifying teachers to participate in the study was attributed to two conditions. First, most teachers did not have possession or control of a computer with a CD-ROM player. Secondly, both teachers and school personnel were skeptical of the validity of the content and the message until the final product was shown. Thus, during the development of the application, identification of schools and teachers who would participate in the study was delayed in some states until the final beta version was almost complete.

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Each beta-tester agreed to three activities. They agreed to: 1) use the disc for at least five hours with their class; 2) conduct pre- and post-tests to assess knowledge gain, and 3) answer a survey concerning the use of the disc, including suggestions for improvement.

One hundred nineteen teachers received the beta disc, and 48 teachers, or 40%, returned all the evaluation materials. Of the 119 teachers receiving the disc, 61% received only one disc, 29% received between two and five discs, 4% received 6 to 20 discs and only 3% received greater than 20 discs. When teachers were prompted to return their evaluation materials, 20% of the teachers reported that they had not had time to share the single CD-ROM player with enough members of the class to properly evaluate the material.

The 48 teachers who returned all evaluation materials represented responses from 1048 students. Pre- and post-tests, designed by an independent agency, were used. The tests contained 23 questions: three demographic questions, two behavior questions, and eighteen knowledge questions (Appendix H). All post-test questions showed a positive knowledge gain, with the exception of one. The question which showed a negative correlation tested knowledge not taught in the program. While the particular question should not have been included in the pre- and post-test questionnaire, the negative response on this one question actually reinforces the validity of the other 17 knowledge questions on the survey. Of particular interest to the client was that students demonstrated an increased awareness that 5 servings of fruits and vegetables should be eaten daily, and to further reinforce this message they also reported discussing this goal with their families.

All teachers administered the pretest before they had possession of the discs. Post-tests were sent to teachers at the end of the twelve week period. While the pre- and post-test data indicated knowledge gain across all questions, one-fifth of the teachers objected to the length of time between the pre- and post-test, stating that they felt their students would have had improved scores if the test had been administered in a time frame closer to the end of

the module. While some teachers objected to this time delay in testing, it could be argued that the delayed tests actually indicated a truer picture of long-term knowledge gain.

From the teacher survey data, it was apparent that the situations in which the students used the disc varied greatly. Their comments raised awareness of issues that some teachers perceived as barriers to the implementation of the disc into their curriculums. Individual situations and comments are noted here because they provided direction in determining how subsequent versions of the disc would help teachers with technical questions and direct them to the supporting materials.

General Reaction

One hundred percent of the teachers responding to the survey reported that their students enjoyed the application. When asked to describe how students reacted to the program, teachers used the words; "enthusiastic, loved it, very favorable with students, and engaging."

Usage

In response to how often and where students used the disc: 42% of the teachers reported having access to the disc only one day a week for a 45 minute period; 20% had access for two days a week, and 40% had access for three or more days a week. When asked to report on individual usage or group usage: 70% of the teachers reported that students used the disc in groups of two or more, and 30% reported that students were allowed to use the program individually. Eleven percent of the teachers reported that they used the computer to demonstrate the program to the students because they only had one computer for a brief amount of time.

<u>Where</u>

In response to where they used the program: 34% reported using it in the classroom; 43% reported using it only in the media room; and 20% reported having access to the program in both locations.

<u>Teacher Observations</u>

Thirty-five percent of the teachers reported that they felt the program had an influence on students' eating behavior, and 33% reported that they felt the program had an effect on their own eating behavior.

Ninety-seven percent of the teachers reported that the disc was easy for their students to use and 83% of the teachers reported no technical difficulties. The 17% who reported difficulties, cited problems with transition speed, playing the movies, the audio, or the screen size (referring to 12 inch monitors). While the program would run on a computer with a 12 inch monitor, the graphics were cut off in the lower right corner. Some computers did not have audio cards, and others had insufficient memory. It was apparent that many teachers, who volunteered for the test, were not avid computer users. One of the teachers reported that *5 A Day Adventures* was the first CD that their school had with sound and movies.

Each CD-ROM case contained an eight page booklet which provided teachers with an overview and directions on how to run the program. In addition, it discussed the supporting material and told teachers how to access it. Five teachers reported that their disc did not come with any booklets, failing to recognize the material in the jewel case as a removable booklet. Three teachers specifically requested that the support material and lesson plans be sent in printed form, rather than on the disc. One teacher commented, "I know the disc manuals are probably the future, but I am not ready for it yet. Please send a 'bound' hard copy manual." (Survey data, January, 1994). Another teacher suggested that if the program were distributed on floppies that more of her children could access it.

Two teachers objected because they did not know the best path through the material. They felt that teachers should be told in what order modules should be taught. One teacher observed that students should not be allowed to return to a challenge section repeatedly. She expressed the idea that students should be given one chance to demonstrate their knowledge. And finally, another teacher suggested that the challenges should be harder and they should be called "test." She even suggested that it would be an improvement if the material came with printed tests for the teachers to duplicate.

While some of the ideas for improvement were in direct opposition to the design of the program, other teachers noted the flexibility of the material and the exploratory nature of the design as positives. Ninety-seven percent of the teachers reported that they would recommend the disc to other teachers and the same number felt they would use it again in the future.

<div align="center">Additional Evaluation</div>

The teacher surveys remind us of the many barriers to the successful implementation of technology based applications in the classroom. While the application was the same for all teachers, significant individual differences were noted in implementation and impact of the program. Teachers' access to and knowledge of the technology was a major factor. Teachers who had computers in their rooms reported using the disc more often and also reported using the supporting materials. Teachers who left students in the media center had very little knowledge of the application or the cross curriculum activities provided on the disc. Additionally, as reported above, distinctions can be noted in the beliefs teachers hold in regard to control in the classroom and their role in directing involvement with the instructional materials.

While the exploratory nature of the program was not redesigned to meet the needs of these teachers, additional materials were written to better express the philosophy of the disc. More detailed descriptions for each of the six main program areas were provided, and

additional ideas on how to utilize the material in both a structured and an unstructured environment were included.

Hawaiian Public Health Department Evaluation

In an effort to evaluate and measure changes in knowledge and behavior concerning fruit and vegetable consumption, after using *5 A Day Adventures*, the Nutrition Branch of the Hawaii State Department of Health conducted a study of seven elementary school classes from three elementary schools on the Island of Oahu. The pre- and post-test instrument used in the Hawaiian evaluation was the same instrument used in the Beta test of *5 A Day Adventures* during the fourth quarter of 1993. One hundred eighty students were involved in the evaluation. The evaluation was conducted in the first quarter of 1995.

"The Yates corrected chi-square of 1.0 or greater was the measure chosen to represent a significant difference in knowledge or behavior between aggregate pre- and post-test results for each of the twenty knowledge and behavior questions. The results of the analysis showed that students demonstrated a significant increase in knowledge on thirteen of the eighteen knowledge questions. In addition, a significant change in behavior was demonstrated on one of the two behavior questions" (HSDH, 1995).

The results of the Hawaiian evaluation and the Beta Test evaluation very closely parallel one another. Questions which showed significant knowledge gain in one evaluative study showed significance in both. In some cases, the pretest scores were higher in the Hawaiian evaluation. This is understandable since the 5 A Day message was more visible in 1995 than in 1993. Thus, one might expect that more students in 1995 would know the 5 A Day guideline or recognize the 5 A Day logo. In addition, the single question which had a negative correlation in the beta test also had a negative correlation in the Hawaiian evaluation. The question tested a concept for measuring one serving of fruit juice, which is not taught in the program.

If these two evaluative studies are considered together, they provide additional insights into the effectiveness of the program to increase knowledge gain. The consistency of the results across the studies done almost two years apart also adds additional validity to the results.

Ongoing Communications with Users

The important aspect of this section is to note that it is always valuable to communicate with end-users and to allow them to communicate with developers. While research is often conducted in a controlled environment, unsolicited communication from end-users can provide valuable evaluation data. In general, when someone takes the time to freely communicate ideas or beliefs, it is generally because they feel strongly about an issue. The teachers and students who wrote the letters to Dole reported in this document, have indicated by their actions, that they felt strongly about the program. The students are blatantly honest in their observations and offer many valuable insights into how they view the material, and the instructional strategies utilized to present it.

The comments and insights from these educators concerning *5 A Day Adventures* often represent observations made over an entire school year, or in some cases, multiple school years. Many of the letters students have written reflect their thoughts and involvement with the project over weeks or even months. While it is not intended that this data provide a thorough evaluation of the product, it does provide information which can be used to better understand the effectiveness of the materials.

This section reports on two different sets of unsolicited data from end-users. Discussed first will be a set of 150 postal letters, and discussed second will be the set of 255 E-mail messages.

150 Postal Letters

Students began writing letters to Dole and the characters almost as soon as the disc became visible in the schools. Over 150 letters were received during the first 18 months of

the program's distribution. All letters are read and analyzed to identify feelings, good ideas, and commitments to behavior change. Most letters are sweet thank you notes written as part of a class assignment and would provide a wealth of information to those who study early childhood composition. While they are fun to read, their value should not be dismissed. They provide valuable insights into what the learner is thinking.

Of the 150 letters evaluated, 21 were from teachers or computer coordinators and the remaining 129 were from students. While not all students identified their grade level, of the 81 who did, 60% were from the 3rd grade; 20% were from the 1st grade, and the remainder were from grades K, 2, 4 & 5.

Music was the most often mentioned feature of the program with 63% of the students mentioning a particular song, or the Juke Box in general, as being fun. While every section of the program was mentioned, the Salad Factory was most often mentioned, with 40% of the students identifying the Salad Factory as their favorite activity. The Challenges, in general, were mentioned as a favorite section by 15% of the students. Selected comments from students and teachers are provided in Table 4 and Table 5.

Table 4: Selected Teacher Comments from Postal Letters

Teacher Initials	Date	Comments
W.A.	1993	Not only is the CD itself entertaining and educational, but your documentation is award winning. Obviously you are aware of how little time teachers have to prepare a good lesson because you have done all the work for us. One of our teachers is going to build an entire language unit around the disc.
M.C.	5/9/94	We have learned lots of things. . . . The challenge was difficult but we managed it.
D.G.	5/7/94	It is simply fabulous. The children are thoroughly enjoying all aspects of the program and are able to explore it independently even through they are 5 and 6 years old. They are especially excited about composing, mixing, and analyzing their own salads.
J.R.	5/19/94	They loved this program. . . . We plan to develop a complete teaching unit next year around your disc.
S.S.	5/23/94	The children love the songs and we sing several each morning to start the day.
D.N.	10/4/94	The students at [our] school are thrilled with the program.
D.W.	11/21/94	I use it with my 2nd graders. . . The class adored the characters and the songs. We sang all the songs. . . .
A.D.	12/5/95	I must tell you that it is a tremendous hit with our third, fourth, and fifth graders. They enjoy making salads. . . . they love the songs on the juke box.
L.M.	1995	[ESL Teacher] The students beg for a turn to use the computer and have already begun to show mastery of many of the concepts taught in this software. . . . one of the students reminded another that the Raisin Guy says, 'wash your hands.'
B.F.	1995	On behalf of the other teachers, I want to thank you for helping us to better teach our students.

