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Pueblo Home: An interactive multimedia CD-ROM on Pueblo architecture

Jo Thompson

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PUEBLO HOME:
AN INTERACTIVE MULTIMEDIA CD-ROM
ON PUEBLO ARCHITECTURE

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

by
Jo Thompson
June 1995
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ABSTRACT

The Pueblo Home CD-ROM is an interactive multimedia program on Pueblo architecture, with extension materials for teachers such as lesson plans and a class project which included a three-dimensional model. Multimedia elements of the software included graphics, animation, video, and music and were designed to support the program’s goals of multicultural education in the social studies curriculum at the Fifth Grade level. It attempts to represent ethnic diversity, to enhance awareness of students’ own cultures, and to develop a sense of global citizenship. Formative evaluation conducted during the development of the project, included individual and group evaluations of Pueblo Home conducted with Fifth Grade students.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>ABSTRACT</th>
<th>ii</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAPTER I</td>
<td>Introduction, Statement of Problem, and Rationale</td>
</tr>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Statement of Problem</td>
<td>1</td>
</tr>
<tr>
<td>Rationale</td>
<td>2</td>
</tr>
<tr>
<td>CHAPTER II</td>
<td>Review of Literature</td>
</tr>
<tr>
<td>Interactive Multimedia in Education</td>
<td>5</td>
</tr>
<tr>
<td>Interactive Multimedia in Social Studies</td>
<td>5</td>
</tr>
<tr>
<td>Multicultural Education in Social Studies</td>
<td>11</td>
</tr>
<tr>
<td>Objectives of Multicultural Education</td>
<td>12</td>
</tr>
<tr>
<td>Multicultural Education on Native American Cultures: Current Social Studies Curriculum</td>
<td>14</td>
</tr>
<tr>
<td>Elements of Interactive Multimedia Design</td>
<td>18</td>
</tr>
<tr>
<td>Graphics</td>
<td>18</td>
</tr>
<tr>
<td>Text</td>
<td>22</td>
</tr>
<tr>
<td>Audio</td>
<td>23</td>
</tr>
<tr>
<td>Interface</td>
<td>24</td>
</tr>
<tr>
<td>Interactivity</td>
<td>26</td>
</tr>
<tr>
<td>Navigation/Branching</td>
<td>30</td>
</tr>
<tr>
<td>Interactive Multimedia And Instructional Design</td>
<td>32</td>
</tr>
<tr>
<td>Evaluation and Efficacy of Interactive Multimedia</td>
<td>34</td>
</tr>
<tr>
<td>CHAPTER III</td>
<td>Goals And Objectives</td>
</tr>
<tr>
<td>Goals</td>
<td>38</td>
</tr>
<tr>
<td>Objectives</td>
<td>39</td>
</tr>
</tbody>
</table>
CHAPTER IV

METHOD AND RESULTS .................................................................................. 41
Method .................................................................................................................. 41
   Instructional Design of Pueblo Home .............................................................. 41
   Interactive Multimedia Design of Pueblo Home .............................................. 43
Technical Considerations: Hardware ................................................................. 46
Technical Considerations: Software ................................................................. 46
   Authoring System ............................................................................................ 46
   Graphics Applications ...................................................................................... 48
Results .................................................................................................................. 50
   Formative Evaluation of Pueblo Home ............................................................ 50
      Individual Evaluation .................................................................................. 50
      Group Evaluation ....................................................................................... 51
Revisions to the Program .................................................................................... 53

CHAPTER V

DISCUSSION ....................................................................................................... 55
APPENDIX A ........................................................................................................ 60
   Illustrations ..................................................................................................... 61-64
APPENDIX B ........................................................................................................ 65
   Figure 1 Test Picture ...................................................................................... 66
APPENDIX B
   Figure 2 Pretest ............................................................................................. 67
APPENDIX B
   Figure 3 Posttest ........................................................................................... 68
APPENDIX C ........................................................................................................ 69
   Extension Materials ....................................................................................... 70-77

RESOURCES ....................................................................................................... 78

PUEBLO HOME CD-ROM BIBLIOGRAPHY ...................................................... 84

SOFTWARE RESOURCES ................................................................................. 86
CHAPTER I

Introduction, Statement of Problem, and Rationale

Introduction

The Pueblo Home project is an interactive multimedia program on Pueblo architecture. It includes a CD-ROM and extension materials for teachers to use in teaching social studies. The term CD-ROM refers to a compact disc with read-only memory which can store the informational equivalent of 1,500 floppy disks and provide ease of access to the information (McCarthy, 1993, p.14). It is designed to meet the goals of multicultural education in the social studies curriculum at the Fifth Grade level.

Statement of Problem

The study of Native Americans is an important part of the elementary social studies curriculum. The search for culturally accurate and sensitive portrayals of Native Americans in technology-based media is especially challenging, as there is an extremely limited number of such programs available. The rapid growth in the numbers of social studies programs on CD-ROM
notwithstanding, there is still a dearth of interactive multimedia materials dealing with multicultural, and particularly with Native American themes.

A general treatment of the topic of Native Americans may be found within the large CD-ROM databases on American history, or multimedia encyclopedias, for example. There have been few attempts to develop software programs which focus on a specific Native American subject.

Rationale

The need for an interactive multimedia program on a specific Native American theme that is instructionally well-designed to utilize the medium to its best advantage and to meet the objectives of multicultural education in the social sciences, drove the selection and development of the project. The author's personal experience and collection of Pueblo images and music, and knowledge of Pueblo architecture led to the choice of specific content.

The rationale for the use of interactive multimedia software as the chosen format for the program was its richness as a
creative medium to tell the story of Pueblo Home, and its potential to powerfully impact learning. Advances in CD-ROM technology allow for enhanced integration of multiple media, particularly video and audio, and for increased storage capacity, making the authoring of interactive multimedia more viable.

When integrated into the classroom, interactive multimedia can provide a complex, interdisciplinary learning environment, in keeping with concepts of learning theories, such as: knowledge construction (Jonasson, 1991; Thompson and Jorgenson, 1989), cognitive apprenticeship (Reeves, 1992), direct manipulation (Weller and Hartson, 1992) and metacognitive cueing (Bennett and Dwyer, 1994). Aspects of these theories have been incorporated into the design of Pueblo Home.

The technological classroom, promotes a distinctive approach to teaching and learning (Cohen, 1991; Fernlund and Cooper-Shoup, 1991; Gilkinson, 1991). Teaching methods which relied on teacher-centered activities, or which fostered high levels of competitiveness, are giving way to a more egalitarian system. The effective use of interactive technology, as a tool and as a medium
for creativity, promotes group interaction and a creates a classroom based on respect, acceptance, and cooperation.

