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Educational software that requires no training to use

Michael Joseph Beck

EDUCATIONAL SOFTWARE THAT REQUIRES NO TRAINING TO USE

A Project

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

in

Education:

Instructional Technology Option

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ABSTRACT

Technology is being pushed into education at an alarming rate and with very high expectations. To succeed as an educational tool, technology must make the teacher's job easier. If software fails in helping to educate, teachers and students will not use technology and technology will be branded as a failure for the wrong reason.

This project examines the characteristics of successful software and technology. Learning resources that can be enhanced through technology are defined and examined. These include information banks, symbol pads, construction kits, phenomenaria, and task managers. The attributes of quality software are found to be flexibility, tailorability, relevance, validity, motivation, portability, friendliness, documentation, support, reliability, student control, and the use of color and graphics. It is acceptable if software makes learning fun providing it does not detract from the learning environment. Educational software has the potential to enhance creativity, stretch imagination, and capture interest. A school wide or individual curriculum can be used to integrate technology into the classroom to enhance technical literacy among students.

The goal of this project is to create a piece of educational software that most anyone can use without prior instruction. The intended audience is secondary level students and up. The content of the software is in the form of a data bank on vertebrates and invertebrates of the Caribbean ocean.

Evaluation data from 151 eighth grade students in a keyboarding class shows that most found the software easy to use. Almost 75 percent of the students polled found that buttons were obvious in their intent, navigation was easy, the purpose of the program was clear, material was level appropriate, and it was worthwhile enough to recommend to science instructors. It was determined that audio clues need refinement and video clips of the creatures in their habitat should be added to later versions.

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CHAPTER ONE

INTRODUCTION

Technology Today

Technology is the latest buzz word in the educational arena. 'More computers' is a common cry heard on many a campus. Groups seem to have sprouted into existence to rally the cause and provide guidance for technology in classrooms. For example, several organizations have formulated explicit guidelines for improving the learning environment. The idea is to promote higher science achievement across all demographic groups. The emphasis is that students should engage in meaningful activities that consistently use calculators, computers and other types of technology. Curricula should stress understanding, reasoning and problem solving rather than the memorization of facts and terminology (Carmona, 1996). There are many calls for technology in schools. Political forces have seen fit to join the push for technology in schools and politicians now promise and follow through with plans to institute programs that will advance technology in the classroom. Federal and state moneys are set aside for technology, meetings are held in schools to decide how and where to spend this funding, grants are then written to acquire the money and finally more computers are placed into the school. Schools can then brag about the number of computers per student on their site and administrators, teachers, parents, and students are happy as technology is being used.

Problem

The introduction of computers into schools will not necessarily create a technological learning environment. Having technology in a school no more creates a technological learning environment than owning a piano makes one a pianist. It is what is done with a computer that will determine if a technological learning environment exists and the level at which technology facilitates learning. Computer assisted instruction is dependent on software and it is the software programs that determine how technology is used. Then, through intentional or incidental evaluation of usage by teachers and students, the software will either be accepted or rejected by those using it. Software that is accepted is used continually and if it has certain characteristics, it can help to create a technological learning environment.

Consider the idea that much of the software available for use in classrooms is poorly designed as an educational tool. This can have a great impact on whether technology is seen as a justifiable expense. If software programs result in poor educational performance, technology is blamed. Funding for technology may then disappear as the technology is considered ineffectual. If software is difficult to use or requires excessive time to learn how to use, teachers and students become frustrated and technology fails again for the wrong reason.

Purpose

This project hopes to create a piece of educational software that is instinctively easy to use. Through the process and format of the design, it is expected that a novice computer user will be able to navigate through the material easily, successfully, and without any frustrations. A wide range of data on the topic of Caribbean Reef Creatures will be readily available in picture, text and drawing formats. It is expected that with information so easily attainable through the use of a computer, technology in the classroom takes one step closer to fulfilling its promise as a dependable instructional tool.

CHAPTER TWO

REVIEW OF LITERATURE

Learning Resources

Technology as a teaching tool offers many venues for delivering educational resources. It is in drawing on these numerous methods that makes technology so appealing for use in the classroom. Dyrli and Kinnaman (1994) discuss five types of learning resources that can be enhanced through technology. These are information banks, symbol pads, construction kits, phenomenaria, and task managers. Information banks contain explicit content information such as encyclopedias, atlases, and dictionaries. Symbol pads would be word processors, drawing, and painting programs. Construction kits are physical objects that allow the building of things. Legos, Lincoln Logs, and Tinker Toys would be considered construction kits. Phenomenaria are learning environments that recreate real-world phenomena for study. Non-technological examples would include aquariums and terrariums. Technological examples are computer programs such as SimCity and Microsoft's Musical Instrument. Task Managers are elements that provide guidance about and during learning. Teachers, textbooks, and computer assisted instruction are a few examples.