Table 5: Selected Student Comments from Postal Letters

Student Initials	Date	Comments
T.H.	1993	My favorite part is singing the broccoli song.
D.P.	1993	I like the Adventure Theater best and I like the broccoli song best and the Salad Sisters were good.
A.M.	1993	Broccoli is my favorite vegetable. 5 A Day Adventures is very fun.
C.C.	1993	Bobby Banana, you guys are good. I liked the whole program.
N.H.	1993	5 A Day Adventures has taught me a lot of things about fruits and vegetables.
M.B.	1993	My favorite part is the Adventure Theater and the Challenges.
C.M.	1993	I am glad that you made that disk!
C.C.	1994	We played the disc for over an hour and no one person wanted to leave the lab. Now whenever my teacher has computer time - we all ask her if we are going to use our favorite disc!
A.H.	1994	In the Salad Factory I have learned about how to make healthy salads. Now I know about Fat, Vitamin A, Vitamin C, Fiber.
A.B.	1994	None of us want to leave the computer lab now.
M. H.	1994	I love the music, my favorite song is the Broccoli Song.
T.W.	1994	Dear Carrothead, I am doing good eating my food.
N.	1994	I like it, it is really neat. I want my own.
K. S.	1994	The reason I like the challenges is that they are a fun way to learn.
D.B.	1995	I like everything except the challenges.
K.B.	1995	I think the Jukebox is a good idea because kids like music, and when they listen they learn. I think your program is a good idea.
S.R.	1995	I got my 5 today. I ate raisins, apple, raspberries, an orange, and broccoli. I love eating the 5 A Day Way!
J.N.	1995	I like the program, it is interesting and different. I think it is a little short, could it be made longer?

In summary, the letters indicate an enthusiastic reception of the material by the teachers and the students. It is not surprising that the music is so often mentioned as the most favorite activity. It is readily accessible in the program and offers a wide variety of musical styles to satisfy individual tastes. Also of interest is the fact that students most often mention the Salad Factory and the Challenges as their favorite activities.

255 Electronic Messages

With the release of Version 2.0, E-mail addresses were established and promoted on the discs from the program section, WFIVE. This new feature was made possible by the removal of "Once Upon a Time Land," after students indicated it was too juvenile. Two E-mail addresses are available. One address is for students to write to the characters and the second address is for teachers to ask questions, voice concerns, or share information. Within the program material, students are encouraged to write to the characters in the Land of 5 A Day and share information on "How they did their 5 today." The printed CD-ROM booklet also encourages teachers to send E-mail.

Each month in the Land of 5 A Day a character is chosen as the "character of the month." When students write to this character they receive a prepared response. If the student asks questions concerning nutrition, or otherwise poses questions to the characters concerning life style or activities, they receive an additional response customized to meet their needs. While I am not the "official" correspondent, I review daily all E-mail sent to the characters and on occasion I correspond directly with students. Usually, I simply ask them to "tell me more" or further explain an idea. An example of this was when a student wrote and indicated that he "hated" the music. Because this was such an unusual comment about the music, I wrote back, asking him to, "tell me more." He responded that Bobby Banana's Song had been stuck in his head for days. When I asked him what he thought about the other nine songs included on the disc, he responded by saying that they were "Great - that it was just Bobby's song that had been the problem."

While the postal letters continue to be interesting, they are only one-way communication. The two-way E-mail communication has created new opportunities to converse with learners. Students and teachers are aware that someone will reply to their request for information. Initially, not all teachers who had the disc were aware of the new communication channel, only teachers who had Version. 2.0 knew of its existence. As the information on the E-mail addresses is further promoted to the schools through a quarterly newsletter, the involvement of students with the E-mail account is growing.

From December, 1994 through August, 1995, two hundred fifty-five electronic mail messages were sent to one of the 5 A Day characters at fiveaday@bev.net or to dole.nutrition@bnt.com, the teachers' resource account. While efforts continue in the collection and tabulation of data within messages, an analysis of the original 255 messages was conducted. Figure 72 shows a breakdown of the 255 messages by respondent type.

Respondents		Number of Respondents
Individual Students	138	
Student Groups	14	
Classes	33	
Individual Teachers	50	
Teacher Groups	1	
Library Media Specialists	16	
Computer Teachers	2	
Science Coordinators	1	
Total	255	
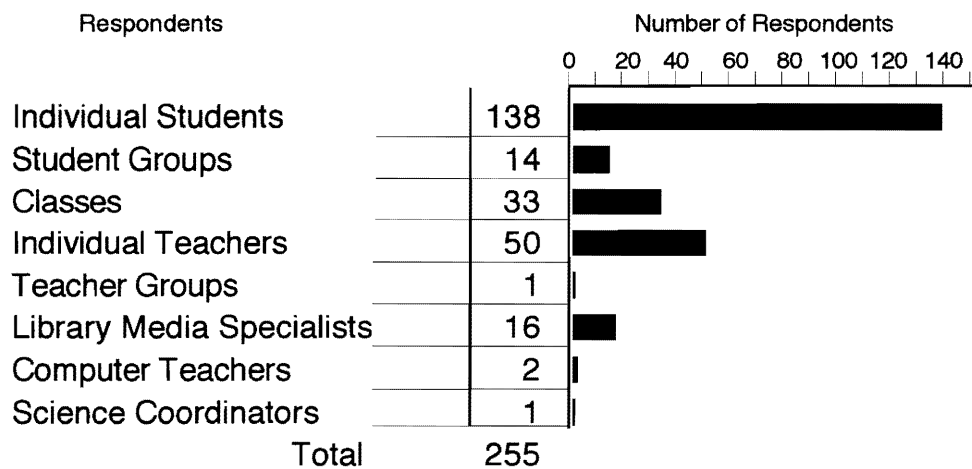
Figure 72: Number of Respondents by groups sending E-mail messages to Dole during the period September, 1994 - September, 1995.

Each message in the set was analyzed to: identify who it represented (an individual, a group of students, a class, a classroom teacher, or a specialist teacher); what specific program sections, characters, or songs were mentioned; specific praises, concerns, or problems; references to changes in behaviors; request for information; and creative ideas to share. Figure 73 shows the breakdown of messages by main program sections identified as significant for the user. Figure 74 identifies the message by type, noting the main focus or purpose of the message. Also noted was the positive or negative aspect of each message. While the overwhelming majority of all comments were positive, seven or 2.7% of the comments identified problems, suggestions or concerns. Table 6 summarizes these comments and presents them for review.

Program Sections Mentioned		Number of Times Mentioned
		0 10 20 30 40 50 60
Main Menu	3	
Adventure Theater	3	
Challenges	11	
H.B.'s Body Shop	0	
Juke Box	55	
Kitchen/Recipies	2	
Land of 5 A Day	9	
Salad Factory	30	
Total	113	
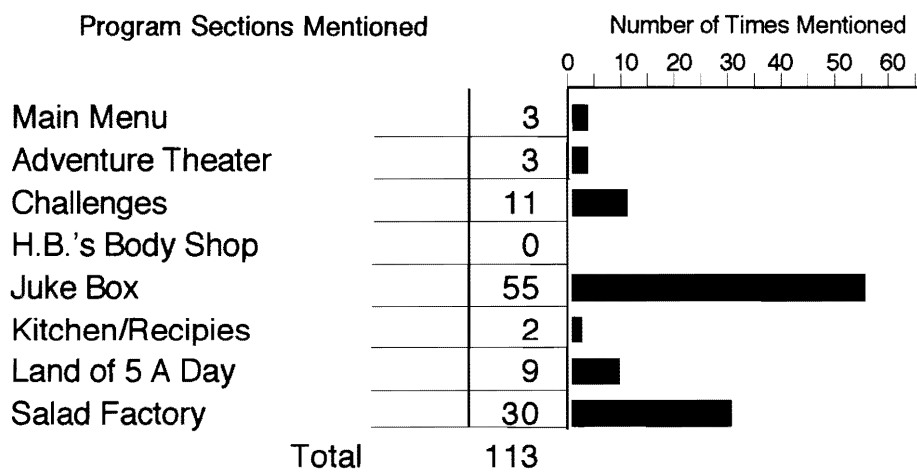
Figure 73: Program sections and the number of times they were mentioned in 255 E-mail messages sent to Dole during the period September 1994 - September 1995.

Types of Comments		Number of Respondents
Praise or Thanks	103	
Creative Ideas	23	
Noted Change in Behavior	30	
IdentifiedComputer Problems	7	
Request for Food/Nutrition Info	12	
Listed Key Phrases	41	
Want to Save Tokens	3	
Miscellaneous	6	

Total   225
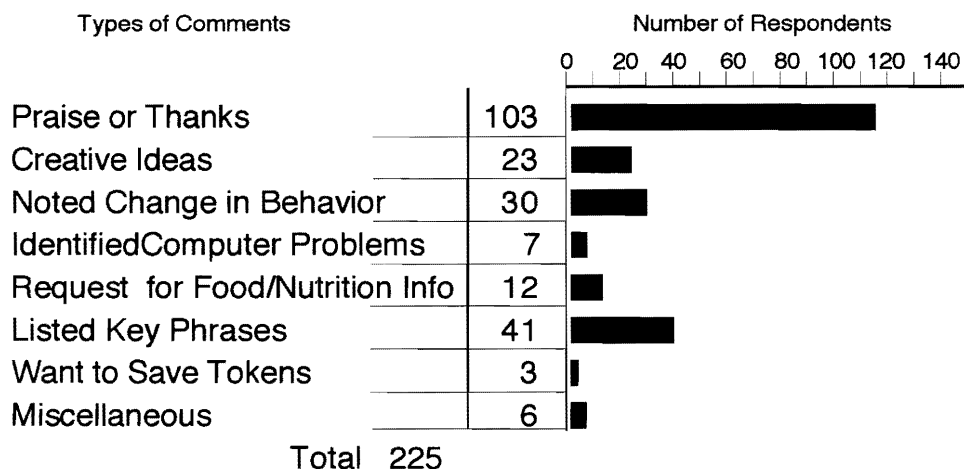
Figure 74: Types of comments received in 255 E-mail messages sent to Dole during the period September 1994 - September 1995.

Following is the summary of this analysis, which highlights reference to specific communications. As shown in Figure 72, the majority of messages were sent by individual students to the characters. When they discussed favorite sections of the program, as shown in Figure 73, the sections most often mentioned were the same sections identified as being popular from postal mail. The music in the program is very popular with students and teachers. The Salad Factory and the Challenges are the two aspects of the program most often cited as favorites by students.

Table 6: Selected Comments from E-mail: Concerns, Problems

Initials	Date	Comments
B.K.	April 1995	We have had a few problems with our CD and sound. We may need another one. Periodically we get no sound. . . . we fool with buttons.
D. U.	April 1995	We cannot get a total image on our Mac LC II
A.A.	April 1995	It was disappointing for me to get a free CD and find that it doesn't play on my 12" monitor. What a shame. . . . the menu bar should have been placed for people like me.
B.	April 1995	I love your program but several of our elementary schools only have old LCs and the CD doesn't show up right.
L.R.	April 1995	I really like the cauliflower girl, but I didn't like the part when the banana talked.
J.G.	April 1995	We have been using 5 A Day for over a year. It is well designed to keep students' interest. However, we have problems with running it on the network. It seems to lock up our computers. Can you help?
B.J.	June 1995	I really like the disk. My favorite thing is the challenges, but my mom and my sister drive me crazy singing Bobby Banana's song.

When the number of complaints are considered as a set, it is notable that the set is almost insignificant. Throughout the project, as reported through all means of communication, the problems or concerns associated with *5 A Day Adventures* have been related to the delivery hardware. Windows based machines most often had problems with sound cards, graphic cards, and printers. Macintoshes have reported problems with 12" monitors, not enough RAM, and running the application on networked machines.

Self-Reported Behavior Change

Thus far, we have evaluated the E-mail to identify popular aspects of the program and investigate problems. While this data is of interest, the most important data may be that which addresses behavior change. It can be shown that the learners sing the songs and

mimic the characters voices and movements. It can be shown that students enjoy the challenge of earning tokens to validate their knowledge. It can be shown that students report using the disc for extended periods of time. However, the most important question is in regard to behavior change. Do students, teachers, or parents report a positive change in behavior in regard to how many fruits and vegetables they consume daily?

In the evaluation of E-mail, 30 references were made in regard to behavior change. Some of the correspondents addressed desired behavior change and others indicated a willingness to change. Table 7 provides a glimpse at some of the selected comments. These comments are important because they were unsolicited. No one prompted the student to disclose what they were feeling in regard to their consumption of fruits and vegetables. At the very least, we can be sure that they are thinking about fruits and vegetables and the 5 A Day guideline.