These qualities which enhance group learning, are also consistent with the goals of the social studies curriculum, and particularly of multicultural education. The use of interactive multimedia in the classroom supports the tenets of a multicultural curriculum as outlined in the literature (Edwards, 1993; Etzioni, 1991; Lynch, 1983, 1989; Khanna, 1991). Pueblo Home can assist in the accomplishment of these goals in a number of ways: through the representation of cultural diversity, by helping students develop a sense of their own cultural identity, and through the cooperative nature of group interaction within the active learning situation provided by the program.
CHAPTER II

Review of Literature

Interactive Multimedia in Education

Interactive Multimedia in Social Studies

New technologies mean new learning and teaching styles. Interactive multimedia has been defined in the literature as a computerized database that presents information in multiple forms: graphics, text, and audio, with nodes linked by associations which allow users to control their access to the information (Hix and Hartson, 1993, p. 88; Reeves, 1992). The terms interactive multimedia and hypermedia have both been used to define a new technology which includes "the integration of text graphics, animation, video and sound into presentations," (Fernlund and Cooper-Shoup, 1991, p.66). Park (1992, p. 260) referred to hypermedia in terms of "the ability of a computer application to use more than one 'presentation medium' for the display of information." Richards, Barker, Giller, Lamont, and Manji (1991, p. 292) defined interactive multimedia as a type of software for
managing and organizing these various types of information media "...into a system so that the user can easily access, retrieve, and modify the information."

The primary changes brought about by the increased use of interactive multimedia lie in the very nature of teaching and learning. These changes have dramatic implications for the social studies. The expanding role of interactive multimedia in social studies is that of a powerful change-agent, giving students real-world skills to go far beyond a textbook, and preparing them for a global, technology-based future (Cohen, 1991; Gilkinson, 1991).

The differences between a traditional social studies lesson and one involving the use of hypermedia or multimedia were highlighted by Fernlund and Cooper-Shoup (1991). The classroom using multimedia was characterized by active, as opposed to passive, learning. According to Fernlund and Cooper-Shoup (1991) active learning is enhanced by the use of interactive multimedia with its "...stimulating visual images, the perspectives of multiple speakers in a variety of languages and the dynamic graphics that can be addressed at the request of a student," (p.67).
Active learning denotes a high level of interactivity (between the student and the material, student and teacher, and among students) and a degree of independence on the part of learners (Cohen, 1991).

The addition of sound, color, and motion into software offers students an opportunity to experience other cultures or eras in a more realistic way. With interactive multimedia, students are able to direct their learning and select what they hear and see. Gilkinson (1991, p.71) noted that programs which included simulations and/or timelines, help students gain a better sense of time and “visualize history and look for patterns as the chronology of historical events is illustrated.” This type of experiential learning about other eras or cultures, has the potential to reach social goals in the affective domain. Technology provides “...the opportunity for vicarious experiences and facilitates the discovery of intangible qualities such as mood, attitude, and feelings” (Gilkinson, 1991, p.73).

Development of information retrieval and processing skills is an important goal of social studies instruction and interactive
multimedia can assist students on several levels. Databases are a large component of most social studies software. They provide an opportunity for students to learn to navigate, locate, organize, analyze and interpret information (Gilkinson, 1991).

Interactive multimedia learning promotes student group research and presentation (Cohen, 1991; Fernlund and Cooper-Shoup, 1991; Gilkinson, 1991). Cooperative learning is a natural corollary to interactive multimedia in the social studies classroom. The active learning style involves students initiating questions, and working in groups to develop a problem-solving approach to projects (Cohen, 1991).

Assessment changes with the introduction of interactive multimedia into the social studies classroom. With access to multimedia research tools the logical next step is to produce multimedia reports using sound, stills, and video. “Producing a mixed media presentation provides new ways for students to demonstrate their understanding and actively participate in a team effort” (Fernlund and Cooper-Shoup, 1991, p. 70).
Changes in teaching style are concomitant with changes in learning style when interactive multimedia is introduced into the social studies class. The social studies teacher is no longer the sole deliverer of content in a multimedia setting, but becomes a manager and coach: selecting and evaluating media, directing its use, helping students select projects based on their interests, and providing feedback, guidance, and evaluation (Cohen, 1991; Fernlund and Cooper-Shoup, 1991; Gilkinson, 1991). In this model, Cohen (1991, p. 36) observed, the “...teacher and student are partners in the educational process which is essentially dialectic. Roles are often exchanged...as they explore topics of mutual interest.”

The challenge for the social studies teacher, particularly at the elementary level, of selecting and integrating multimedia into the curriculum is daunting. “Preparation time will consist more of selecting appropriate software sequences, designing student projects and identifying necessary skills...” (Fernlund and Cooper-Shoup, 1991, p. 70). Generic guidelines for evaluation of microcomputer courseware are not particularly valuable to the
social studies teacher as they do not focus on the specific goals of that discipline.

This need was addressed by the National Council for the Social Studies when they developed evaluation and selection guidelines relevant to the social studies. The report of the Council’s committee, (Rose, Brandhorst, Glenn, Hodges, and White, 1988, p. 197) noted the abundance of software, but stated, “...identifying that courseware most useful for achieving social studies goals and objectives is often problematical.” They outlined the development of guidelines by the Council, specifically for use in evaluation of social studies software. Pertinent to the development of this project were the evaluation guidelines for content emphasis on global perspectives and multiculturalism (p.200), cooperation and participation skills (p. 203), and values, assessed according to societal orientation, and the valuing process (p.204).

Interactive multimedia technology has the potential to support many of the goals of social studies education. An
examination of the role of multicultural education in the social studies curriculum brings further focus to this discussion.

**Multicultural Education in Social Studies**

The social studies have long included study of cultures and viewpoints other than those of the predominant culture. Etzioni (1991) traced the inclusion of multicultural themes in the social sciences, such as the need to overcome ethnocentric biases, from authors as early as the 1920’s. The author further stated (Etzioni, 1991, p. 65) a “greater reliance on social sciences in teaching future generations would help to evolve socially appropriate responses to the challenges posed by multiculturalism.”

The basic concepts of multicultural education came from educator’s efforts in the 1920’s, to integrate new waves of immigrants into American society, and the movement continued through the 1930’s. The subject was less prominent during the 1940’s through the mid-1960’s. A resurgence of interest in what was variously termed ethnic studies, intercultural education, or multiculturalism, was spurred by the Civil Rights movement and

The focus has changed from integration of immigrants into the American culture, to emphasis on various sub-groups, to a more inclusive approach: to educate about diversity while seeking to bring together disparate groups into a common culture.

Objectives of Multicultural Education

Addressing an increasingly multicultural audience is a global phenomenon affecting educators in many other countries as well as the United States. British and Australian educators have attempted to outline a set of multicultural objectives from which to build a framework for a multicultural curriculum. Among them: to enhance awareness of one's own culture, to build a multicultural society united by a common supraculture, and to develop a global perspective on citizenship (Khanna, 1991; Lynch, 1983, 1989).