Designing a comprehensive lesson could include all of these resources using technology in each instance. The original assignment might be a lesson currently done without technology. Research on a project would begin with gathering information from electronic encyclopedias. Organizing the data would be accomplished with a word processor and construction of a model can be done with a computer simulation. The simulation can then be tested within a computer generated and controlled environment. A report can be given to the class using a hyper card stack. There are many uses for technology in the classroom. If used wisely and with quality software, technology can be successful as an educational tool.

Characteristics of Quality

Computer assisted instruction (CAI) needs to have distinct advantages over textbooks and other methods of instruction if it is to be considered as a valuable tool in the classroom. CAI has the capability to offer tremendous usefulness and many existing educational programs exploit its advantages based on their individual needs and purposes. For an educator, a sizable task is determining the qualities and advantages a particular software package contains.

In evaluating CAI for educational purposes, McDougall and Squires (1995) judged known checklists for evaluating software. Their results show that checklists were commonly comprehensive and covered the attributes of the program as well as quality of the material. Items the checklists commonly included are the hardware needed to run the program, quality documentation with printed support, the topic area and content of the program, its ease of use and reliability of operation, use of color, graphics, and sound. Also included are educational or instructional criteria, learning objectives, topic relevance to curriculum, student control over pace and stopping the program, quality of feedback to the learner, motivation characteristics, and assessing and record keeping of user performance.

To gain another perspective, McDonough, Strivens, and Rada (1994) have determined the following attributes are found in quality software materials:

- flexibility-courseware should be suitable for a range of abilities and be largely content-free for easier customization and reuse;
- tailorability-it should allow reasonable modification for different models of use;

- relevance-courseware which is not content-free should be clearly relevant to the curriculum it is intended for;
- validity-the educational content of the courseware and the reasons for using it must be valid;
- motivation-courseware should attract and hold the interest of the student;
- portability-it should be usable on a range of hardware;
- friendliness-courseware should be well-documented and easy to use.

While this list is not as comprehensive as the previous list, it also is concerned with some of the same issues. Both lists consider it important that software be adjustable to suit the needs of the user, applicable for its intended audience and level, easily usable and motivating.

There are many qualities to consider and expect when evaluating or considering the purchase of educational software. With considerable planning, educational software can promote itself as an indispensable tool in the classroom. It makes sense that the same qualities that are valued when selecting for use should be the same values examined when designing software.

During the analysis process of design, goals and expectations of the project are determined. More specifically, the identification of where multimedia could improve the teaching and learning process. Teachers who already have a student-centered teaching style and use discovery and exploration activities frequently in their instruction may adapt very easily to using interactive multimedia in their classes (Leidtke, 1993). Those teachers whose teaching style is not student-centered might be motivated to change or adapt to multimedia through its use. The same holds true of students. The success or failure of a multimedia application can be determined by how students learn in comparison with the application as well as the computer proficiency level of the students. The success or failure of a piece of software is determined by its design considerations.

Successful Software

There are many ways to determine acceptance of software in an educational setting. A high amount of usage can indicate ease of use, reliability, popularity, and relevance. One way to determine the success of technology in an educational setting is to ask students to perform an evaluation. Through the use of a program, students can determine it's shortcomings and successes and assess whether or not they think it has educational value. Hutchings et al. found that undergraduate students were positively receptive to learning cell and developmental biology using hypermedia learning materials. Hypermedia is similar to multimedia but allows a direct interaction with the information which can be accessed quickly and efficiently. Of the students questioned, eighty percent or above felt the hypermedia program was relevant to the course, efficient as a learning resource, and would use it again (Hutchings et al, 1994). Responses like these could point to the conclusion that technology is capable of facilitating learning. Quick and efficient accessibility of information is not enough to constitute a successful design in educational software.

Motivation

Proctor, Weaver, and Cotrell in their article on entertainment in the classroom support using entertainment as a teaching style. Among other arguments, they reference a survey in which 135 students at a Midwestern State University gave Likert scale responses to statements dealing with instructional entertainment. The survey data demonstrated clearly that students respond positively to entertaining instruction. Proctor goes on to list several entertainment type alternatives to standard lectures. Included in that list is the idea of combining audio and visual simulations as found in high-tech entertainment with educational applications.