Table 7: Selected Comments from E-mail: Behavior Change

Initials	Date	Comments
M.B.	Oct 1995	Dear Anthony Apple, You are my favorite fruit. We are working on eating 5 A Day.
A. B.	Sept 1995	Yesterday I ate only 3 servings of fruits and vegetables, I can eat 5 today.
B. H.	Sept 1995	I am in the third grade. I can reach my goal each day if I have my orange juice for breakfast. I am having fruit for snacks.
M.F.	Sept 1995	Dear Bobby Banana, We will eat 5 fruits a day. You are cute and yellow.
C.B.	Aug 1995	My mom is a gym teacher and she tells me it's important to eat healthy. I ask for healthy snacks instead of cookies.
D.Z.	July 1995	For lunch today I had carrots. . . . I still need to eat more fruits and vegetables, but I am trying.
J.C.	May 1995	Dear Bobby, I think all of us like you on the CD ROM.. . . My family has been eating better. And I have liked having good food.
L. A.	May 1995	Dear Bobby, your computer program has helped me eat more fruits. My family has been eating lots of fruits.
A.	May 1995	We had fun and learned. I am eating better and I know I am going to grow stronger.
M.W.	May 1995	Already our kids are excited about fruits and vegetables.
M.T.	May 1995	I think your CD-ROM is a good thing. Because it can teach kids to start eating fruits and stop eating junk food.
M.G.	April 1995	It has been most rewarding to hear from parents that the unit actually helped their children be more conscious of their eating habits and choices.
A.P.	April 1995	Broccoli, you have become one of my favorite vegetables. The school nurse says you are a big help to children who have to make choices in eating healthy.
H.G.	April 1995	Dear 5 A Day Friends, I really like Bobby Banana. I tried asparagus. It's okay.

<u>Teacher Surveys</u>

In the effort to continually learn more about the impact of the program with the students and to learn more about how the teachers are integrating the material into the curriculum, Dole developed a survey for teachers, and included it in its first quarterly newsletter (Appendix I). All teachers who answered the five part survey received cookbooks and charts for their students and a chance to win a 5 A Day party for their class. L.M.'s response was drawn at random from the thirty teachers who responded. The quality of her response and the thoughtfulness of her answers were indicative of the type of responses received.

She wrote, "I have noticed a difference in the attitude the children take towards fruits and vegetables. At snack more children began bringing apples, oranges, and raisins. They have also been willing to try different foods. My students were also excited to go to the grocery story and find the 5 A Day logo on the vegetable bags. I feel students have a better understanding of why fruits and vegetables are important to their growing bodies."

Teachers strongly indicated that the program had influenced the behaviors of their children. Eighty-one percent of the teachers reported that they felt the students were eating more fruits and vegetables.

When asked to identify their favorite section of the program, 33% named the Salad Factory, and 25% named the music. Additionally, music was cited as a favorite for the students and 59% reported incorporating the 5 A Day music into curriculum activities.

<center>Consumer Union's Report</center>

As discussed in Chapter 1, *5 A Day Adventures* was evaluated by Consumer Union in 1995. In an effort to inform the American public about the types of materials being given to public schools by corporate sponsors, Consumer Union obtained 111 programs from the public schools to evaluate. *5 A Day Adventures* was one of eleven programs which received a "no objection finding." It was found to be, "non-commercial, basically

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complete and objective. . . . No corporate or product logos on student handouts, and no Dole brand names are shown in the interactive modules" (p. 50). It received their best review in regard to presenting a complete and objective program in a non-commercial manner for the public education setting.

<div align="center">Distribution of the Discs</div>

Since Spring, 1994, the *5 A Day Adventures* has been distributed, free of charge, to teachers and health professionals. No formal means of advertisement has been used to promote the discs. The initial introduction of the discs, on the Today Show, in December 1993, generated request from 15,000 teachers. Since that time, magazine articles and television appearances have generated additional requests from 21,000 schools, representing a placement into 40% of all elementary schools in the US. On average a school has 3.62 discs. Figure 75 shows the percentage of schools in each state utilizing the disc. Figure 76 shows the average number of discs, per school, in each state. Hawaii, with 100%, has the highest percentage of schools with the disc and Mississippi, with 5%, has the lowest. Nevada has the highest average number of discs per school (7.65) and Montana has the lowest average number of discs per school (1.98).

This data only reflects the placement of the 5 A Day discs and cannot be used to generalize technology trends in the public schools. The placement of discs into a public school relies on the initiative of a teacher in the local setting. Teachers must become aware of the disc from professional journals, magazine articles, newsletters, or word of mouth.

Percentage of Schools with the *5 A Day Adventures*

CD-ROM by State (March, 1996)
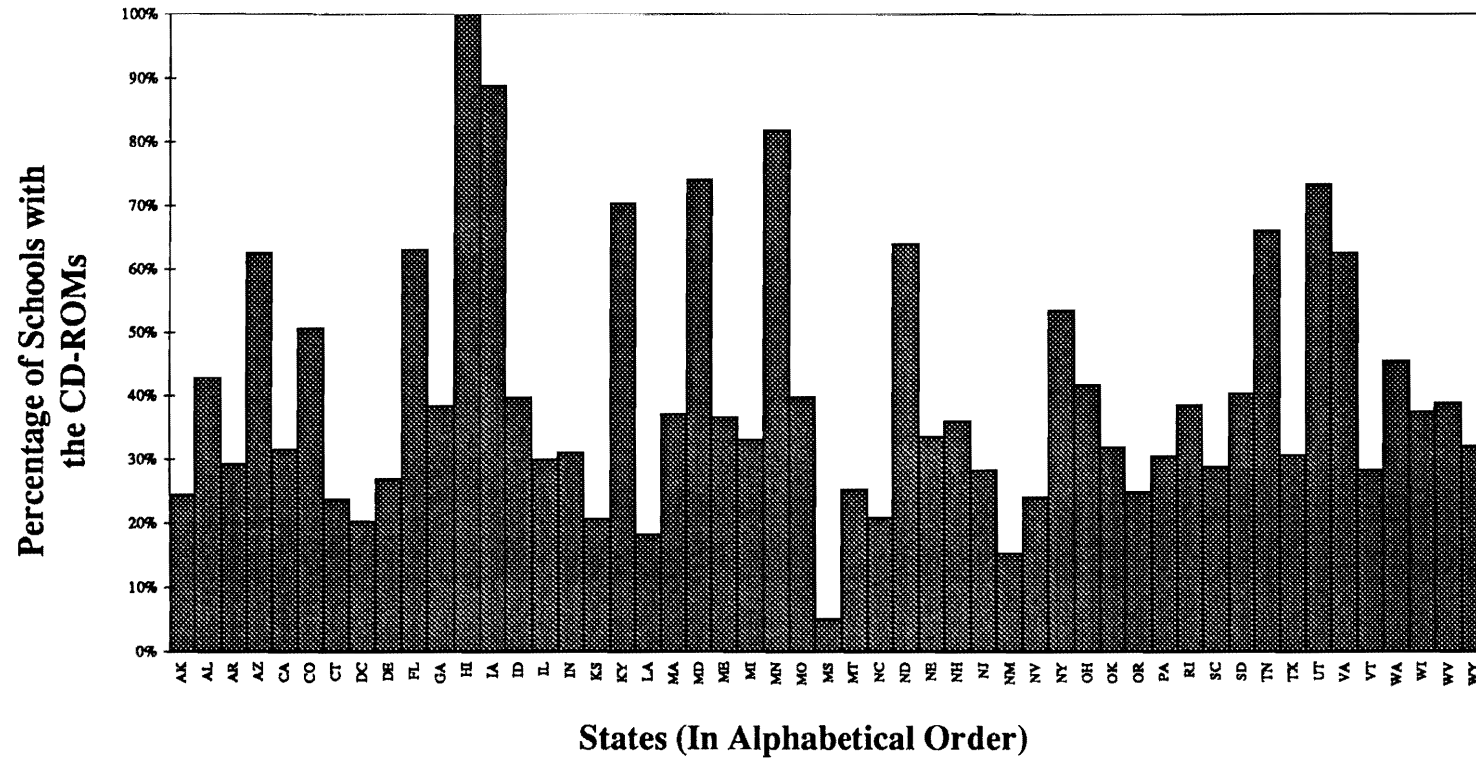
Figure 75. The percentage of schools in each state utilizing the disc.

Average Number of *5 A Day Adventures* CD-ROMs

per School by State (March, 1996)
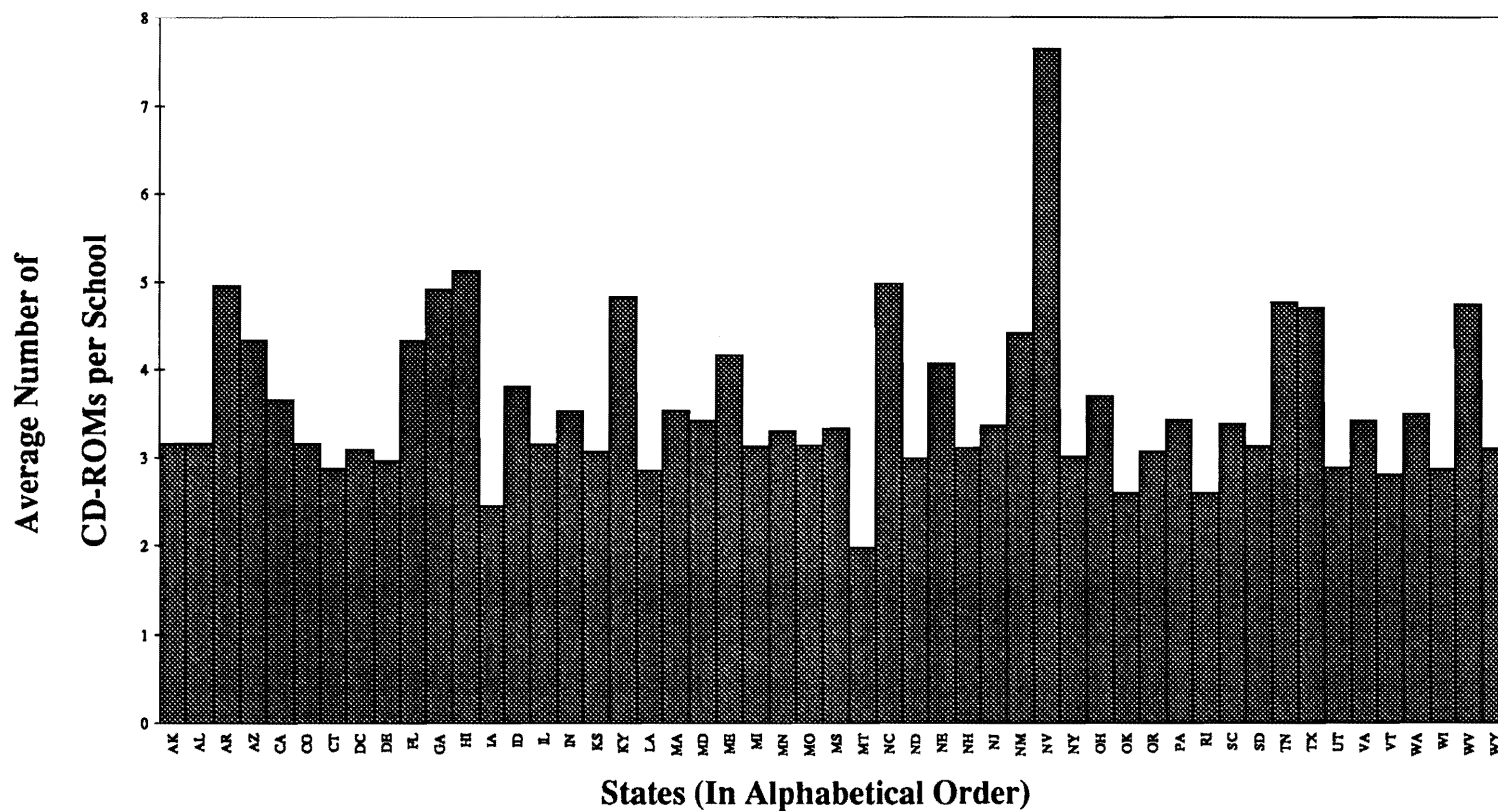
Figure 76. The average number of discs per school by state.