Lynch (1983) identified basic principles for teaching a global multicultural curriculum, including the provision of a creative environment, respect for students, and a climate of acceptance. In
accordance with these principles, Lynch delineated a number of salient, practical teaching methods useful in a multicultural curriculum, among them, group investigation approaches, ethnic contact, and dramatic role-playing. Given a set of conditions for an efficacious instruction in an ethnically mixed classroom, following a global multicultural curriculum, Lynch (1983, p.11) stated that not only would students learn basic information, but they would realize “the stimulation of higher order thinking and some affective gains.”

The concepts, principles, and methods of multicultural education are in line with the recommendations for effective learning with interactive multimedia. The conclusion may be drawn that interactive multimedia would prove to be an appropriate instructional tool to meet the objectives of multicultural education.
Multicultural Education on Native American Cultures: Current Social Studies Curriculum

Multicultural education is a major focus of the California State Framework (1985, p.15), as part of the goal of cultural literacy “to develop a multicultural perspective that respects the dignity and worth of all people.” The Framework calls for integration of multicultural experiences into the curriculum at every grade level.

The value of multicultural education informs the current social studies curriculum, especially in the Middle Grades curriculum, Grades 4-8, where cultural diversity of Native Americans is stressed. Native American cultures are studied with various emphases: California tribes in Fourth Grade, major pre-Columbian settlements of the Southwest, Northwest, the Great Plains and the Mississippi in Fifth Grade.

Availability of culturally sensitive instructional materials on Native Americans has been a challenge for the social studies teacher. While the situation has improved slightly in recent years in terms of books, audiotapes, and some videos, as Shaffer-
Nahmias (1990) has indicated, there is a still a need for appropriate materials in all forms about native peoples.

Native Peoples of the Southwest is a set of five, objectives-based curriculum units, one for each of Grades 2-6. Its development by the Heard Museum in Phoenix, Arizona with a grant from the Flinn Foundation, was detailed by Shaffer-Nahmias (1990).

Social studies and art concepts were part of each instructional unit, with additional interdisciplinary activities. Based on humanistic themes, the “instructional objectives and attitudinal objectives were deemed to be of equal importance in development of the curriculum” (Shaffer-Nahmias, 1990, p. 73). Among recommendations offered for those designing instructional programs about other cultures, were to have thorough subject matter knowledge and to be wary of imposing a western worldview onto the other culture.

The package included pretests and posttests, student booklets, slide programs cued to instruction, audiotapes with narration, music, poetry, stories and overhead transparencies.
Three dimensional artifacts (a Hopi gourd rattle, Pueblo pottery, Apache basket, etc.), were included and keyed into the instruction and to art activities as part of the program, which allowed the learners to access a kinesthetic mode. This feature supported the addition of the three-dimensional model to the extension activities in the project. While an ambitious and worthy project, this is still traditional learning in the sense that the interactivity is teacher-centered, the material is linear in presentation, and the project includes no animation or video, which could have been used to illustrate certain aspects of the lessons and to enhance motivation.

Evaluation of multicultural materials involves respect and care. Citing an "escalating awareness of human diversity... and sensitivity to cultural differences," Stevens (1993, p. 5), in Videos for Understanding Diversity, outlined categories for critical analysis of multicultural materials as part of a project designed to help meet the increased need for a compilation of video material available for multicultural education. Thirty scholars compiled and reviewed videos for the American Library Association collection. Important areas of evaluation were the reliability of
the group perspectives presented; any special introductions needed for some viewers; limitations or biases; and implicit or explicit points of view in the materials. Two videos on Pueblo culture, both made by Hopi, in the Hopi language with English subtitles, are included in this comprehensive list (Stevens, 1993).

Slapin, Seale, and Gonzales (1988) examined children’s books for anti-Indian bias and gave examples of blatant stereotypes, subtle distortions, loaded words, offensive illustrations and dialogue. These examples, balanced by positive illustrations from recommended books, gave a clear indication of acceptable and unacceptable materials. These considerations guided the design and development of Pueblo Home.

Computer software on Native American topics is quite limited. North American Indians, is a CD-ROM database comprised primarily of historical photos and art, speeches, and documents. There were no audio components or dynamic graphics. The text was extremely dense and displayed in black on white backgrounds in scrolling text windows. Any graphics illustrating the text were shown in separate windows which were unwieldy
and confusing. The search capabilities were excellent. That, however, was the extent of the interactivity of this software.

As the responsibility to address multicultural themes and issues falls increasingly to the social studies teacher, interactive multimedia takes on a potentially powerful role in multicultural education. Clearly, a need exists for materials in this content area which fully employ the richness of all the elements of interactive multimedia.

Elements of Interactive Multimedia Design

Graphics

Graphic images, such as art work, photos, or video, are an important part of interactive multimedia. Graphic images have been defined as either static or dynamic and were deemed so important that several authors argued for designing interactive multimedia programs beginning with the images, and then adding text (Ambron, 1990; Nanny, 1990; O’Connor, 1993). Static graphics include still photos, art work, graphs, charts, and maps. Dynamic graphics include animation and video clips. Park (1994, p. 21) defined dynamic visual displays as any “pictorial or
graphical moment during instruction," from continuous motion video, to animation, to electronic behaviors (i.e. pop-in arrows).

Dynamic graphics are best when they enable the learner to do the impossible, to become smaller than a microbe or travel to Mars (Cates, 1989). Margo Nanny (1990), while helping to develop the Visual Almanac with the Apple Multimedia Lab, found that the most successful dynamic graphics for use in interactive multimedia were those which allowed the user to change perspective and to overcome human limitations by allowing for the control of some aspect of time and space. Control of space though change of location, angle of vision, or scale (size of the object or size of the viewer), and control of time through compression or expansion (time-lapse photography, instant replay) gave the user a more global perspective.

King, Dent, and Miles (1991) differentiated between static, analytical graphics such as bar graphs and pie charts, and dynamic presentation graphics, and examined differences in persuasive effect among three treatments (written text, static graphics, and dynamic graphics). Their findings indicated that
subjects exposed to dynamic graphics were more likely to be persuaded to take a specific action, i.e. pledge to donate money, than those exposed to text only.

Importantly, King, et al. (1991, p.275) also found that, "the analysis revealed no significant differences between the willingness to pledge for those subjects exposed to the dynamic graphics treatment versus those exposed to the static graphics treatment."

They concluded that while text employs a single mode, both types of graphical presentations utilized several modes of communication, and so, were more successful in attracting and maintaining the user's attention. "Involving the viewer is a critical variable affecting the creation of persuasive effect" (King, et al. 1991 p. 276).

Several researchers noted the fact that injudicious or inappropriate use of dynamic graphics can have a negative effect on cognitive load or prove to be distracting (Cates, 1992; Park, 1994). O'Conner (1993) also noted that still photos and artwork were equally effective as motion video in certain applications.
Cates (1992, p. 8) pointed out that 600 various illustrations, maps, graphics and photos of original documents can fit into the "sacrifice of just twenty seconds of full motion video."