There are those who feel the classroom is a place for stimulating minds and not a place for fun. At one time this philosophy was appropriate for the education portion of society. However, the present day classroom does not lend itself to this school of thought. A common problem found in contemporary classrooms is that of motivating students. Today's media saturated students need an alternative or additional form of entertainment to keep their interest on school subjects (Consider that it is not necessarily true that the term entertainment must carry with it non-intellectual connotations). Teachers today must compete with the entertainment industry for the attention of their students minds. If a class can be entertaining without sacrificing academic goals, teachers can hold student interest, nurture it, peak it and stimulate future growth long after the teacher has been a direct influence. An aspect of software design that needs to be considered then is the type or level of entertainment used in presenting the material.

Crowded Classrooms

Another problem found in today's classrooms is the excessive student to teacher ratio. As the number of students attending higher institutions expands, the amount of work for instructors increases. McDonough, Strivens, and Rada (1994) found that because of classroom crowding there is a increasing interest among lecturers in the use of Computer-based Teaching (CBT). CBT is seen as most helpful in first year college courses which often have a discipline-wide agreement on content. Lecturers that use CBT are happy that they chose to do so and many other lecturers, while not using CBT, think it has value.

Successful Technology

Going beyond the need for motivation or class size reduction, the next step is to evaluate whether or not a particular technology is useful as a learning tool. Jeremy Roschelle (1994) analyzes John Dewey's thoughts on collaborative inquiry learning with respect to technology in the classroom. Roschelle feels there is no question that technology makes learning fun, gives students access to more information, and enables a more efficient delivery of the resources. Fun, information, and efficient delivery are not enough so continuing in Roschelle's perspective of Dewey, the next step requires that the student make sense of what is problematic while still using technology. Technology can expedite this next step by allowing the learner to view a problem over and over, to probe the situation, and test many postulated solutions. Roschelle describes a desirable learning experience: knowledge is constructed, meaning is shared, and experience is rendered comprehensible (Roschelle 1994). In the same context, Dewey refers to specific functions that Roschelle claims call forth a need of technological support in order for the process of inquiry to extend: continuous engagement with the problematic situation, focus and context, communicative action, and experimental doing and undoing. The two ideas are basically the same. Suffice to say that construction of knowledge is synonymous with continuous engagement within the situation, focus, and context. The outcome of experimental doing or undoing, in an educational setting, should be equivalent to comprehensible experience. Shared meaning is synonymous with communicative action.

Creativity

Technology can play an extremely important role beyond what is common. According to Maureen Smith (1996), computers in the classroom are becoming tools for facilitating creativity as well as devices to inspire students to experiment in new ways. Technology accelerates the creative process by allowing mistakes and changes which can relieve students of inhibitions. This can promote risk taking, inquisitiveness, and problem solving.

Classroom technology might benefit if software authors became cognizant of the needs in educational settings and so give teachers more selections of software that promote inquiry in the student.

Imagination

Imagination can be the greatest tool in problem solving. It allows one to explore beyond prescribed boundaries and venture into the world of alternative solutions and possibilities. If we expect this of our students they learn higher levels of thinking. The French philosopher Joubert summarized the nature of imagination best 'He who has imagination without learning has wings but no feet' (cited in Roberts, 1922). To use imagination to solve problems involves summoning up facts, images, analogies, and metaphors to predict solutions to a problem. Simple technological devices can be used to create constructive cognitive conflict and provide structure for imagination (Dorner and Kowalski 1992). If computer programs can draw a user into searching for alternative solutions and possibilities, cognitive growth occurs and technology can be labeled as a successful tool in the classroom.

Interest

The entertainment industry has long been successful in the creative arts at capturing the attention of it's school age audience. Perhaps there is something to be learned by their success. In an editorial in Technical Horizons in Education Journal, Dr. Sylvia Charp (1996) states that Interactive Multimedia software is capturing the student's attention, arousing curiosity, stimulating creativity, encouraging critical thinking and fostering interaction. Interactive Multimedia is augmenting traditional lectures and laboratory presentations, providing more interesting and innovative material to the student. Multimedia software succeeds in drawing on the entertainment industry's ideas and successes in capturing student's attention and thus gives educators the opportunity to challenge minds.