Summary

In this section we have looked at six evaluative studies conducted with the *5 A Day Adventures* CD-ROM. The findings across all studies indicate significant trends in knowledge gain and change in attitudes. Students, teachers, parents, and outside agencies have evaluated the product and found it to be a credible source of information which has an impact on those who use it. Formalized evaluation data from 1200 students attest to the ability of the program to affect knowledge gain. Communications from 400 individuals covering a period of twelve months consistently report the same findings: across all evaluations the music is cited as being significant. The Salad Factory and the Challenges each enjoy recognition from the learner as being highly motivational. While students report favorite sections, the Challenges are located in each of the nine program sections and it is certain that students are engaging all of the activities in the program.

It would be difficult not to recognize that the program is having an impact. Because the goal is to have a long term impact on health and nutrition, it is difficult to know if the program will have any lasting effects on those who use it. However, as the disc is placed more and more into homes, the potential for long term impact is increased.

Chapter 4

CONCLUSION

This dissertation focuses on the development of instructional materials and relates

this development to the research in many of the disciplines associated with the area of

improved learning. Snelbecker (1983) notes that there has always been a gap between

research and practice in the field of instructional development. This dissertation is an

attempt to narrow the gap by providing an opportunity for others to experience "how

concepts were used and processes occur in authentic contexts" (Rowland, et al., 1994).

Instructional Design Models

There are many specialty areas within the field of instructional design. They

include: message design, learning theory, communication research, cognitive psychology,

and visual literacy. The research in these areas has produced hundreds of models, theories,

and principles which can be considered in the development of instruction. This dissertation

references only a few of these models, principles, and theories (e.g., Andrews &

Goodson, 1991; Aspillaga, 1991; Bednar & Levie, 1993; Brandt, 1988; Briggs, 1977;

Briggs, et al., 1991; Collins & Stevens, 1983; Fleming & Levie, 1993; Gagné & Briggs,

1974; Gustafson & Tillman, 1991; Hannafin & Hooper, 1993; Heinich, et al., 1996; Keller

& Burkman, 1993; Krathwohl, et al., 1964; Landa, 1983; Merrill, 1983; Moore & Dwyer,

1994; Reigeluth, 1987; Winn, 1993). A knowledge user, in Snelbecker's (1983) terms,

can be overwhelmed by the seemingly endless flow of models to consider. Their decisions

are made even more complicated by the fact that "most models which have been developed

are viewed as being valid only for vocational education" (Andrews & Goodson, 1991, p.

133).

In authentic contexts, (Rowland, et al., 1994), models of instructional design are

not well matched to a "creative view which sees design as an imaginative, iterative process

whose defining element is an imaginative leap to a new possibility" (p. 5). Rather,

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designers often feel more comfortable following principles and theories (Fleming & Levie, 1993; Moore & Dwyer, 1994) which direct their development with succinct rules.

Applied Design Principles

The development process of *5 A Day Adventures* is disclosed throughout Chapter 2. While the development process was a creative process as discussed by Rowland, et al., (1994), it was nonetheless, guided by principles and practices from the research. The discussion in Chapter 3 provides evidence of the overwhelming acceptance of this program. Whether or not we believe the program has an ability to achieve its long term goal of affecting behavior change, the widespread distribution of the program and the interest it has received from students, parents, and educators must be noted as significant.

Various aspects within the design have contributed to the acceptance of this application. It is possible that particulars of the instructional design can be generalized.

Before generalizing design treatments, however, it is important to review the specific requirements of this project that differentiate it from the development of standard curriculum materials. As stated in Chapter 1, the goals of the project were based in the affective domain. The project was more about valuing than knowing. Also, the project was not defined to be an integral part of a required curriculum. It had to express its own self-worth to those who might encounter it serendipitously. Additionally, it is important to acknowledge that the content for the program (nutrition) did not represent one of the students' favorite subject areas. While this situation is not unique to nutrition, whenever the content is unpopular or determined to be difficult by the students, the designers should acknowledge this situation and recognize it as a potential barrier to success. Keller (1983) reminds us that there are few conditions more difficult to deal with than the condition of learned helplessness. When a learner is convinced that they cannot learn the material, they probably can't. Additionally, if they are convinced that they "hate" the material, the designer must focus on ways to dispel the myth.

Gagné & Briggs' (1979) nine events of instruction provide guidelines in development. Their first event, gaining attention, is also noted as the first category of Keller's ARCS model (Keller & Kopp, 1987), and the first requirement in addressing Bloom's Taxonomy of Affective Objectives (1964). Keller and Burkeman (1987) additionally, identify six motivational principles to help the designer address this critical aspect of instruction.

Keller (1983) reminds us that attention is a function of curiosity and arousal. There are many possibilities for arousing curiosity in a lesson. It is important to first grab the attention (perceptual arousal) which is usually an easy task. The more difficult task, sustaining the curiosity (inquiry arousal), requires a creative approach.

Through self-reported observations by teachers and students, we can confidently conclude that *5 A Day Adventures* has the ability to address the perceptual arousal necessary for Gagné's first event of instruction, and to sustain curiosity, as demonstrated by inquiry. Because it has been demonstrated that students display a high degree of willingness to interact with the program, it can be inferred that *5 A Day Adventures* has a high motivational value for the students. Motivation appears to be the single most critical factor in the success of the project.

Keller (1983) asserts that motivation refers to what a person will do, rather than to what a person can do. This is of critical importance in a project which addresses the affective domain, an area where we want to encourage emotions. In the past, many educators have assumed that affective behaviors are a by-product of cognitive objectives. Krathwohl, et al., (1964) observed that this effect is not necessarily true. Knowledge and understanding do not guarantee proper response, satisfaction, enjoyment, or the internalization of a value.

There is some evidence that learners are attending and responding to messages of nutrition and health. There is additional evidence that some learners are valuing the

message. These three behaviors are, by Karthwohl, et al.'s (1964) classification, hierarchical. That is to say, one must attend to the message before responding, and one must demonstrate a willingness to respond to the message before confirming the acceptance of a value.

What are the design factors which have contributed to the motivation of *5 A Day Adventures*? What has enabled a program about vitamins and fiber to sustain the attention of children to the extent that they will express a desire and willingness to change behavior?

Music

First and foremost, we must consider the music. Throughout all evaluative efforts the students, the teachers, and the parents reported that they value the music. No other media has the ability to elicit a response simply by its presence. Rosenfield (1985), observes, "We respond to music by a complex mix of psychological and physiological reactions triggered by numerous aspects of the music itself" (p. 48). Burmeister's comments are more simply stated, "In the plainest language possible, we like music because it makes us feel good" (p. 218).

As Ward (1976) advises, it is important to recognize that the sensitivity to music exists regardless of intellectual or cultural limitations. Students respond to the structural aspects of music such as rhythm, harmony, and melody. It has been observed, in formative evaluation, that students sing along with the 5 A Day Tunes the first time they experience them. Educators report music helps students organize their thoughts and expressions. Summer (1985), explains, "In silence, one must rely on one's own capacity to stay organized and focused, but music can transform haphazard, chaotic and non-purposive expression into meaningful and organized expression" (p. 84).

In the program, the music was designed to entertain, however, it was also designed to instruct. Each song specifically addresses stated objectives of the program. Many of them were developed in accordance with Gagné's events of instruction: they gain the

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attention of the learner, they inform the learner of the objective, they often stimulate recall of prerequisite knowledge, they present the stimulus material, and they elicit the performance (Gagné & Briggs, 1979).

The songs are also used as mnemonic devices to help students remember information. This strategy addressed the program's objectives to teach sources of vitamins and proper spelling of vegetables. Brigham and Scruggs (1991) report research findings that validate the fact that music does seem to be memorable. Gingold and Abravanel (1987) additionally report that using music to help children rehearse seems to be beneficial in some areas, including immediate recall of paired associates, spellings of words, recall of story events, and recall of verbatim text. This technique imposes organization on the rehearsal of information and can be very effective with students who lack organizational skills.

Many of the motivational principles presented by Keller and Burkman (1993) are additionally addressed by the music. The songs use humor, unexpected lyrics, role modeling, and they are extremely enthusiastic. It would appear that motivational instruction set to music is additionally motivational.

<center>Relevance</center>

Keller's ARCS model (1987) proposes that relevance is the second category of motivation. Designers increase the relevance of the material when they make the message personal. Within the program the message is delivered to the learner in a very personal tone. The characters believe that they, themselves, are real, and they relate to the learner as if they believe the learner is also real. To increase the relevance of the material, it is important for designs to address the learner on a personal level. Relevance of the material is additionally supported with role modeling (Bednar & Levie, 1993). Throughout the program, the characters serve as role models. Additionally, in the Cook's Kitchen, children serve as role models.

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Confidence and Satisfaction

Designing an environment which promotes confidence for the learner is an environment which also promotes satisfaction (Keller & Burkman, 1993). Gagné and Briggs (1979) address these same principles in their events of instruction. Informing the learner of the objectives, and providing guidance and feedback are instructional events which work in unison to increase the confidence of the learner. These strategies were utilized throughout the design of the instruction for 5 A Day.

The benefits of developing confidence and satisfaction with the learner are associated with the increased willingness for them to attend to the message. Krathwohl, et al., (1964) report that when a learner feels satisfaction in responding, they are more likely to continue in the activity. Satisfaction is necessary before valuing.

The Challenge Sections

Keller and Burkman's general motivational principle 3.1 (1993) suggests that the challenge level needs to have an appropriate expectancy for success in order to be a motivational feature. The Challenges are highly motivational. While some students suggest that they should be harder, most students simply report how much they enjoy them.

There are no penalties in the Challenge sections, only rewards. They were designed not to intimidate students, but rather to foster their involvement with the material. The most surprising aspect of the Challenges is their broad appeal. Students in all grade levels (K - 5) report liking the Challenges.

One of the reasons for their success is associated with the motivation design principle 3.2 (Keller & Burkman, 1993). This principle reminds us that the learner always needs to know what it will take to reach their goal. Gagné and Briggs (1979) additionally identify this motivational principle as one of the necessary conditions for learning.

Learners need to be informed of what is expected of them. Additionally, when they are informed, they are motivated by the information.

The strategy to provide information to the learner is applied throughout the program, and can most be noted in an evaluation of the audio scripts. Most directly, this principle is applied in the Challenge sections, where students are in pursuit of obtaining the goal of becoming a "5 A Day Kid." When students enter a Challenge section, they are immediately informed about the number of tokens needed to become certified. Each time tokens are recorded, the student is reminded of the remaining number to be earned. In addition, from any screen in the program, a student can request to see their token summary. This "game board" type display reminds students how many more slots need to be filled, in order to reach their goal.

<div align="center">The Salad Factory</div>

The Salad Factory is reported by the students to be one of the most popular sections of the program. Chapter 2 discusses the organization of the interface and treatment of the material. Students report most often enjoying the factory because they can create a different salad each time they interact with the program. They report that they enjoy being "in control."

Keller and Burkman's principle 3.4 and 3.4a (1993) address the motivational impact of allowing the learner to be "in control." The learner needs to be in control and they need to feel "in control." In the 5 A Day program, students are asked to study "nutrition." They give the program their attention, knowing that at any moment, they can "escape" if it becomes too painful, because they are in control.