Video and other dynamic visual displays are effectively used when they properly fit the instructional purpose and objectives of the interactive multimedia program (Cates, 1992; Nanny, 1990). Park (1994) noted several appropriate instructional roles of dynamic visual display: to focus the learner's attention, to illustrate structural or sequential relationships, to facilitate formation of a mental model, and as a visual analogy or anchor for abstract concepts or processes. The designer must choose both the proper type of graphic and allow for its relevant and appropriate use in an interactive multimedia program.
Text

Text, the written word, was described by Vaughn (1994, p. 195) as the system of communication in multimedia which can "deliver the most widely understood meaning to the greatest number of people - accurately and in detail." In traditional usage, text is generally read in sequence, however, in a multimedia treatment the designer cannot predict the exact order in which the learner will access text passages. Text which is too dense on the screen may not even be fully read. Research has shown that concise text messages are more likely to be read than long text passages (Vaughn, 1994).

Text can be organized in simple windows, scrolling windows, pop-up menus, or it can be organized as hypertext. Hypertext involves the use of a "hot" word on the screen, usually denoted in bold type, which is linked to related information. These nodes can be accessed by the learner via the mouse, in a non-linear, learner-centered manner. Segmented text, breaking the text apart into phrases in keeping with the natural rhythm of reading, has been
shown to be an effective technique to improve reading comprehension of on-line text, with both low and high functioning readers (Schweir and Misanchuck, 1994 p.234; Vaughn, 1994).

**Audio**

Audio in interactive multimedia has been defined as the use of speech, music, natural and synthetic sound effects, and interface sounds in the presentation of information (Whiteside and Whiteside, 1994). Audio may include digitized and synthesized sounds, and can be a very powerful tool in interactive multimedia. Channel redundancy, the use of two sensory channels to transmit similar or related information, should be congruent but not identical, and has been shown to improve understanding by affecting an alternate learning modality (Hannafin and Hooper, 1993; Whiteside and Whiteside, 1994). Motivation has been improved by the additional realism, atmosphere, and interest of narrative speech, music and sound effects (Whiteside and Whiteside, 1994).

Digitized sound may be taken from pre-recorded tapes or CD’s, live broadcasts, or cassettes custom-made for the interactive
multimedia program being designed (Vaughn, 1994). A cautionary note was sounded by Ambron (1990, p.120) when she reminded the designer of interactive multimedia, “sound is more intrusive than images or text.” Allowing some learner control of audio would be warranted to maximize the repeated use of the program.

Interface

The interface has been described as the “cognitive locus of computer human interaction” (Gassee with Rheingold, 1990, p. 226). The literature on interface design is massive. The development from the early text-driven interface through the icon-based interface to environments of multimedia and virtual reality has been extensively documented. The graphical user interface has been most commonly used in interactive multimedia.

The GUI (graphical user interface) promotes the exploration and discovery learning within the complex environment of interactive multimedia. Hix and Hartson (1993, p.89) maintained the GUI was “easy to design badly and can quickly overload a user with information.” Guidelines for avoiding this and other design
problems for the interactive multimedia interface abound, but researchers have agreed on a number of issues: be clear, be consistent, be as simple as possible, and use each element (graphics, video, color, music, narration) in a meaningful manner (Barker, 1990, 1991; Cates, 1992; Hix and Hartson, 1993; Richards, et al. 1991; Schwartz, 1994).

Members of the Interactive Systems Research Group (Richards, et al., 1991) have, individually and jointly, researched and written extensively about multimedia, especially the electronic book model. The authors have outlined four models of page structures for electronic books: overlay, oversize, dynamic, and tiled. Overlay page structures use overlapping windows to display multiple forms of information simultaneously. An oversize page structure represents the computer screen as a viewfinder, through which the user sees only one part of a large page at a time. The viewfinder must be moved around, in a manner similar to a spreadsheet program, in order to see the rest of the page. Dynamic page structures involve the construction of
pages by bringing up information from the storage system in response to the individual learner.

Tiled page structures present fixed areas within the display space, usually for text and graphics, allowing for coherent organization of information facilitating information transfer in the multimedia environment (Richards, et. al. 1991). Components should complement each other and increased design complexity could be a factor in terms of cognitive load (Richards, et. al. 1991).

Interactivity

Debate in the field over the definition of interactivity was chronicled by Laurel (1993 p. 21), who added her own observation that interactivity was the successful integration of variables of frequency, range, and significance of interactions, which gave the user the feeling they were "participating in the ongoing action of the representation." Empowering environments for problem solving have been discussed in the literature as the most suitable style of interactivity for multimedia. Direct manipulation is a style of interactivity used in learning environments. Elements of this style include continuous
representation of information, physical actions on the part of the learner, and rapid feedback to learner choices (Schneiderman, 1983). Direct manipulation is empowering in part, because it utilizes learner’s prior knowledge to recognize representations of familiar objects, and common physical actions like those on the Macintosh desktop (Weller and Hartson, 1992).

Weller and Hartson (1992) identified three metaphors for the nature of the direct manipulation style of interaction: tool, mimesis, and model world. The tool metaphor for interaction is that, as a tool, the mechanics of the operations should be invisible, and the model world immerses the user in the illusion and allows for user action on the objects in the model. Most designers would agree with Barker (1991, p. 143), in his conclusion that no single metaphor fulfills all the needs of learners and “often a hybrid strategy involving several different approaches can be advantageous.”

The contention of Weller and Hartson (1992, p. 325) was that “...the real distinguishing factor (of direct manipulation) is engagement, and that inevitably comes back to the mimetic
illusion portrayed in the interface.” Laurel (1986) described the interface as a mimesis and elaborated on this thesis further in descriptions of human-computer interactivity as analogous to theater. She compared aspects of theater and human-computer interaction as a series of actions/enactments represented by elements like images, language, and music, with a beginning, middle, and end. She noted that a sense of catharsis was helpful to provide closure and to satisfy the user (Laurel, 1986).

Other metaphors found in the literature include situated learning metaphors, the classroom metaphor, and the book metaphor (Chiou, 1992; Richards, et al. 1991). The book metaphor was a natural evolution from printed page to interface. The term electronic books has been used in the literature to define the conversion of a paper-based book to computer software, as well as the metaphor of a book with “pages” to “turn.” This metaphor has been applied both the design of the interface and the style of interaction involved. This is essentially linear multimedia which presents information with minimal branching. The addition of the linking dimension of hypertext would allow for more learner
control over the presentation of information (Richards, et al. 1991).

The game is another interactivity metaphor with implications for instructional software design. Researchers have studied the intrinsic motivation of computer-based games in an attempt to determine the relevance of game elements in the design of other types of applications (Carrol and Mack, 1984; Carroll and Thomas, 1988; Malone, 1980, 1981; Thomas and Macredie, 1994).