Technology and software together have unlimited potential as an educational tool. For a start, they can provide entertainment and motivation, stimulate creativity and imagination and help in overcrowded classes. While technology can be effective in the classroom, changes to help it do so must occur at other levels.

Technology in the Curriculum

When educational reform is mentioned, ideas related to it include students learning to solve problems, students being actively involved in learning as opposed to being observers, and the idea that the use of hands is interdependent with using the mind. Joseph McCade (1995) feels that technology educators should use their unique position as hands-on, minds-on mentors to help students discover and develop their unique combination of intelligences, emphasizing a more holistic view of both assessment and context for learning. This is easy to suggest but the solutions and implementing those solutions is not easy. Using the appropriate educational software is the first step but it can be taken further. These kinds of changes can be brought about at a curriculum level.

Traditional curriculum does not always meet the needs of students. At Community High School in Ann Arbor, Michigan, problems with traditional curriculum led to the creation of Foundations of Science (FOS), an integrated science curriculum combining earth science, chemistry and biology into a project-based, three year course using technology as the support for the new curriculum. What was needed was something that would encourage students to think for themselves and foster their ability to communicate ideas. Prior and Soloway (1996) claim that if students are the ones who are talking, writing, exploring, evaluating, and making decisions (acting like scientists), they will claim ownership of the material and gain a genuine understanding and thus apply the concepts to their lives. However, without the resources and training, students will not be able to perform these tasks. Situations like these is where technology becomes useful.

Technology allows students to master the methods by permitting students to seek answers for themselves instead of relying upon the teacher. Through technology, resources can be simulated, software can act as a guide, and students can explore, write, evaluate and make decisions. Learning now has become part of the process rather than the goal.

Some software programs will be more conducive to the process of curriculum integration than others. Carlson, Hitzfelder and Redmon (1996) found that when integrating software into the curriculum, the program Authoring Tool allows teachers to create lessons that are appropriate to their student's ability level, capture student interest or accommodate situational requirements and, foster individuality and creativity for both students and teachers. Appropriateness, entertaining, and stimulation of creativity, these are the qualities that have been shown to be advantageous in blending technology into the classroom.

As an example, state of the art images can help teach biology. Hands-on Image Processing (HIP) Biology I and II are a 9 through 14 grade curriculum in which students analyze digital images to learn biology concepts. Measurements and gathering of actual data through the computer facilitate understanding of the processing and solving of real world problems (Center for Image Processing in Education, 1996). Lessons include comparing x-rays of hands, hooves, paws, and wings to understand evolution.

As another example, Texas Learning Group in Austin Texas has developed a multimedia program that helps students make the connection between curriculum and real world experience. The program promotes critical thinking and problem solving by using real-world scenarios on which students explore environmental pollution and health-related issues. Judy LeMoine, a teacher at O. Henry Middle School in Austin ISD says "This is the closest thing to the way I like to teach that I have ever found. It actually takes what you want the student to learn and has them apply it, not just memorize information. The interactive curriculum allows them to get enough information to make wise decisions" (Unknown, 1996).

Once we are convinced that computers in a classroom are beneficial to the educational process, the next step is to decide what the best circumstances are with respect to software.

Instructional Design Goals and Technology

Barbara Seels (1993) authored an introduction for a magazine devoted to instructional design (ID). Her concern centered around ideas fundamental to instructional design. She questioned philosophical viewpoints, problems with fundamental approaches, criteria for alternate approaches, fundamentals that should be accepted or rejected, and the implications of changes in ID fundamentals. Seels concluded with two ideas. First, that the fundamentals of ID must expand (although experts disagree on what the changes should be) and become more open. Second, the basics of traditional instructional systems design must be retained.

Rita Richey (1993), in the same magazine, claims that ID theory has evolved due to the influence of values, philosophy, research, and practitioner experience and now is beginning to reflect the same societal changes that influence ID practice.

ID has its origins based in other disciplines but is now growing independently. It is developing its own models of human learning and instruction. Early predictions on technology had it leading us out of the dark ages of instruction. This has happened to any arguable degree as years of outside pressures have led to many changes. One of the more prominent pressures has been to develop in students their problem solving capabilities. Computer software programs have a distinct capability for doing this and this advantage should be fully explored and exploited.