Karthwohl, et al. (1964), identify a "willingness to respond" as one of the behaviors in the affective domain which impacts the formulation of values. Whenever control can be given to the learner, we are providing an opportunity for the learner to

express their willingness to receive and we increase the chance that the learner will progress in the hierarchy to a "willingness to respond."

By revisiting the models, principles and guidelines used in the development of *5 A Day Adventures*, it has been shown that instruction can be designed in such a fashion that it has an innate ability to motivate the learner. May this discussion remind designers that it is not necessary to rely on chance to develop designs which are motivational.

Some Design Fundamentals

Many years before the start of the *5 A Day Adventures* project I began to keep a list of design fundamentals that I felt strongly about. I would share this list with the new members on the project team so that they would understand some of my underlying beliefs. In general, these fundamentals were based on my intuition, experience, or research, as reported in the literature. On occasion, I would find research which validated a design intuition. The development of the list was not a focus of my work, but rather it was a by-product of my work.

I would be the first to admit that the list is not a set of laws, it was developed to be a set of guidelines, intended to help my employees keep main points in focus. However, the list did provide another benefit: it allowed me to more closely evaluate my personal attitudes in regard to design. I began to realize that above all else, I believe that a program should be respectful of the user. The design should make it easy for the learner to navigate through the environment, locate needed information, and interact with the lessons (unless it is purposely designed to do otherwise). The presentation of material should be focused, and the program should help the learner set clear expectations about what will take place and what they [the learner] are expected to do.

The concept, of putting the needs of the end-user first, is a concept that I feel strongly about. The casual development of the list helped me define my beliefs when I was a beginning designer.

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Following is a partial listing of design points which were implemented in the development of *5 A Day Adventures*. I have cited an example of how each one was used in the program. Perhaps they will give you some ideas to begin your own list or challenge you to think differently about your next project.

1) The program is always interruptible. The learner is never required to listen to, view, or read information they have not chosen, or do not wish to attend to. The learner is always in control.

    In 5 A Day, the learner sets their own pace and their own path in moving through the material. They are in control. In Chapter 1 and in Chapter 2 the motivational factor associated with learner control has been cited.

2) Navigation controls are consistently presented and always available.

    As discussed in Chapter 2, 5 A Day uses a status bar throughout the program to provide the learner with a consistent location for control icons.

3) The learner must indicate when they are ready to be moved to a new setting or screen.

    For example: The Challenge audio says, "Click on Next Question when you are ready." Moving a learner from "one" location to "another," in most cases, should require the consent of the learner. This type of design has been implemented throughout the program.

4) The learner is never required to "back-track" to get out of one presentation to move to another.

    Learners can directly access the main menu from a lesson in the Land of 5 A Day even though they had to go through a sub-menu. The status bar provides a constant path to each sub-menu.

5)   If a button or other selectable area is visible on the screen, then it can be selected. This is a requirement for the programmers. Objects can be selected as soon as they can be seen. Selectable objects which are not available must be frosted until they become available for the learner.

6)   Areas which are selectable are identifiable, by color, shape, edges, placement, change of cursor etc. A conscience effort is made to identify, for the learner, areas which are selectable.

     In 5 A Day a custom cursor is used to show students active areas of the program.

7)   The <u>Introductions</u> to the program, a section, or a lesson, are always scripted in such a manner that they will help the learner set clear expectations about what they will learn and what they will be expected to do.

     Examples of opening scripts are included in Chapter 2. Each opening script was designed to meet these two objectives.

8)   All interactions from the learner are acknowledged. They are confirmed by graphic change, audio response, or both.

     All clicks in 5 A Day are confirmed with color, sound, or an action.

9)   The "status bar," or other information area, is used to inform the learner their location in the program.

     In *5 A Day Adventures*, the title of each section is displayed on the Status Bar.

10)   No vertical lettering is allowed to be used, unless it is used to mimic a real life situation.

     There are no examples of this, because no vertical lettering is allowed. Vertical lettering is very difficult to read. Often artist and designers want to use it, to save space. It is almost always a poor choice when a designer uses vertical lettering. Just try to read it.

11) Menus are designed to provide visual cues as to the type of information they contain. An example of this can be found on Banana Boulevard. Each store provides a slight hint as to its purpose, without disclosing the associated nutrition related activity.

12) The image must convey a clarity and strength of message, independent of text or audio.

The Land of 5 A Day looks like a good place for an Adventure, even before anyone "says so."

13) If text and audio are used in a presentation simultaneously, they do not mimic one another. Either the text carries the message and the audio highlights main points; or the audio carries the message and the text provides a summary of the spoken word.

The Adventure Theater is a good example of this. The character always provides a summary statement, and the white board or the map provides the more detailed information.

14) When possible, graphic images (icons) are designed to suggest real-world analogs (e.g., doorbells, traffic lights) to increase clarity of message.

On the status bar, the print icon looks like a printer, and the music icon looks like a note. While these icons were designed to present clarity of message, the challenge icon (a maze) was designed to present a vague message. The images associated with quizzes or testing were not desired for use as a challenge icon. Rather, the icon was designed purposely to be explored.

15) Screen designs direct the learner's attention.

In the opening of the Land for 5 A Day, the client wanted the learner to visit WFIVE first. As the menu builds, WFIVE is broadcasting and the colorful waves of broadcast can be seen. It has been documented in formative evaluation that students notice the radio station, WFIVE, first.

16) Content is broken into small chunks of information, "bits of truth" that can be woven together as the learner needs them.

In Adventure Theater, each icon provides one little chunk of information for the learner.

17) Color schemes for projects are specified before the project begins.

In *5 A Day Adventures,* the colors of the rainbow were selected to be the primary colors of the program. Teaching students that the colors of the rainbow provided clues to find your vitamin A, is reinforced throughout the program. In addition, the bright colors complimented the colors of the fruits and vegetables.

In summary, this small collection of design fundamentals was included to remind the reader that design is not a casual process. Laying ground rules in place prior to the initiation of design can provide a basis for designs that can work well with both the developer and the learner.

Summary

This dissertation has provided the reader a unique opportunity to look inside the development of an authentic product which has enjoyed wide distribution and acceptance. While focus has been given to the instructional design of the product, an effort has been made to show that the process and the product are interwoven, creating an intricate web which cannot be addressed in a casual manner. Unfortunately, because the intricacies are many, it has been possible to provide the reader with only a small glimpse into the total developmental environment. While the many disciplines associated with the area of improved learning are often investigated separately, this encounter, however brief, should remind the reader of the interrelatedness of these disciplines.

Throughout these pages, this author has focused on many of the details and challenges associated with the design and development of instructional materials. Indeed, this has been the goal. However, it would be a mistake to close this document without acknowledging that involvement in these activities can be very positive and rewarding. Without question, the development of *5 A Day Adventures* and the opportunities to observe the product in use, while documenting the positive impact it has had on children, have been very rewarding experiences. It is my hope that this dissertation has provided food for thought for readers who are interested in pursuing such a career.

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Appendix A

SAMPLE OF AUDIO SCRIPT USED IN *5 A DAY ADVENTURES*

The following document includes excerpts from the actual audio script used in the Salad Factory section of the *5 A Day Adventures*. The file naming convention used in the audio scripts allowed programmers to easily identify not only the section, but the exact location of each of the hundreds of audio files used in the program.

Sally Salad -- Industrious, always completes tasks others start, problem solver.

[NOTE: THE TONE IS A LIGHT, FUN TONE, NOT AN ACADEMIC TONE. SALLY LIKES HER SALAD FACTORY AND SHE WANTS PEOPLE TO HAVE FUN].

Filename	Audio to be recorded
SFClickTheBowl.aud	Click the bowl to continue.
SFWeWillHave.aud	We will have some fun today. Just start by selecting what you like best and the gauges will help you with all of the rest.
SFBrocFlorAdd.aud	Adding 2 broccoli florets.
SFBrocFlorRem.aud	Removing 2 broccoli florets.
SFMixingYourSalad.aud	Mixing Your Salad **[MACHINE LIKE VOICE]**.
SFYouHaveForgotten.aud	You have forgotten to make your salad.
SFYourSaladHiVitA.aud	Your salad is high in vitamin A.
SFYourSaladLoFat.aud	Your salad is low in fat.
SFCongratsSuper.aud	Congratulations, you have made a super salad!
SFThisisGreat2.aud	This is a great salad. I bet you can make a real salad that is just as great.
SFWeHopeEnjoy.aud	We hope you enjoy your salad. Salads are a great way to get your five a day. Thanks for visiting our factory. Come see us again!

Appendix B

OBJECTIVES FOR DOLE "5 A DAY" CD-ROM PROGRAM

The following document is the original list of 27 objectives developed by the Director of Nutrition for Dole. These objectives were sent along with a large box of content material in order to evaluate the objectives and present ideas on how to address each one.

Dole "5 A Day" CD-ROM Program

Goal: To increase consumption of fruits, vegetables and juices to at least 5 servings a day among third grade students.

Educational Objectives: At the conclusion of the Dole "5 A Day" CD-ROM program third grade students will be able to:

1. State the number of servings of fruits/vegetables recommended daily for good health.

2. Explain what the "5 A Day" logo means and why it is important.

3. List/spell the nutrients that fruits/vegetables are high/low in.

4. Indicate the amount of fruits/vegetables that equals one serving; indicate the fraction of large fruits/vegetables that equals one serving.

5. Use a nutrition chart to select fruits/vegetables rich in Vitamin A, Vitamin C, and dietary fiber.

6. Record their daily intake of fruits/vegetables and indicate the number of additional servings they need to eat to achieve five.

7. Use colors to select fruits/vegetables rich in Vitamin A and Vitamin C.

8. Identify the names of specific fruits/vegetables and spell names correctly.

9. State why they like specific fruits/vegetables.

10. State why Vitamin A, Vitamin C, and dietary fiber are important to their health.

11. Demonstrate increased knowledge about the types of plants fruits/vegetables come from and how they are grown.

12. Demonstrate increased knowledge of where (country/state) various fruits/vegetables are grown and why they are grown in these specific geographic areas.

13. Demonstrate increased knowledge about the origins of various fruits/vegetables.

14. Demonstrate increased knowledge about how fresh fruits and vegetables are processed (i.e. frozen, juice, canned, dried) to preserve freshness and nutrients.

15. Use the label reading skills to select 100% unsweetened fruit juice, unsweetened canned and frozen fruit, and no-fat added frozen vegetables.

16. Indicate the sections of the grocery store where fruits/vegetables meeting the "5 A Day" criteria and recommendation are found.

17. Select/indicate at least one nutritional benefit for commonly eaten fruits/vegetables.

18. Indicate the difference between the nutritional benefits of whole fruit and fruit juice.

19. Make a salad using a variety of fruits and vegetables; add fruit/vegetable salad ingredients to calculate the total number of servings the salad contains.

20. Select salad ingredients (a la sandwich interactive video) that will increase the nutrient content of the salad; select salad ingredients that are lowest in fat.

21. Make a behavioral commitment to eat a fruit and/or vegetable rich in Vitamin A, Vitamin C, and dietary fiber every day.

22. Make a behavioral commitment to eat a fruit and/or vegetable as a snack every day.

23. Make a behavioral commitment to drink a glass of 100% fruit juice every morning.

24. Make a behavioral commitment to eat at least one new fruit an/or vegetable every week.

25. Make a behavioral commitment to try at least one of the recipes in the Fun with Fruits and Vegetables Cookbook every week.

26. Make a behavioral commitment to eat at least three vegetables from the cabbage family every week.

27. Make a behavioral commitment to explain the "5 A Day" recommendation to their parents and to encourage their parents and siblings to eat at least 5 fruits/vegetables a day.

Appendix C

GEORGIA FOCUS GROUP SCRIPT

The following document is the script used to conduct focus groups in Georgia during the development of *5 A Day Adventures*.