Thomas and Macredie (1994) have suggested that while features of computer games are not suitable in the design of productivity applications or systems, they can be effectively used in the design of instructional software. They identified from the literature, the features of intrinsically motivating environments: discovery, challenge (graduated levels of difficulty), fantasy, curiosity, complexity, control, goal formation, feedback or scoring, and competition.
Navigation/Branching

Instructional design has approached learning as a series of events of instruction, which have traditionally been presented to the learner in a predetermined, linear fashion in order to reach established goals, objectives, or behavioral outcomes. Interactive media and recent cognitive theories have precipitated a less linear approach to courseware design.

The non-linear structure allows for learner control of the selection, timing and form of presentation of information, which has been linked to increased curiosity and intrinsic motivation (Thomas and Macredie, 1994). Some structure must be imposed upon the access to information to prevent the user from becoming lost, to maintain a sense of place (Jonassen, 1985, 1991; Schwartz, 1994). Non-linear, branching software structure was made widely accessible by the introduction of Hypertext.

Hypertext navigation systems have been defined as a variety of nodes or units of information, and the associative links which allow the user to control access to the information. Jonassen (1991, p.89) has concluded from multiple studies of
hypertext that it is a “cognitive design tool and a learning environment in which the learner is an active participant in the construction of the knowledge base of the system, and concurrently, of his or her own knowledge base.

When the nodes of information are in multimedia form (i.e., text, graphics, and audio), the term hypermedia has been extrapolated from hypertext to describe the network of nodes and links (Barker, 1990). Many of the same guidelines for design and navigation in hypertext apply to hypermedia with added concerns of more opportunities for cognitive overload and confusion.

Each element of interactive multimedia design contains the potential for myriad combinations and permutations, and may be perfect in one application and annoying in another. Yet the key to their use lies in words found throughout the literature, repeated many ways. Designers of interactive multimedia software must utilize these elements in a manner “appropriate for the instructional purpose” and they must look to instructional design for direction.
Interactive Multimedia And Instructional Design

The field of instructional design has focused primarily on instruction as a series of events, presented to the learner in a predetermined sequence, to achieve predictable learning outcomes (Gagne, Briggs, and Wager, 1992). Recent trends in the instructional design of interactive multimedia learning environments have been increasingly influenced by cognitive learning theories. Contemporary cognitive learning theory has posited that learning is a process of knowledge construction, that learners build upon existing knowledge (Jonassen, 1991; Reeves, 1992; Thompson and Jorgenson, 1989).

Reeves (1992) outlined the development of a cognitive apprenticeship model of instruction based on cognitive strategies of modeling, coaching, and scaffolding, and which emphasizes acquiring skills and knowledge for meaningful tasks. He also suggested that interactive multimedia programs can offer activities and simulations which would support the cognitive apprenticeship model. The initial learning situation has been found to be important in transference. This has been defined by
Reeves (1992, p. 50) as, "...gaining knowledge, skills and attitudes in the context of their use." Thompson and Jorgenson (1989, p.25) first offered a model for interactive learning which combined both behaviorist approaches and a proactive, constructivist design with, "activities that are grounded in the learner's own evolving understandings of the experience." They cited Papert's use of the computer, not as tool or tutor, but as a medium for creating new thinking.

The optimal interactive design would, according to Jonasson (1985), reconcile cognitive and behaviorist theories. It would provide the organizational structure of the presentation, identify options open to the learner in order to achieve the instructional goals, and then allow the learner to control access to the information, to construct new knowledge. It has also been noted that learner control is more effective when metacognitive strategies are provided in the program or by the teacher to guide students in making choices (Bennett and Dwyer, 1994; Jonasson, 1985).
Gagne (1992, p. 71) defined metacognition as the “use of cognitive strategies to monitor and control other learning and memory processes.” A schema representing the learning goal serves the metacognitive function of relating prior knowledge to the goal toward which learning is aimed, and monitoring incoming information for relevance to the goal (Gagne 1992, p. 182). In Pueblo Home, a goal schema is embedded in the directions included in the main menu to make students more aware of the purpose of learning activities within the program (see Appendix A, Figure 2).

**Evaluation and Efficacy of Interactive Multimedia**

Researchers (Clark and Craig, 1990; Reeves, 1992; Yildiz and Atkins, 1993) have traced the evaluation of courseware from the 1950s to the present and agreed that while instructional designers and educators may intuitively believe in the efficacy of interactive multimedia, many studies have shown no significant advantages to the use of new technologies over traditional media. However the studies themselves have often been faulted in both
their design and implementation (Clark and Craig, 1990; Yildiz and Atkins, 1993).

Early research concentrated on straightforward comparisons of traditional media to new technologies. The 1970s brought criticism that the design of media comparison studies tended to result in "no significant difference" conclusions, regardless of the media employed (Levie and Dickie, 1973, in Clark and Craig, 1991).

Factors which have been found to most influence the effectiveness of interactive multimedia applications were the design of the user interface, the design of the interactions, and the individual differences in motivation, aptitude and prior knowledge brought to the program by the users (Reeves, 1992). These are actually three aspects of a single instructional method: interactivity.

Recent studies of interactive multimedia have concluded that the instructional method, particularly interactivity, can be more relevant to successful achievement of learning than the media involved. Hannafin (1984) noted that the cognitive effects
of interactivity, employed in a single medium, as well as multiple media, can accrue to even common human interactions between teacher and student. Clark and Craig (1991, p. 26) in their review of several meta-analyses of interactive videodisc and interactive multimedia research, concurred, noting "...various instructional methods (such as interactivity) are responsible for the measured achievement gains when multiple media treatments are compared with more "conventional" single media treatments. This result has been found with each successive wave of new media and technology for at least the past seven decades of education research."

Research on the effects of varied visual interactive strategies by Bennett and Dwyer (1994), further focused the discussion in the literature on the idea that simply including these interactions in an interactive multimedia application does not automatically improve student achievement. They concurred with Joanasson (1985) that some explanation of how the interactivity helps one learn may be helpful in supporting the cognitive
strategy of metacognition. This cue might be offered by the teacher or embedded in the interactive multimedia program.

A distinction has been drawn between formative and summative evaluation. Formative evaluation has been defined by Flagg (1990, p.1) as "the systematic collection of information for the purpose of informing decisions to design and improve the product." Among a number of evaluation strategies outlined by Flagg were observation of an individual learner, pilot studies, field tests, and expert review. After employing these strategies for assessment, the designer modifies the program, and tests again. This qualitative, iterative process of trial and revision is an extremely important aspect of design.