To design instruction, one must seek a means of identifying the human capabilities that lead to the outcomes called educational goals (Gagne, Briggs, Wagner, 1992). Human capabilities or categories of learning outcomes, consist of intellectual skills, cognitive strategies, verbal information, motor skills, and attitude. Intellectual skills allow interaction with the environment using symbols and conceptualizations. Cognitive strategies govern an individual's own learning, remembering, and thinking behavior. Verbal information is the type of knowledge that can be stated or declared. Motor skills involve the physical ability to perform a task. Attitudes or affective domain is the class of learned capabilities called attitudes we possess towards various things (Gagne, Briggs, Wagner, 1992). Educational goals are a vast and complicated topic with different definitions for any society or individual defining them. In most any situation though, educational goals should be designed to develop intellectual skills in the student that shape the student and society toward virtuous and worthy ends.

Instructional design most often occurs at a single course level and not as a broad, comprehensive definition. The assumption being made that the larger definition is defined as a complete educational outcome for a particular institution. The individual goals combining to form the whole. The learning of intellectual skills is influenced by the retrieval of other intellectual skills that are prerequisite, simple skills or the actual components of the skill to be newly learned. Prior learning then is tantamount to an educational foundation. The greater the foundation, the greater the learning potential. Expectations of college students can be related to all learning that has take place. For intellectual skills, the most direct effect of prior learning is through the retrieval of other intellectual skills that are prerequisite components (Gagne, Briggs, Wagner, 1992). What the learner brings to an educational setting will effect what is to be learned. And with each successive year of education, the learner will bring more prior learning and thus have the capability to learn more and learn in a more complex manner. It should make the job of each successive teacher easier and should allow for a greater amount of material to be covered. Rosenshine (1995) is concerned with how to help students develop well connected bodies of knowledge. Rosenshine claims the solution is to provide extensive reading from a variety of materials, frequent review, testing and discussion and application activities. Processing of new information takes place through rehearsal, review, comparing and contrasting, and drawing connections. What shows through here is that students should be given activities that require information processing and application. Fletcher-Flinn and Gravatt (1995) suggest that the way to do this is with computer assisted instruction (CAI). They say CAI provides not only the presentation of realistic problems requiring interactive hypothetical-deductive reasoning but immediate feedback and self-evaluation, as well as opportunities for collaborative learning in small groups.

Technical Literacy

Technology is a powerful tool that has many applications in an educational environment. It is not an easy task to integrate technology into the curriculum or classroom but there are many reasons for doing so. If not for the purposes of teaching any of the disciplines, motivating students to learn, helping in crowded classrooms, or stimulating creativity, technology should be integrated for the sake of technical literacy. In an article published by the New York State Technology Education Association, Thomas Liao (1994) comments on technical literacy. "We must all become more technologically literate so that we can make more informed decisions about personal choices as well as societal choices. And if our democratic society is to thrive in an increasingly competitive global economy, we must use technology more intelligently. In order to be a successful contributing member of society, students of today will need to learn how to use the new information and communication tools to solve problems, make more informed decisions, and to be more productive. If they use these new mind tools well, a more fulfilling life will be realized".

CHAPTER THREE

OBJECTIVES

Of the learning resources mentioned above, this project will be designed as an information bank. It will be a data CD ROM on creatures found among the Caribbean reefs. Of the qualities desirable in educational software, this project will concentrate on making the information available in a format that stresses ease of use. It will be expected that a new user will be able to navigate through the material with a minimum of instruction. The end goal is to have a piece of software that most anyone can use competently to extract a variety of data and data types.

The completed project will not be a full scale version of what is intended. For the purpose of fine tuning, detail, and precision, only a portion of the project will be created. This portion will be a representation of the intended program in its information, structure, appearance, and functionality. It will function as the intended whole would, with the only difference being limited data. In designing this project, the following items will be considered. The intended audience, instructional objective, content level, data presentation, usability, user control, aesthetics of color, sound, and graphical format.

CHAPTER FOUR

PROJECT DESIGN AND DEVELOPMENT

User

The intended users are students at the lower secondary level. Specifically, science students with interests in the zoological, oceanographic, and perhaps biological fields of study are targeted. Another branch of users might be recreational scuba divers. The user will be expected to be self motivated in the desire to access the information. It will be expected that the user will have at least a minimum of previous computer experience. This would include knowledge of mouse movement and mouse clicking will be expected as well as familiarity with some common software terms such as back, forward, open, and close.

Instructional Objective

The instructional objective intended is an information bank or reference tool status. The software will not be intended to teach but to act as a information archive. Various levels of data such as pictures, text, and drawings will be accessible depending upon the desired information.