Interview Schedule: Third Graders

Part I. Introduction

1.   Hi. I'm really glad you are here today. I am _____ and I am here to find out your ideas about eating, especially fruits and vegetables. I also want to know how you think kids like to learn about things, like what they eat. There are no right or wrong answers. There is just what you think and that is what we want to know. I am going to ask questions and you are the experts who will tell me what you think. We want to know what you like and what you don't like. The camera person is going to video tape this so that people who are going to do the teaching, can know what you have to say. There is a TV set up in another room so that some of them can listen. If they think of a question for you that I didn't think of, they'll send a note to me. Otherwise, they will just listen to you... the experts.

Part II. Nutrition

2.   We're going to play the "What if" game now. What if I sent you to the grocery store and told you to put fruits and vegetables in the cart that you like to eat? Would you put anything in the basket? What? (Go around the room and make sure everyone says something.)

3. What if I told you to go to the grocery store and put fruits and vegetables in the cart that you did not like and would not eat? Would there be anything in your cart? What?

   (Take turns.)

4. Why would you eat certain fruits or vegetables? Why wouldn't you eat the ones you named?

   Probe for knowledge and language use about nutrition.

   Probe for likes and dislikes.

   Probe for reasons for likes and dislikes.

   Probe for how they got their information.

5. Can anyone remember the last time you tried a new food? Any Food? What did you try? Why did you try it? Did you like it? Will you keep eating it? Why? Why not?

6. "What if" you wanted to get a friend of yours to try a new food? What would you say?

7. "What if" you were a teacher, how would you teach kids about eating nutritious food?

8. "What if" you were a parent, how would you teach your kids to eat right?

9. Has anyone in here ever learned anything on a computer? What did you learn? Was learning fun with the computer? What made it fun?

10. "What if" you could talk to the people who make programs to tell them how to make programs about learning about eating healthy foods on the computer? What could you tell them that would help them make it fun to learn about?

Part III: Conclusion

Thank you all for your great ideas.

Appendix D

CHARACTER PERSONALITY PROFILES

The following document is the set of personality profiles used for the 36 fruit and vegetable characters in *5 A Day Adventures*.

5 A Day Adventures CD-ROM Program

Fruit and Vegetable Character Profiles

Anthony Apple

Jolly, enthusiastic, a joker, likes to keep things positive, likes to be in the middle of things.

Annie & Arthur Asparagus

Annie is always cautious. Arthur runs head on into things, taking Annie with him. He's very protective of Annie.

Bobby Banana

A California surfer, very cool, uses surfer lingo (dude), loves Ninja Turtles.

Barney Broccoli

Hip-hop type, music enthusiast, info fads, outgoing, always tries to get everyone involved, a leader.

Christopher Cantaloupe

Mischievous, inquisitive, always takes things apart to see how they work.

Calvin Carrot

Competent, both feet on the ground, always knows the right thing to say or do. Good at everything he does, very proud.

Courtney Cauliflower

Little mother, very family oriented. Always taking care of other's problems, endearingly fussy.

Sam Celery

A tag-along, always snacking on something, always has an additional idea for whatever the group is doing, very lovable.

Chester & Chelsea Cherries

Always talking to themselves. Always in the middle of everything, but oblivious to everything except each other. Very affectionate.

Cornelius Corn

Studious, preppy, athletic, proud of his heritage (dates back to the Mayflower - his family fed the pilgrims). Wants to go to Harvard to become a Hybrid corn.

Danny Dates

Life is a game for him, he's always the announcer for whatever is going on. He's very suave.

Gretta Grapefruit

A housekeeper and organizer. Cleans up messes that others make.

Gus Grape

Very sweet, good-natured, always has a kind word for everybody.

Greg & Gary Green Beans

Happy-go-lucky. Go everywhere together. One always finishes the other's sentences.

Lucy Iceberg Lettuce

Little princess, vivid imagination, day dreamer, cool, popular, and polite.

Kevin Kiwi

Laid back, soft spoken, finds solution to any problem after everyone else has argued for hours.

Amber Orange

Show off, know-it-all, always thinks she can do something better and is willing to try.

Peter Peach

An environmentalist, back to nature kind of guy, loves camping, fishing and the outdoors.

Penny Pear

Happy, giggly, always on the brink of danger, but nothing ever happens to her. A bit of a valley girl.

Green Pea Gang

Playful, full of fun, and zest for life. A tightly knit group.

Pepe Pepper

Jovial, peppy, a joker, chuckles a lot - everything is fun and funny.

Pamela Pineapple

Shy, studious, and very sweet. Always thinks before acting.

Kenny Canned Pineapple Juice

Good-spirited, always laughing and goofing around. Never wears a frown.

Paula Plum

Fun-spirited, good-natured and easy-going. Gets along with everybody.

Patrick Potato

A jock, loves baseball, basketball & football. All-American, straight-laced, happy-go-lucky. Very well organized and stable.

Perry Prunes

Always asking questions - why, how, what if, how far - inquisitive.

Randy, Rita, & Rhonda Radishes

Randy is high energy, Rita is sweet and Rhonda is somewhat quiet. All are very happy-go-lucky.

Ray Raisin

Boy Scout type, helps whomever is in need. All around kind of guy.

Rachel, Reuben & Rex Raspberries

Mischievous, create havoc, go out of the way to make things happen that aren't supposed to.

Rita Romaine Lettuce

An aristocrat, follows the latest fashions, concerned about her looks and what's "in."

Stuart Spinach

An adventurer, daredevil, tries things no one else dares to try. Very self confident.

Stan & Sarah Strawberries

They're brother & sister. Stan is older, naive and trusting. Sarah is smarter. He gets in trouble & she gets him out.

Tasha Tangerine

Preoccupied with what's cool. Loves to talk - especially about what and who is the latest thing.

Terry Tomato

Spunky, a dreamer, thinks of ideas to make things better, an idealist.

Juanita Watermelon

Jovial and warm-hearted. Has a strong character and is a team leader.

Appendix E

SONG LYRICS

The following documents are the lyrics to the 5 A Day Top Tunes used in
5 A Day Adventures.

5 A Day

5 a day, eat 5 a day

We all know that's the healthy way

Fruits and vegetables, they're OK!

A healthy way is 5 a day

Spinach, cabbage, and cauliflower

Green pepper, corn and peas

Choose your very own favorite vegetable

Any five you please

5 a day, eat 5 a day

We all know that's the healthy way

Fruits and vegetables, they're OK!

A healthy way is 5 a day

Grapefruits, oranges, and nectarines

Bananas and honeydew

Fruits for a snack or a fun dessert

Will make you happy, too!

5 a day, eat 5 a day

We all know that's the healthy way

Fruits and vegetables, they're OK!

A healthy way is 5 a day

When you go to the grocery store next time

Keep fruits and vegetables on your mind

Fresh or frozen, even canned will do

However they come, they're good for you

When your family sits down to eat

You can have some fun

Play the game of 5 a day

Count them one-by-one

5 a day, eat 5 a day

We all know that's the healthy way

Fruits and vegetables they're OK

The healthy way is 5 a day

Fruits and vegetables they're OK

The healthy way is 5 a day

Vitamin A

Vitamin A, vitamin A, we're gonna sing about vitamin A

It's good for your body in everyway

We're gonna learn about vitamin A

It's good for your hair and it's good for your teeth

It's good for your skin and everything underneath

It's good for you and it's good for me

It's good to know about A you will see

Vitamin A, vitamin A, we're gonna sing about vitamin A

It's good for your body in everyway

We're gonna learn about vitamin A

The color of the food gives the clue away

Look closely at the color to find your A

Yellow squash, carrots and peaches, too

There's a lot of vitamin A there for you

Vitamin A, vitamin A, we're gonna sing about vitamin A

It's good for your body in everyway

We're gonna learn about vitamin A

Look at the color, you'll find the A

Dark green spinach or broccoli is great

The colors of the rainbow are loaded with A

Dark green, yellow/orange can show you the way

It helps your eyes adjust to the light

When you have your A, you have done what is right

Vitamin A, vitamin A, we're gonna sing about vitamin A

It's good for your body in everyway

We're gonna learn about vitamin A

Vitamin A, vitamin A, we're gonna sing about vitamin A

It's good for your body in everyway

We're gonna learn about vitamin A

Vitamin C

Vitamin C, vitamin C, vitamin C, C, C

Oh de oh de oh re me   can we find some vitamin C

Oh de oh de oh re my   we'll list the reasons why

If good strong bones are what we like

And healthy blood is our delight

Being healthy is now in style

And wounds that heal will make you smile

(Spoken) Wounds that heal will make you smile

Whoa!

Oh de oh de oh re me   can we find some vitamin C

Oh de oh de oh re my   we'll list the reasons why

Let's list some fruits that we know well

Like cantaloupe, strawberries, gosh they're swell

Citrus fruits like lemon 'n lime

There's so many for us to find

(Spoken) There's so many for us to find

Whoa!

Oh de oh de oh re me   can we find some vitamin C

Oh de oh de oh re my   we'll list the reasons why

Vitamin C

Vitamin C

Oranges, potatoes, watermelon, too

They gotta lotta C, honest they do

All these foods help us stay strong

I bet you didn't know the list was so long

Vitamin C, vitamin C, vitamin C, C, C

Oh de oh de oh re me   can we find some vitamin C

Oh de oh de oh re my   we'll list the reasons why

Oh de oh de oh re me   can we find some vitamin C

Oh de oh de oh re my   we'll list the reasons why

Vitamin C

Vitamin C, vitamin C, vitamin C, C, C

Fiber

Fiber is in the right direction

Fiber, it helps you get along

Fiber, it helps you with digestion

Fiber's just a little song

It's one of those things we need everyday

It's simple, it's easy, and we like to say

It helps with digestion and that's at the core

We get it from apples, broccoli, and more

Fiber is in the right direction

Fiber, it helps you get along

Fiber, it helps you with digestion

Fiber's just a little song

There's raspberries, apples, bananas, and pears

Don't forget kiwi there's fiber in there

So have some today; you know you should

Five-a-day will have you feeling so good

Fiber is in the right direction

Fiber, it helps you get along

Fiber, it helps you with digestion

Fiber's just a little song

I love my spinach salad

I love my dates

I love my fruits and vegetables

High fiber really rates

Fiber is in the right direction

Fiber, it helps you get along

Fiber, it helps you with digestion

Fiber's just a little song

Fiber is in the right direction

Fiber, it helps you get along

Fiber, it helps you with digestion

Fiber's just a little song

Fiber's just a little song

Fiber's just a little song

Broccoli

Broccoli is my name you hear

And I am here to make it clear

Eat some broccoli just like me

And you will find your Vitamin C

The B is for the bunch you find

R is for a rappin' good time

O comes in for Oh so good

C says, Cool, you know you should

The second C says Cooked up right

O says, Oh yeah, what a delight

L says Love your body and mind

I says Inside you'll feel just fine

That is what I have to say

Just eat your broccoli anyway

Try fresh, frozen, cooked, or raw

It's always good, stalks and all

BROCCOLI

Broccoli is the one to try

BROCCOLI

Broccoli is the one to try

Let me say it again

BROCCOLI (I'm tellin' you)

Broccoli is the one to try (let me say it again, ya)

BROCCOLI (and you know that)

Broccoli is the one to try

I tell you BROCCOLI

Composed for *5 A Day Adventures*

Cauliflower

I'm a flower of a sort and a cabbage of a kind

You can call me cabbage flower and I really don't mind

I'm good for you, provide Vitamin C

I hope you'll get to know and like me

My head is white and my leaves are green

I'm one of the best snacks you ever have seen

I'm good after school or for a meal

I fix up real fast, there's nothing to peel

CAULIFLOWER

I will spell it slowly

Now don't go too far

You start with a C

then you add an A

You next add a U

Then an LI will do

The first part is finished; the last part you know

Just spell out flower and you can head for the show

Cauliflower

Spelling my name is important to me

I want us to be friends; I hope that you'll see

I'm one of the veggies that fit five a day

Just remember my name and you're on your way

Cauliflower

Cauliflower

Cauliflower

Cauliflower

Cauliflower

Cauliflower

Composed for *5 A Day Adventures*

Lyrics and music © 1993 Interactive Design & Development, Inc., Blacksburg, VA 24060-6668