Traditional experimental or quasi-experimental evaluation designs would be best used in summative evaluation. While both formative and summative evaluation are important components of instructional design, summative evaluation is generally undertaken after the application has been refined through the formative evaluation processes (Reeves, 1992).
CHAPTER III

Goals And Objectives

Goals

Goals of the Project

The goals of the project were: (1) to determine the status of the study of Native American cultures in the elementary social studies curriculum and the availability of appropriate technology-based materials, (2) to design and develop an interactive multimedia program that will address findings regarding the status of interactive multimedia in social studies, (3) to support the objectives of multicultural education in social studies by making available interactive computer-based material, (4) to utilize the elements of interactive multimedia design in the development of computer-based instructional material, and (5) to incorporate into the project acceptable instructional design and learning theories. The research led to development of an interactive multimedia CD-ROM on the topic of Pueblo
architecture, consistent with the objectives of multicultural education, which could be implemented in the social studies curriculum at the Fifth Grade level.

Goals of Pueblo Home

The goals of the Pueblo Home interactive multimedia program include: (a) to enhance awareness of the diversity of Native American culture in the United States, (b) to foster curiosity about building forms, techniques and materials, about how dwellings reflect the people, land, and climate (c) to, by comparison and contrast, enhance awareness of the student’s own culture, and (d) to help students develop a broader perspective on citizenship.

Objectives

From these goals, the objectives of the CD-ROM software were constructed so as to address a wide range of social studies knowledge and skills: from simple verbal information, to motor skills, to objectives in the affective domain, such as attitude (Gagne, Briggs, and Wager, 1992).
After using the Pueblo Home CD-ROM, students should have acquired the following competencies:

1. Given a picture of a pueblo, the student will be able to accurately identify the elements of pueblo architecture.

2. Given a paper cut-out with the various elements of pueblo architecture the student will construct a three dimensional model of a pueblo home.

3. Given a series of questions, the student will analyze the architecture of his/her own neighborhood and compare/contrast it with that of a pueblo.

4. Given oral questions the student will demonstrate an awareness of the diversity of Native Americans by naming more than one Pueblo tribal group.

5. Given a question about how values and beliefs affect human behavior, the student will describe one value or belief of the Pueblo people which influenced their architecture.

6. Given opportunities to contact other people/groups, students will demonstrate an awareness of citizenship in a wider world by selecting to write to people or organizations, to use the internet, or visit a pueblo.
CHAPTER IV

Method and Results

Method

Instructional Design of Pueblo Home

The design of Pueblo Home was influenced by the objectives of the social studies and particularly of multiculturalism. Pueblo Home was intended to enhance awareness of the diversity of American society and one’s own place in the culture, and thus, to help to build a society united in respect for differences. It was designed to encourage exploration of the values and beliefs which influence human endeavors, and to help students develop a sense of themselves as citizens of a wider world.

Teaching methods discussed in the literature as useful in a multicultural curriculum, were included in the design of Pueblo Home. Group investigation approaches and dramatic role-playing were utilized in the suggested extension activities (see Appendix C). Ethnic contact and exposure to life in a pueblo, were simulated by creating a learning environment rich with details of daily life,
to transport students to the arid lands where people have built homes for centuries.

Varied learning modalities were addressed by the multiplicity of media. Visual learning, for example, has been enhanced by animation, the color of graphics and text, and maps. Audio narration of text and music improve aural learning. Kinesthetic learning was supported by both physical user actions on the computer and by extension activities such as construction of the three-dimensional model pueblo.

The program was designed to provide freedom for discovery within a structure for the presentation of information. Once learner options in the main menu have been identified, the program allows for learner control of sequence and rate of access to information. Metacognitive strategies were provided in the program by cueing students as to the instructional objectives, to help guide their learning selections.

Pueblo Home was designed to provide an intrinsically motivating environment through the fantasy of being asked to imagine another way of life, and by employing the natural
curiosity children have for Native American cultures. The development of the software and extension materials was intended to support students working in cooperative groups, to identify the elements of pueblo architecture, or answer thought-provoking questions, as part of the active learning style, a natural adjunct to interactive multimedia.

**Interactive Multimedia Design of Pueblo Home**

The images used in the program's design were drawn from the author's extensive portfolio of original work as a professional artist, or created by the author for the software. Static graphics, (i.e. photos, artwork, and maps of the Southwest depicting the area of Pueblo tribes) were used to isolate the individual elements of Pueblo architecture, to illustrate the process and sequence of making adobe bricks and plastering, to help students locate the geographic area (see Appendix A for illustrations). Dynamic graphics, such as the animation of the construction process, were designed to focus attention, to illustrate structural or sequential relationships, and to give the learner a change of perspective on space and time (see Appendix A for illustrations). The video
sequence was included to motivate students and to link their learning to the extension activity of building a model.

Concise, clear text passages were used, along with some segmented text. Text boxes, which remain consistent throughout the program, were used to organize text in what is essentially a tiled page structure as used in electronic books (see Appendix A, Figure 3). The Flesch-Kincaid Grade Level Scale and Flesch Reading Ease instruments are included in the CorrecText Grammar Correction System software within Microsoft Word 6.0. The text of Pueblo Home was analyzed for readability using this software and scored at a 5.3 grade level on the Flesch-Kincaid Grade Level scale, and rated a Flesch Reading Ease score of 80.1.

The use of audio in the program included music and the oral pronunciation of key words. Original music, taped by the author at various Native American gatherings, was recorded directly into Authorware and used to create atmosphere. Narrative speech was included to help students with pronunciation of unfamiliar words. Hearing a word, as they also read it, provides learners with
channel redundancy, or the involvement of two sensory channels to improve understanding.

The interface was intended to convey the beauty and earthiness of adobe architecture, the textures of the Southwest, and the traditional patterns and colors of Pueblo tribes. It was designed to be clear and consistent in terms of recurring elements such as background, layout, color of text, and buttons. Consistency was also viewed in terms of maintaining the atmosphere of the Pueblo in terms of the adobe wall surface and adobe brick buttons.

Interactivity in Pueblo Home involved a combination of strategies. Elements of direct manipulation included the continuous representation of information on the computer screen, physical actions on the part of the learner (dragging labels to complete the puzzle, clicking the mouse,) and rapid feedback to learner choices (when an object is selected in the main menu). Interactions from the metaphor of games included employing fantasy, curiosity, and discovery.
Technical Considerations: Hardware

The configuration of hardware, the computers and peripherals used in the design and development of the project were as follows:

- Macintosh Quadra 610
- Macintosh Power PC 7100/66 AV
- Apple Color OneScanner
- Mirror external 1.4 Gigabyte Hard Drive
- Hitachi Hi-8 Camcorder
- Sony CVD-1000 Hi-8 VCR

Technical Considerations: Software

Authoring System

The choice of an authoring program was influenced by prior experience with Hypercard, Supercard, Macromedia Director, and Authorware. Hypercard did not support the color and other media necessary for the project. Supercard, while employing color, still did not provide enough flexibility and ease of use. Both applications also required the use of scripting in an authoring
language. **Director** is often used to design interactive multimedia, although it is not strictly speaking an authoring program. **Director**, however did not provide the kind of interactivity or recording and analysis of student responses found in **Authorware Professional**.