Content Level

Content level will vary from photographs of individual species in their natural habitat to textual information on the species to diagrams of internal structure. The level of textual information will be directed for secondary school students. Text will include classification status such as genus, species. Habitat, behavior, and reaction to divers will be included as available.

Interface Design

Interface design will follow commonly found format which uses a Graphical User Interface or GUI (pronounced gooey). Labeled buttons will allow the user to navigate and access various levels. These buttons will represent the most common of devices such as open, close, exit, back, and forward. Travel throughout the program will be strictly by the choice of the user. For example, if the user desires information about the habitat of a particular species, that part of the program is directly accessible from a main menu. If from there, internal organ structure is needed, one click of a button produces the data. Navigation will start as though from the center hub of a wheel from which all points are accessible.

Audio

Sound will be evident upon what is clicked and when. This will be tied directly with travel as the user may rely upon audio clues to remain aware of their position or destination.

Presentation Format

With multimedia there is an expectation that interaction is to take place. It is the interaction that gives interactive multimedia it's power as an educational tool. The ability to make choices to move to any area of the program can be motivating and satisfying in itself. However, having too many choices to get anywhere in the program can be confusing and a hindrance. A fine line must be discovered and held to. The main menus will be located as the hub of a wheel. Several spokes or groups will be represented by a particular species of reef creatures and the individual spokes within a group will represent the individual creatures. Travel along the spoke outward will provide successive information about the creature. First will be a photograph of the creature, The next level will be common name and scientific name. The creature's size, depth found at, visual identification, abundance and distribution, and habitat and behavior will be available through using the mouse to scroll down a window. Finally, internal organs and bone graphics will be available.

In a classroom setting, a teacher needs time to teach above all else. An efficient classroom has students being self motivated to learn on their own and the teacher acting as a facilitator. This project hopes to provide an educational tool that students can use without needing to be taught how to use. A desired outcome is to create a tool that teachers find desirable to use as it creates less work for them and stimulates passion for the material in the student.

Formative Evaluation

The intent of the software program was to have a piece of educational software that could be used competently and without instruction by most anyone, even those with very limited computer experience. To determine if the program could be used instinctually and proficiently, 151 eighth grade students navigated through the program and explored it without being given operating instructions or a predetermined intention. These were male and female students at the end of a one semester keyboarding class. The school resides in a small middle class community and draws more than half it's population from a working class community. After ten to fifteen minutes of delving into, exploring, and maneuvering through the program, the students were asked to circle their responses to ten questions on a 1 to 5 Likert-scale. A response of 1 represented a strong negative or low and a 5 represented a strong positive or high. An answer of Unknown was included as an option for each question.

The questionnaire or evaluation, was designed to elicit information about whether or not the students felt comfortable and competent at navigating through the program. The ten questions the students answered are as follows.

1. Rate your computer experience.
2. Did you find the program easy to use?
3. Did you find the buttons easy to understand?
4. Did the buttons do what you expected them to do?
5. Did you find it easy to move through the program?
6. Was the purpose of the program clear to you?
7. Did the material seem appropriate for middle school students?
8. Were the sounds and music helpful in moving through the program?
9. Was the type of font easy to read?
10. Would you recommend this program to your science teacher for use in your class?

Two optional questions for written response followed these ten inquiring if the student felt that any changes should be made to the program or if the student had any comments they wished to make.

Of all ten questions, responses were most varied on question one, computer experience. Percentages for each possible response are listed below.

#1 Responses

LOW			HIGH		UNKNOWN
1	2	3	4	5	
1%	13%	31%	35%	20%	0%

It appears that after one semester of a keyboarding class and any other previous encounters with computers, all but 14 percent of the students felt they had at least a medium amount of computer experience.

Responses to question two on the program's ease of use was much more definitive in it's orientation towards the high end.

#2 Responses

LOW			HIGH		UNKNOWN
1	2	3	4	5	
0%	3%	5%	13%	79%	0%

It might be expected that if any students were going to have problems with operating the program, it would be the 14 percent from above with minimum computer experience. Only 3 percent of the total population felt they had considerable problems using the program.

The program's buttons were easy to understand by a great majority of students. This should be expected considering the results from question number two above. The results for question three closely resemble question two.

#3 Responses

LOW				HIGH	UNKNOWN
1	2	3	4	5	
3%	1%	5%	9%	81%	1%

Question four queried about the expectations of what a button would do. Results here began to vary a small amount.