Healthy Buddy

I'm H. B., your Healthy Buddy

I'll tell you what I know

It isn't hard, so listen up

I'll tell you how to grow

Fish is good, chicken, too, and lean meat is a start

5 a day, the healthy way, and low fat for the heart

Lots of grains, vegetables, and fruit everyday

And milk is good for calcium and energy to play

I'm H. B., your Healthy Buddy

I'll tell you what I know

It isn't hard, so listen up

I'll tell you how to grow

For healthy skin and hair and eyes that see the light

Gets lots of fruits and vegetables to feel all right

Your blood will be rich and your bones will be strong

As long as you remember the Healthy Buddy song

I'm H. B., your Healthy Buddy

I'll tell you what I know

It isn't hard, so listen up

I'll tell you how to grow

I'm H. B., your Healthy Buddy

I'll tell you what I know

It isn't hard, so listen up

I'll tell you how to grow

Composed for *5 A Day Adventures*

Lyrics and music © 1993 Interactive Design & Development, Inc., Blacksburg, VA 24060-6668

Salad Sisters

We are glad that you are here

And we have heard from far and near

That you like fruits and vegetables

And they are good for you

We can have some fun today

Just come along and we can play

Make a salad on the way

With fruits and vegetables

Big or small or in between

A large tomato or leafy greens

Any choice you make is keen

So make it right today

We are glad that you are here

And we have heard from far and near

That you like fruits and vegetables

And they are good for you

Just remember when you shop

We Salad Sisters are on the top

We'll help you grow, run, and hop

With fruits and vegetables

We are glad that you are here

And we have heard from far and near

That you like fruits and vegetables

And they are good for you

Eat your fruits and vegetables

'Cause they are good for you!

Composed for *5 A Day Adventures*

Let's Go Bananas

I've gone bananas for bananas!

They are my favorite fruit (echo: favorite fruit).

Let's go bananas for bananas.

They're so appealing.

They're so appealing to me.

Eat'em when you bike. Eat'em when you hike.

Or even eat them whenever you like.

Eat'em on the run. They're loved by everyone.

This food is really good fun.

They're one good source of potassium.

They keep me healthy and strong.

They have plenty of energy.

They help me power skate all day long.

I've gone bananas for bananas!

They are my favorite fruit (echo: favorite fruit).

Let's go bananas for bananas.

They're so appealing.

They're so appealing to me.

They're good I guarantee.

Help me climb a tree.

Help keep me strong as a body can be.

It's a real cool food, wouldn't you conclude?

This is the happening fruit.

They are a part of my 5 A Day plan

And help me skate to the beat.

If you're a body who wants to feel good,

Bananas are a really good treat.

I've gone bananas for bananas!

They are my favorite fruit (echo: favorite fruit)

Let's go bananas for bananas.

They're so appealing.

They're so appealing to me.

Just Try Us!

Why don't you just try us.

That's all we're saying.

Come on and try us for 5 a day.

We'd love you to try us everyday.

Let's eat the super, duper, healthy,

happy, 5 a day way!

We are the fruity dudes.

Now here's the good news.

We're apples, oranges, peaches, cherries.

To make your 5 a day

It's two of us we say.

Try grapes, bananas, kiwis & berries.

It's even cool to eat.

Four fruits a day are neat.

Throw us in a blender

and we'll make a smoothie.

Why don't you just try us.

That's all we're saying.

Come on and try us for 5 a day.

We'd love you to try us everyday.

Let's eat the super, duper, healthy,

happy, 5 a day way!

Yes, we're the fruity dudes.

And we've got more good news.

Check our colors, taste and flavors.

We'll make your lunch complete.

Our taste is juicy sweet.

We're plums, pears, nectarines & raisins.

You'll want us everyday.

Eat two or more we say.

Our flavors will please you,

We're happy to tell'ya.

Why don't you just try us.

That's all we're saying.

Come on and try us for 5 a day.

We'd luv you to try us everyday.

Let's eat the super, duper, healthy,

happy, 5 a day way!

Let's eat the super, duper, healthy,

happy, 5 a day way!

Appendix F

NEWSPAPER ARTICLE

The following document is a newspaper article from the Athens Banner Herald that brought media attention to *5 A Day Adventures*.

ATHENS BANNER/HERALD

Fruitful Learning

Winterville Third-Graders Learn Eating '5-A-Day' Is Fun And Nutritious

By TRUDI F. GREEN
Staff Writer

Given the wide array of fruits and vegetables on the screen, it's not surprising Carol Hall's third-graders snubbed Barney Broccoli and Rita Romaine Lettuce for the more exiting and exotic (and tasty) Amber Orange and Pamela Pineapple.

The students learned Wednesday what the rest of Winterville's third-graders learned Monday and Tuesday: Learning about nutrition can be fun with the help of talking produce and a computer.

Winterville Elementary was the test site for a new nutrition education program from Dole Food Co. The program for third-graders will be pilot-tested at Winterville and five other cities nation-wide in September and be available for all schools in January 1994.

The purpose of the program is to teach students the importance of getting their five servings of fruits and vegetables each day — the guidelines under the U.S. Department of Agriculture Food Guide Pyramid.

Program developer Lorelie DiSogra, director of nutrition and health for Dole, said the Dole cam-
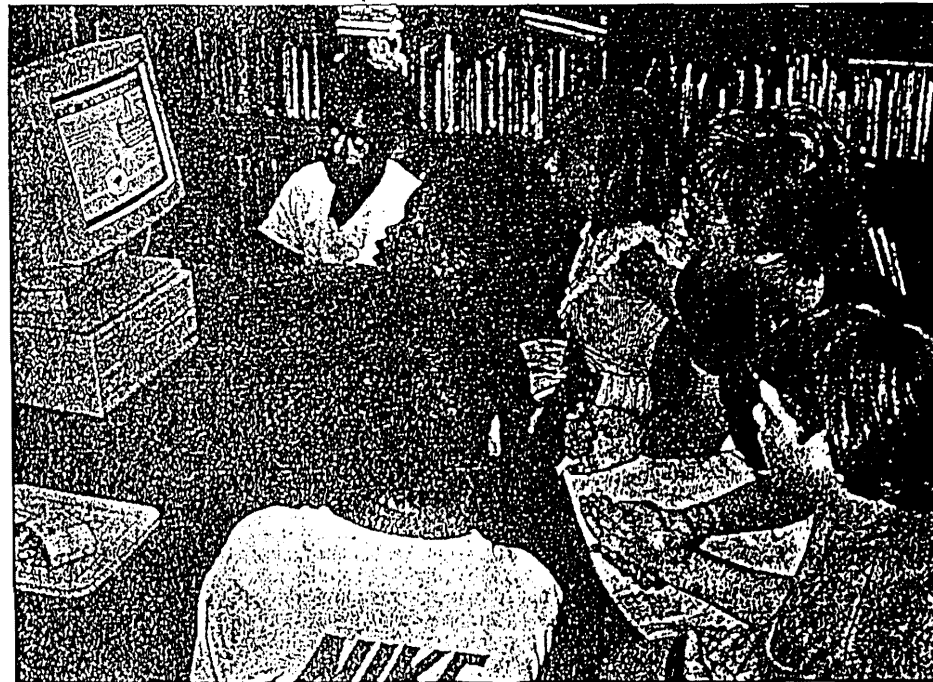
Michelle Biggio/Staff

MARY MILLER TALKS WITH STUDENTS IN CAROL HALL'S THIRD GRADE CLASS
Students (L-R) Lesley Moore, Ricky Byrd, Ashley Bagwell, Heather Casper, Whitney Sapp

Fruit

From page one

paign is part of the national "5-A-Day For Better Health" campaign sponsored by the federal government and the National Cancer Institute.

"We're trying to reach children to encourage them to eat more fruits and vegetables," Ms. DiSogra said.

She said children have turned the food pyramid upside down and are eating more sweets and fats and only 2.5 servings of fruits and vegetables.

"If children learn how good fruits and vegetables taste and begin to meet the 'five a day' recommendations now, their eating habits will become a way of life by the time they are adults."

The computer program brings more than 30 fruits and vegetables to life using audio, text, graphics, video and music.

In the case of Amber Orange, the animated orange bragged to the students that she is the most popular fruit. Students learned the fruit's history (it was brought to the New World by Christopher Columbus), where they're grown in the United States (mostly in California and Florida, some in Arizona, Texas and Louisiana) and why it's good for you (vitamin C).

Other characters are Courtney Cauliflower, Stan and Sara Strawberry and Bobby Banana.

Nutrition is one of the hardest subjects for teachers to teach because the curriculum in schools is usually out of date and because nutrition is a rather dull subject, said Mary Miller, president of Interactive Design and Development, the company which worked with Dole on the program. Ms. Miller, a former teacher, has been at Winterville Elementary all week working with the third-graders.

By using the computer program, students get excited about learning about cauliflower, carrots and celery.

Between the computer program and their regular class studies, Mrs. Hall's students know that lettuce, celery and carrots date back to ancient times. They learned that orange fruits and vegetables – like carrots and cantaloupe – mean they're rich in vitamin A.

In a bit of food trivia, students learned that kiwi is one of the newest fruits, and was brought to the United States by Australian singer Olivia Newton-John.

The students also taught Ms. Miller something: Broccoli is a favorite food of their pet iguana, Godzilla.

Winterville was chosen as a test site because principal Tom Brown knows one of the program designers, who said parent, teacher and student input was needed, but that they were having difficulty finding a school to cooperate. Brown volunteered Winterville.

Dole is offering the program free to all schools, but technology may limit the number of schools using it. The program is on CD-ROM (compact disc, read-only memory), which requires a compact disc player hooked up to the computer. Winterville Elementary will have one by September, but most schools do not have that technology yet.

Appendix G

TECHNICAL SUPPORT CALL GUIDESHEETS

The following documents are technical support guidesheets developed for use when solving technical problems.

5 A Day Adventures Technical Support Sheet
Macintosh Version

5 A Day Disc Version Number : [#]

Machine Type: [   ]

Clock Speed: [MHz]

Ram: [MB]

Do the movies play? [Y or N]

Yes : Great

No : QuickTime Version : [#]

      2.0 : This version will not work on some systems without virtual memory turned on or Apple's Multimedia Tuner.

      To turn on virtual memory :
          1) Go to the Apple Menu
          2) Open the Control Panel
          3) Select Memory
          4) Turn on the Virtual Memory Option

      To contact Apple on the Internet :
      http://www.apple.com/

      To contact Quicktime :
      Technical Support :   1 - 800 - 767 - 2775
      http://quicktime.apple.com/develop.html

      2.1 or later : These versions work fine with virtual memory off.

Disk Cache Setting : [kB]

256 kB : Great

Less than 256 kB : They should increase their disk cache setting to 256 kB.

      To set the Disk Cache :
          1) Go to the Apple Menu
          2) Open the Control Panel
          3) Select Memory
          4) Set the Cache to 256 kB

5 A Day Adventures Technical Support Sheet
Macintosh Version

Does the sound play? | Y   or   N |

  Yes :   Great

  No :   Sounds problems are usually related to the sound level on the
              system being set too low. They should check their settings.

              To check sound settings :
                              1) Go to the Apple Menu
                              2) Open the Control Panel
                              3) Select Sound
                              4) Set the Volume

Do the documents print ? | Y   or   N |

  Yes :   Great

  No :   We have had printing problems on a few Macs. We have found that
              setting the system memory to 256 kB and virtual memory ON
              corrects this problem on all the computers we tested.