Macromedia’s **Authorware Professional** is an object-oriented authoring application designed to develop interactive multimedia instructional programs. It is designed to support industry standard operating systems and networks. Cross-platform authoring and playback for the Macintosh and Windows environments are both available in **Authorware**.

It utilizes an iconic interface and a flowline. Scripting in a programming language is not necessary. The program is modular, in that icons can be easily moved, edited, or reused. Standard cut, paste, and copy operations can be carried out on icons in the flowline.

Certain characteristics make **Authorware** particularly suited for instructional design. Interactivity is built in and data collection features allow for input of learner responses, answer
analysis, progress and performance evaluation. Responses can be judged and instruction adjusted to the individual’s needs.

Multimedia is supported in Authorware by the integration of elements including video, sound, and animation from diverse sources. Although the program has a toolbox, it is somewhat limited and most designers would prefer to create animation, artwork, and graphics in other applications such as Painter, Director, or Illustrator, then import them into the authoring environment.

Navigation design in Authorware is flexible. Several models are provided which can be used as templates for certain types of interactions, including the typing of students’ responses into the program (Macromedia Program Information, 1993, p. xvi). These responses are tracked, and can then be analyzed by the teacher.

Graphics Applications

The majority of images used in Pueblo Home are the original photographs, paintings, and pastels of the author, transferred into digital form onto Kodak Photo CD. Original photographs were scanned on the Apple ColorOne Scanner, while a few photographic
images were taken from the Corel Photo CD, New Mexico. Ofoto software was used to scan printed images.

Processing and enhancement of images was done in Adobe Photoshop 2.5. The background texture seen throughout the program was created by cropping a section of a digitized photograph of an adobe wall, then tiling it in Photoshop to repeat the texture. Button graphics were created using the Authorware tool palette and PICT images from the program itself. (See Appendix A for illustrations).

Fractal Design's Painter was used to add color and to create original images. The map of New Mexico and its keys were created in KidPix. Video Monitor was used to digitize Hi-8 video on the Power Macintosh and Quick Time for importing digital video into Authorware.

Hypercard animation effects were imported into Authorware to create the construction sequence, which was drawn by the author (see Appendix A, Figure 5). Text animation effects were created in the program using Authorware's animation capabilities and text created in Photoshop.
Results

Formative Evaluation of Pueblo Home

Two types of formative evaluation of Pueblo Home were undertaken with Fifth Grade students at Sea View Elementary School's Technology Center located in Salton City, California. Testing of individual students was used to determine usability of the program. Cooperative learning groups were used to assess motivation and transfer of learning.

Individual Evaluation

Individual evaluation was conducted with six students from the Fifth Grade class. These students were given a pretest, then they used Pueblo Home. Feedback from students was collected and revisions were made in the program. The same six students repeated the program one week later and took a posttest.

As a pretest, the students were shown a copy of the picture used in the main menu with the elements of pueblo architecture numbered. They were asked several questions about the picture and asked to identify the numbered items (see Appendix B, Figure 1). The results of the pretest are shown in Appendix B, Figure 2.
After working with the program, each student was shown the picture again and asked the same questions. The results were an improvement in the students’ ability to recognize the elements of architecture, from 29 correct responses on the pretest to 55 correct responses on the posttest (see Appendix B).

**Group Evaluation**

In a subsequent evaluation, with the involvement of the teacher, two groups of three students used the program and built a three dimensional model using the extension materials. The level of excitement and sense of discovery was enhanced when the interactive multimedia was accessed in these cooperative learning groups.

The members of each group were highly motivated to work together to discover information within the program, to discuss their navigational options, to read the text, and to compile their answers to questions. Students were actively engaged in the construction of knowledge, as they referenced prior knowledge about buildings, or adobe, or an horno that a grandmother used in Mexico. They spoke of their dream homes, and the houses they
live in now. They talked about the materials used to build houses, and guessed what they may be like in the future. Architecture is a neglected discipline and the students seemed to relish this exposure to it.

After working with Pueblo Home, the groups constructed the three-dimensional models of an adobe building in the extension materials (see Appendix C). The students needed to be able to transfer learning from the software to their models in order to complete the them and meet the objective of constructing a model of a pueblo home. Every student in each group made a model and they grouped them to form a pueblo-like arrangement of buildings with a plaza space. One group decided to make their vigas and ladders of wood, instead of paper. This idea spread, and soon other innovations were being made, such as adding ramadas of wood and building an horno out of clay.

Interactive multimedia, and active learning in cooperative groups proved to augment each other significantly. The teacher's response was highly favorable and noted that the program filled a gap in the curriculum both in terms of material on Native
Americans, and in terms of the lack of attention to architecture. He remarked on the students’ active engagement with the software and the high levels of transference of information to the building of the model.

Revisions to the Program

The reading level was appropriate for the majority of Fifth Grade users, although there was great disparity in reading abilities among those using Pueblo Home. The use of segmented text facilitated students’ reading in terms of their phrasing and intonation, as observed by the author.

Some specific sources of confusion in text were noted. For example, the sentence “This ancient tree has ‘witnessed’ countless ceremonies.” proved to be confounding to every user of the program. When asked what the word meant, one student discussed it in terms of testifying in court. The text was changed to read, “This ancient tree has been the center of countless ceremonies.” Further testing has shown that the change eliminated the confusion.
The following revisions were made in the program as a result of the formative evaluation: (a) use of segmented text and revision of confusing text, (b) inclusion of an oral pronunciation of key words, (c) speeding up the introductory animation, (d) clarification of directions and metacognitive cues included on the main menu, and (e) providing a continuous navigational link back to the main menu.
This project has attempted to document the advantages and power of interactive multimedia to address issues and themes in multicultural education in the social studies. The major goal has been the development of an instructional software program which fills a need in this content area, utilizes the full potential of the medium, incorporates sound instructional design, and is supported by current learning theory.

By their very nature, interactive multimedia instructional programs have the potential to be interdisciplinary and access a variety of learning modalities. Interactive multimedia is able to augment instruction and promote social skills in classrooms which are increasingly multiculturally diverse. The experiential qualities of interactive multimedia simulations and interactivity can affect attitude, feelings and beliefs about oneself and others.

The Pueblo Home project addresses the principles and methods of multicultural education through its attempts to
represent ethnic diversity, to enhance awareness of students' own cultures, and to develop a sense of global citizenship. The active learning style of the program supports student-centered and cooperative learning.

The media elements in the Pueblo Home CD-ROM were utilized to improve understanding and support learning in a variety of modalities. These elements included: static graphics, (art work and maps), dynamic graphics (animation and video), text passages (concise, segmented), and audio (Native American music and oral pronunciation of key words). The interface was designed to display the art work, photos, and textures in a beautiful manner, and to be clear, consistent, and easy to use.