#4 Responses

LOW				HIGH	UNKNOWN
1	2	3	4	5	
9%	4%	10%	11%	61%	5%

Some students appear to be confused about the function of a button. However, there might be an explanation for this. Remember, the program the students evaluated was not a completed version. The format of the program was present in it's entirety but the data for all creatures was not. Index screens for pictures and text list over one hundred possible creatures to select from. Creatures that currently have pictures and text available (pink colored buttons) only numbered seven. Buttons that were not represented with either type of data (yellow colored buttons) sent the user to a screen that said it was under construction when the button was selected, then the user was returned to the index of origin. This confusion about the completeness of the program might account for the slightly scattered results at the low end of this question.

Question five which asks about ease of moving through the program, shows a similar though weaker scattering at the low end but this but lacks any impact in the results.

#5 Responses

LOW			HIGH		UNKNOWN
1	2	3	4	5	
3%	4%	5%	9%	77%	2%

Over three quarters of the students polled answered a 4 or 5. These students felt it was very easy to navigate through the material. The small percent that felt otherwise might fall into the same category as explained above. A button going to an under construction statement rather than to a picture or data on a creature, might be construed as an unexpected reaction to a button.

The purpose of the program was not clear to more students than expected. Although 16 percent is not a great amount to have circle a 1 or 2 for this question, it is enough to indicate a short coming of some kind.

#6 Responses

LOW				HIGH	UNKNOWN
1	2	3	4	5	
11%	5%	9%	17%	54%	4%

Unfamiliarity with this type of program might be an explanation but the data does not necessarily bear this out. Of the students that gave this question a 1 or 2, 58 percent labeled their experience level with a 3 or 2. The other 42 percent gave a 4 in experience. Not greatly conclusive data if low experience is held on par with program unfamiliarity.

Question seven dealt with material appropriateness for the middle school level. Just over three quarters gave a 4 or 5 and so were satisfied with the material for their level.

#7 Responses

LOW				HIGH	UNKNOWN
1	2	3	4	5	
6%	5%	7%	10%	67%	4%

Students recognizing material as being appropriate for a grade level indicates that an understanding of the program occurred in these students. To be able to see an application of material (appropriateness), comprehension (understanding) of the material must be present. Three quarters of the students or those answering a 4 or 5 understood the material well enough to recognize the application.

Audio clues given throughout the program were seen as helpful to many but the lower end of possible responses has its highest numbers yet.

#8 Responses

LOW				HIGH	UNKNOWN
1	2	3	4	5	
16%	5%	13%	11%	51%	4%

Many of us use combinations of methods or strategies to learn. That is, not only do we learn by reading about something, but learning is accentuated or enhanced when reading is accompanied by something else such as with a hands-on experience or associated with an event. There must be those who do not depend upon audio sources to assist in mastering material. Individual likes and dislikes for styles of music vary as well. Music relative to the West Indies was used in the program. Not all palates are receptive to this kind of music. This might account for some of the lower responses to question number eight.

Responses were almost overwhelming to question nine in favor of the legibility of the font style used. It would be a fatal mistake to use an illegible font in any kind of program.

#9 Responses

LOW				HIGH	UNKNOWN
1	2	3	4	5	
1%	2%	0%	5%	90%	1%

Question ten asks if students would recommend the program to their science teacher. Three quarters said they would recommend it by answering a 4 or 5. The surprise here is the number of unknowns and low end scores. Perhaps this is a result of the students who were not sure of the programs purpose.

Responses

LOW				HIGH	UNKNOWN
1	2	3	4	5	
8%	3%	6%	12%	63%	8%

The most common change that students requested in the optional section at the end of the evaluation was to see the project completed. The desire to see more pictures and data of creatures was a common statement. Another popular request was to see video clips of the creatures in their natural environment. This solicitation emphasizes the expectations students have come to develop within the realm of multimedia and the significant and powerful role multimedia can play in capturing attention.

Effectiveness and Infirmities

If the evaluation data is looked at as a whole, it appears that the software has achieved the desired purpose. At least three quarters of the students felt that buttons were obvious in their intent, navigating through the program was easy, the purpose of the program was clear, the material was appropriate, and felt it would be worthwhile recommending it to their science teacher for classroom use. Students with various levels of experience were able to use the program with proficiency, without first being taught how. The program has the ability to become a tool teachers can depend on to perform it's function without being a burden by requiring time to teach how to use it. In a classroom, this is a time saver for teachers. A teacher can give an assignment without having to worry about extra preparation. Given a task to obtain certain information, most any student could feasibly maneuver through the program and return with the correct data.