5 A Day Adventures Technical Support Sheet
Windows Version

5 A Day Disc Version Number : `#`

Machine Type: `386    486    Pentium   Other`

Clock Speed: `MHz`

Ram: `MB`

Do the movies play? `Y  or  N`

> **Yes :** Great
>
> **No :** QuickTime Version : `#`
>
>> **1.x :** This version will conflict with the 2.0 version. They should upgrade their version by contacting QuickTime.
>>
>> To contact Quicktime :
>>> Technical Support :   1 - 800 - 767 - 2775
>>> http://quicktime.apple.com/develop.html
>>
>> **2.0 :** This version conflicts with old multimedia programs which use version 1.x. They should upgrade their version by contacting Apple.
>>
>> **2.01 or later :**   These versions work fine with 5 A Day.

Using Smartdrive : `Y  or  N`

> **Yes :** Great
>
> **No :** Add a call to the SmartDrive in the Autoexec.bat file. This will improve the performance of their drives.

Smartdrive call is after CDROM call : `Y  or  N`

> **Yes :** Great
>
> **No :** The SmartDrive line in the Autoexec.bat should be located after the call to the CDROM drive. The SmartDrive can not buffer the CDROM drive without knowing that the drive exists.

Still having problems after trying the above : `Y  or  N`

> **Yes :** This could be related to a hardware problem. Contact their video board manufacturer for new drivers.
>
> Video Board Manufacturer: `_____`

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5 A Day Adventures Technical Support Sheet
Windows Version

Does the sound play?   `Y  or  N`

    Yes :   Great

    No :   Did the user have sound in Windows?   `Y  or  N`

        Yes :   Great

        No :   If they do not have windows sound, then they will not have sounds in the program.

            They should check to see that the windows sounds are turned on. To do this:
                1) Go to Main Group
                2) Go to Control Panels
                3) Go to Sounds
                4) Check the Windows Sounds Box

      Is the volume set too low ?   `Y  or  N`

        Yes :   To check volume level, the user will have to read their sound card manual. They can test the new level in Windows.

        No :   Great

      Have they moved the computer recently?   `Y  or  N`

        Yes :   Moving the system can sometimes causes cables or connects to become loose. They should check all connections and the volume settings on their speakers.

        No :   Great

      Still having problems?   `Y  or  N`

        Yes :   They may have a hardware problem. They should contact their manufacturer for new drivers.

            Sound Card Manufacturer: `[            ]`

Appendix H

PRETEST AND POST-TESTS USED TO EVALUATE
5 A DAY ADVENTURES

The following documents are the pretests and post-tests used to evaluate

knowledge gained from using *5 A Day Adventures*.

STUDENT SURVEY

Please answer all of the questions by circling the answer that seems right to you.

1.   Are you . . .

       1   A boy, or

       2   A girl ?

2.   What is your teacher's name ?

_____

3.   And what is the name of your school ?

_____

4.   We should all eat ___ servings of fruits and vegetables every day.

       1   One

       2   Two

       3   Three

       4   Four

       5   Five

       6   More than five

5.   ___ is the best source of vitamins, minerals and fiber.

       1   Meat, fish and poultry

       2   Dairy products (milk and cheese)

       3   Sweets and nuts

       4   Fruits and vegetables

6.   Fruits and vegetables are a good source of _____ and _____.
(CIRCLE TWO FROM THIS LIST.)

       1   Vitamin A

       2   Vitamin B

       3   Vitamin C

       4   Vitamin D

       5   Vitamin E

7.   ___ helps scrapes and cuts to heal.

       1   Vitamin A

       2   Fiber

       3   Vitamin C

       4   Fat

8.   ___ helps your intestines stay healthy.

       1   Vitamin A

       2   Fiber

       3   Vitamin C

       4   Fat

9.   ___ helps you see better in the dark.

      1   Vitamin A

      2   Fiber

      3   Vitamin C

      4   Fat

10.   Fruits and vegetables contain vitamins and _____.

      1   Protein

      2   Fiber

      3   Cholesterol

      4   Fat

11.   _____ contain fiber.

      1   Cheese and milk

      2   Meat and fish

      3   Eggs

      4   Fruits, vegetables and whole grains

12.   Fruits and vegetables that are high in Vitamin A are ____ in color.

      1   Red and White

      2   Blue and brown

      3   Yellow-orange and dark green

      4   Brown and purple

13.   If you add ____ to your salad, it will be high in <u>Vitamin A</u>.

        1   Broccoli

        2   Grapes

        3   Iceberg lettuce

        4   Raisins

14.   If you add ____ to your salad, it will be high in <u>Vitamin C</u>.

        1   Carrots

        2   Oranges

        3   Iceberg lettuce

        4   Romaine lettuce

15.   To buy the best juice, look for ____ on the label.

        1   100% fruit juice

        2   Contains fruit juice

        3   100% pure

        4   Tastes great

16.   ____ equals one serving of <u>fresh fruit</u>.

        1   1 watermelon

        2   1 grapefruit

        3   2 apples

        4   1 banana

17.   _____ equals one serving of <u>dried fruit</u>.

    1   1 handful

    2   2 handfuls

    3   3 handfuls

    4   4 handfuls

18.   _____ equals one serving of <u>100% fruit juice</u>.

    1   3/4 cup

    2   1/2 cup

    3   1 cup

    4   2 cups

19.   _____ equals one serving of <u>leafy salad greens</u>.

    1   1/4 cup

    2   1/2 cup

    3   1 cup

    4   2 cups

20.   _____ equals one serving of <u>canned or cooked vegetables</u>.

    1   1/4 cup

    2   1/2 cup

    3   1 cup

    4   2 cups

21. Have you ever talked to your family about eating five servings of fruits and vegetables a day ?

      1   Yes

      2   No

22. Do you like to eat fruits and vegetables ?

      1   Yes

      2   No

23. What do you think this picture means ?

5 a Day- for Better Health!

      1   Sunshine makes fruits and vegetables grow

      2   Fruits and vegetables are good to eat

      3   Eat five fruits and vegetables a day

      4   Eat fruits and vegetables every day

THANK YOU FOR YOUR HELP !

Appendix I

5 A DAY ADVENTURES **TEACHER SURVEY**

The following document is the teacher survey developed by Dole and included in its

first quarterly newletter.

5 A DAY ADVENTURES TEACHER SURVEY

1.   Have you used the following modules with your students ?

		Yes	No
a.	Land of 5 A Day	1	2
b.	5 A Day story	1	2
c.	Serving sizes	1	2
d.	Finding fruits and vegetables in a supermarket	1	2
e.	Reading food labels	1	2
f.	Exploring the food pyramid	1	2
g.	H. B.'s body shop	1	2
h.	Cook's Kitchen	1	2
i.	Salad factory	1	2
j.	Juke box (music)	1	2
k.	Glossary	1	2
l.	Challenges	1	2
m.	Adventure theater	1	2

2.   What do you like best about the CD-ROM program ?

_____

_____

_____

3. How did your students react to the program ?

   _____

   _____

   _____

4. Did your students learn to sing the songs ?

   1. Yes   2. No

5. On average, how many days a week did your students use the program ?

   1/week   2/week   3/week   4/week   5/week

6. How much time did you spend familiarizing yourself with the program ?

   1   One hour or less

   2   1-2 hours

   3   More than two hours

7. We'd like to get an idea of how you're using the program. Are you using it in your . . .

   1   Classroom only,

   2   Media center or computer lab only,

   3   In both classroom and computer lab

8. Do your students spend more time working in groups around the computer or working individually ?

   1   Working in groups   2   Working individually

9.   Who spends more time directly operating the CD-ROM program, you or your students ?

        1   Teacher   2   Students

10.   Did you read the booklet that came with the disk ?

        1   Yes   2   No

11.   Would you describe the teacher support materials that came with this program as . . .

        1   Very helpful

        2   Somewhat helpful

        3   Not at all helpful ?

        4   Did not look at them

12.   Do you have any suggestions for how the teacher support materials could be improved ?

_____

_____

_____

13. On the CD-ROM, have you found any of the following ? Did you print any of them ?

		Found ?		Printed ?	
a.	Teacher support material	1	2	3	4
b.	Lyrics to the 5 A Day songs	1	2	3	4
c.	5 A Day certificate and logo	1	2	3	4
d.	Activity lessons in language arts, math, science, and social studies	1	2	3	4
e.	Educational objectives	1	2	3	4
f.	Cookbook order from	1	2	3	4
g.	Rhymes	1	2	3	4
h.	Token summary	1	2	3	4
i.	Hints on getting started	1	2	3	4
j.	Instructions on how to navigate or get around in the program	1	2	3	4
k.	Technical support on hardware, troubleshooting, printing and so on	1	2	3	4

14. If you were you able to include 5 A Day Adventures into any other curricular

_____

_____

_____

15. How are you tracking individual student progress ?

    1   Using the challenges and token summary

    2   Making up my own tests

    3   Currently not tracking progress

16. How easy was it for your students to find their way through the program ?

    1   My students found this program to be easy to use

    2   My students found it moderately difficult to use

    3   My students found it very difficult to use

17. Do you think using 5 A Day Adventures has encouraged your students to eat more fruits and vegetables ?

    1   Yes   2   No

18. Has using 5 A Day Adventures encouraged you to eat more fruits and vegetables ?

    1   Yes   2   No

19. Would you recommend this program to other third grade teachers ?

    1   Yes   2   No

20. Will you continue to use the 5 A Day Adventures Program in the future with this or with other classics ?

    1   Yes   2   No

21. How do you feel about the following statement ?

I appreciate that the Dole Food Company created 5 A Day Adventures to teach my students about proper nutrition and the importance of eating five servings of fruits and vegetables a day.

1 Strongly Agree

2 Agree

3 Neither Agree or Disagree

4 Disagree

5 Strongly Disagree

22. If you had to give 5 A Day Adventures a grade, what grade would you give it ?

1 A

2 B

3 C

4 D

5 F

23. What specific things about the program do you think need to be improved ?

_____

_____

_____

Thank you very much. Meanwhile, if you have any questions or problems, please call me at 1-800-766-7201.

Mary Guy Miller

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Current Position

President, Interactive Design & Development, Inc., 1991-Present.

Previous Experience

Instructional Designer and Director of Interactive Design & Development, Virginia Cooperative Extension Service, Virginia Tech, Blacksburg, VA 24060, 1985-1991.

Instructor for student and faculty courses in computer literacy, Virginia Tech, Graduate Student, Computer Science Department, 1983-1985.

Instructor in elementary, secondary, and post secondary settings, 1972-1983.

Education

Virginia Polytechnic Institute and State University. Doctor of Philosophy, 1996, Curriculum and Instruction; Master of Information Systems, 1985, Computer Science; Bachelor of Science, 1972, Education.

Selected CD-ROM Multimedia Applications Designed and/or Developed

5 A Day Adventures for The Dole Food Company, Inc.; *Nutrition DISCovery* for Mead Johnson Nutritionals; *Images of Cancer Prevention -- The Nutrition Link: A Case Based Approach to Cancer Risk Reduction*, National Cancer Institute grant; *Nutritional Anemias* and *Nutrition and Stress* --for the Nutrition in Medicine series for The University of North Carolina at Chapel Hill.

Publications and Presentations

Published numerous articles in various publications including: *Journal of Agriculture and Food Information*, 1993; *Journal of Medical Education Technologies*, 1993; and *American Entomologist*, 1990. Delivered numerous presentations on Instructional Technology across the United States and around the World for organizations including: the Australian Council for Computers in Education, Society for Nutrition Education, the Soviet Academy of Science and the Association for Educational Communications and Technology.

Awards

Honored with awards from various organizations and publications including: Agricultural Communicators in Education (ACE) Award of Excellence for Innovative Use of Technology, 1988-1991, 1995; ACE Award of Excellence for Public Information Interactive Video Programming, 1989-1991; *Who's Who of American Women* 1995-1996; and Outstanding Woman Graduate of Virginia Tech, 1996.