Interactivity in Pueblo Home involved a combination of strategies: direct manipulation, rapid feedback, and learner control of sequence and rate of access to information. Pueblo Home was designed to be intrinsically motivating, employing game elements of challenge, fantasy, curiosity, and discovery.

During formative evaluation, students were actively engaged in the program, working together to discover information, to
navigate, to read, and to answer questions. Knowledge construction based on prior knowledge was a part of the learning, and transference came into play when students built the model or compared Pueblos to their own homes. Creative problem solving included making decisions to color the models the same colors as they had seen in the CD-ROM, and to make vigas and ladders of wood.

This was a useful instructional program for the sample students, in that they found it easy to use, and their ability to correctly answer the target questions on the posttest improved, after using the Pueblo Home CD-ROM. Future quantitative research on the efficacy of Pueblo Home would be indicated as part of the process of summative evaluation.

Several areas for improvement of the program became evident over the course of development and evaluation. A small, brief animation (an animated petroglyph image or pottery design element) at the end of each branch from the main menu would alert students to the end of that branch and reinforce the successful completion of the segment.
Interactivity would be improved by incorporating the extension activities into the CD-ROM at the juncture where the particular subject of the activity appears in the program. This would allow students to type in their answers to questions in the program or build a virtual reality version of the model within the program.

The puzzle was a popular element and more challenges of this type (a vocabulary game or a "Jeopardy"-type game) would be motivating additions. Feedback in the form of drum beats, shouts, or music could be added to reward the students' successful completion of each game. More short sections of music and narration of Native American poetry on the subject of home would add interest.

An expanded video component could include video of actual construction or video interviews with Native American residents of the Pueblos. An interview with a Native American child discussing life in a Pueblo home would be compelling for students. The development of an on-line pals project for students to communicate with their Pueblo counterparts, or a search for
internet resources on the Pueblos would further bring the learning into real life.

This project has provided an example the iterative nature of the development of interactive multimedia instructional materials. A project is designed, evaluated, improved and expanded upon. The users of the program provide valuable input to the development. Innovations in technology or developments in learning theory may drive changes to a program. Pueblo Home is the foundation, the potential exists for continued construction.
Appendix A

Illustrations
An ancient ladder from Acoma Pueblo, this one has double rungs and a carved top piece holding it together.

Before the late 16th century, for security from invasion, pueblitos were built without doors or windows and people entered through holes in the roof.

When threatened, they could go inside and pull the ladders up behind them.
Appendix B

Evaluation Instruments
Appendix B

Figure 2 Pretest

**PUEBLO HOME**

+ = a correct answer
- = an incorrect answer
0= no answer

<table>
<thead>
<tr>
<th>QUESTIONS:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Answers)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. What type of building is this? (A pueblo or a house)</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>2. Who do you think made it? (Native American people or Indians)</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>+</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>3. What do you think it is made of? (Adobe, clay, or mud)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>4. What is #1? (Horno)</td>
<td>0</td>
<td>+</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5. What is #2? (Ramada)</td>
<td>+</td>
<td>+</td>
<td>0</td>
<td>+</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6. What is #3? (Vigas)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>7. What is #4? (Ristra)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>8. What is #5? (Window)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>9. What is #6? (Door)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>10. What is #7? (Canale)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11. What is #8? (Ladder)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
## Appendix B

### Figure 3 Posttest

**PUEBLO HOME**

+ = a correct answer  
- = an incorrect answer  
0= no answer

<table>
<thead>
<tr>
<th>QUESTIONS: (Answers)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2. Who do you think made it? (Native American people or Indians)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<td>3. What do you think it is made of? (Adobe, clay, or mud)</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4. What is #1? (Horno)</td>
<td>0</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>5. What is #2? (Ramada)</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>6. What is #3? (Vigas)</td>
<td>0</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>7. What is #4? (Ristra)</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>8. What is #5? (Window)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>9. What is #6? (Door)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>10. What is #7? (Canale)</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
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<td>+</td>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
Appendix C

Extension Materials
Objective: Given a series of questions, the student will analyze the architecture of his/her own neighborhood and compare/contrast it with that of a pueblo.

Materials: Pueblo Home CD-ROM, What about your home? handout, pens, pencils, etc.

Lesson: Discuss Pueblo Home with students before they use the software. Set the stage by asking them to notice, while they are going through the program, how pueblos are different or similar to their own homes.

Questions on the student handout are:
1. What are the homes like where you live?
2. Do many families live in one building or are they single-family homes?
3. What is the climate like where you live?
4. How does the climate affect the way homes are built?
5. What materials are used to build homes in your area?
6. What shape are the houses?
7. How is your home different from a pueblo home?
8. What are some ways in which your home is similar to a pueblo?

Conclusion: Use the answers to spark discussion in class, or to write reports, or create one of the extension activities.
What about your home?

Think about what you have discovered about pueblo homes. Answering these questions can help you compare what homes are like where you live to homes of the Pueblo people.

Describe the homes where you live?

Do many families live in one building or are they single-family homes?

Describe the climate where you live?

How do you think the climate affects the way homes are built?

What materials are used to build homes in your area?

What shape is your house?
What color is your home?

What is the roof like?

How is your home different from a pueblo home?

What are some ways in which your home is similar to a pueblo?
Art:
- Color, cut out, and construct the included three-dimensional model of a pueblo building.
- Draw a picture of a pueblo and include all the elements.
- Draw a picture of your dream home. Think about all the things you would like in your dream home, and draw them.

Role-play:
- Imagine you are a Pueblo Indian person. Tell what is like to live in an adobe house.
- In cooperative groups, students write a skit about people who live in different types of homes, and how their houses are different or alike.

Video:
- Create a video of illustrating types of homes found in your neighborhood, or near your school.
- Videotape the construction of a house which is typical of your area.

Multimedia Presentation:
Collect or create pictures to compare and contrast a variety of dwellings from around the world. Describe them in text, add narration, animation, music, and sound effects. Use KidPix Slide Show, Multimedia Workshop, or a similar program to create the presentation.
Objective: Given a paper cut-out with the various elements of pueblo architecture the student will assemble a three dimensional model of a pueblo home.

Materials: Pueblo Home CD-ROM, Build a Pueblo Home handout, small milk cartons, scissors, glue, crayons, etc.

Lesson: Discuss with students what they learned about adobe buildings and the elements of architecture in Pueblo Home. Follow the directions to build a model of an adobe house.
Follow these pictures to construct a model of a Pueblo Home.
This pattern needs to be enlarged by 50% on a copy machine, to fit a small milk carton. Students can then cut the pattern out along the solid lines, and fold it along the dotted lines.
Color and cut out these parts and glue them to your model of an adobe house.
RESOURCES


SOFTWARE RESOURCES