Not all students found the audible clues helpful. The choice of music might of been offensive to some with specific tastes. Sound, especially music, is an integral part of multimedia and many programs rely heavily upon it. The option of no music at all is unacceptable so this should not be considered as an alternative. A one-size-fits-all program is an unrealistic expectation but still a worthwhile goal.

Proposals for Version 2

One last item mentioned by a few students in the optional portion of the evaluation was to have the program speak to them. Perhaps rather than associating audible clues such as noises with movement through the program, it might work better to have a desired destination or present location communicated through spoken word.

It was suggested previously that some users might be put off by the music used in the program. It would be an easy task to prepare an option that would allow the user to select a music style from several choices. After the opening screen, a preferences page could be displayed that would allow the user to create a personalized version of the program. Choices could include language, music, color schemes, and animal kingdom. Adding video clips would be strong enhancement of the program. While it would not be hard to incorporate the video portions, acquiring them could be.

Most any subject or discipline can be incorporated into the format this program used. The key is simplicity. When a program tries to incorporate extensive amounts of information or to cover all the bases, it begins to grow in complexity and so must the user. Teachers cannot base their lessons on the assumption that all students are at the same level of readiness or complexity. Software programs that empower most any user with the ability to extract information should be a required item in today's technology rich classroom.

References

Carlson, A., & Hitzfelder, E., & Hudson, T., & Redmon, D. (1996, March). Classrooms as test-beds for educational software design. Technical Horizons in Education, 23(8), 75-78.

Carmona, J. (1996, December). Science and simulation products let students probe real world problems. Technical Horizons in Education, 24(5), 10-18.

Center for Image Processing. (1996). State-of-Art imaging helps teach biology, Tuscon, Az.

Charp, S. (1996, February). Interactive multimedia. Technical Horizons in Education, 23(7), 6-7.

Demarais, N. (1994). Multimedia on the PC. New York: McGraw-Hill.

Dorner, R., & Kowalski, L. (1992, December). Imagination in Japanese educational experiments. The Technology Teacher, 52, 12-14.

Dyrli, O. E., & Kinneman, D. E. (1994, February). Integrating technology into your classroom curriculum. Technology and Learning, 14(5), 38-44.

Environmental science series immerses students in real problems. (1996, December). Technical Horizons in Education, 24(5), 42.

Fletcher-Flinn, C. M., & Gravatt, B. (1995). The efficacy of computer assisted instruction (cai): a meta-analysis. The Journal of Educational Computing Research, 12,(3), 219-242.

Gagne, R. M., & Briggs, L. J., & Wagner, W. W., (1992) Principles of instructional design, Orlando, Fl: Harcourt Brace Jovanich.

Hutchings, G. A., & Hall, W., & Thorogood, P., (1994). Experiences with hypermedia in undergraduate education. Computers Education, 22,(1/2), 39-44.

Leidtke, J. (1993, December). Multimedia technologies for education. The Technology Teacher, 53(3), 9-22.

Liao, T. T., (1994, November). Toward technology literacy for all. The Technology Teacher, 54, 2-4.

McCade, J., (May/June 1995). Educational reform and technology education. The Technology Teacher, 54, 31-39.

McDonough, D. & Strivens, J., & Rada, R. (1994). Current development and use of computer-based teaching at the university of liverpool. Computers Education. 22(4), 335-343.

McDougal, A., & Squires, D., (1995). A critical examination of the checklist approach in software selection. Journal of Educational Computing Research, 12(3), 263-274.

Pryor, A. Z., & Soloway, E. (March/April 1996). Practicing authentic science. Electronic Learning, 15(5).

Roberts, K. L. (1922). Hoyt's new encyclopedia of practical quotations. New York: Funk and Wagnalls.

Roschelle, J. (1994, May). Collaborative inquiry: reflections on dewey and learning technology. The Computing Teacher, 21(8), 6-9.

Rosenshine, B. (1995, May/June). Advances in research on instruction. The Journal of Education Research, 88(5), 262-268.

Seels, B., (1993, February). Instructional design fundamentals: a review and reconsideration. Educational Technology, 33(2), 7-8.

Sharpe, J. J., (1993 March 2). Multimedia technologies for education. Society of Manufacturing Engineers, Peoria, Il.

Smith, M. M., (1996, May/June). The creative edge. Electronic Learning, 15(6), 47-68.