

**Just for Kids: an Interactive Children's Web Site  
for Cincinnati Museum Center**

By

Natalya Kelly and Amy Camberos

Submitted to  
the Faculty of the Information Engineering Technology Program  
in Partial Fulfillment of the Requirements for  
the Degree of Bachelor of Science  
in Information Engineering Technology

University of Cincinnati  
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## **Abstract**

*Just for Kids* is an interactive, multimedia based way to raise the level of interest of children in the Cincinnati Museum Center through the use of games and puzzles. The current site for the Museum Center is aimed at adults and thus misses a large part of its potential audience, the children. The Cincinnati Museum Center has commissioned this children's addition to their Web site to capture the attention of younger visitors. This is a part of a long term branding effort to engage children's attention with exhibit inspired activities. We created this Web site using colorful interfaces, easy navigation and engaging different cognitive skills that are based on exhibits at all three museums and therefore create direct appeal to children to visit. Our site was designed using the latest tools: Macromedia Flash, ASP.NET and SQL Server. The site is easy to maintain for staff, gather important information about attendees, and increase the level of trust concerning child Web usage among adults, while offering positive activities that accomplish several educational goals of the Museum Center in a user friendly format attractive to children.

# **Just for Kids: an Interactive Children's Web Site for Cincinnati Museum Center**

## **1. Statement of the Problem**

This project was conceived after conversations with local businesses and their education executives (14, 16), after a review of the local Cincinnati Museum Center Web site (2) and other children's Web sites, and after conversations with the directors and staff of the Cincinnati Museum Center (5, 11, 13).

Cincinnati Museum Center is one of the great attractions in Cincinnati that includes three museums in a renovated Art Deco train terminal, Union Terminal. These museums are: Cinergy Children's Museum, Cincinnati History Museum, and Museum of Natural History and Science. The Museum Center also has an Omnimax Theatre.

The increased interest of children in the Internet drives a lot of organizations, especially those designed mostly for children, to adopt their Web sites to children's needs. This interest has led the Cincinnati Museum Center management to think about creating an addition to their existing Web site that would be intended for their younger visitors. The current Web site wasn't created with children as users in mind. The Museum Center needs a Web site that will help to bring the Museum to children's homes and bring the children into the Museum (11).

## **2. Description of the Solution**

All three museums provide exhibits for children as they try to incorporate more interactivity into those exhibits. Because educators today pay more attention to the different psychological aspects of learning, they reinforce interactive learning as one of the ways to educate children (17). While existing activities in the museums are becoming more interactive and effective, interactive multimedia helps implement and reinforce this

interactivity on the Web. Interactivity in learning is "a necessary and fundamental mechanism for knowledge acquisition and the development of both cognitive and physical skills" (15). Our Web site gives "visual learners and those with special needs new and powerful ways to comprehend complex phenomena" (4). To stimulate children's interest, we created a Web site where children and schools can gain educational information about the museums and the exhibits through activities and games. To create this Web site we used our programming, multimedia, and database knowledge.

In our discussion with Gwen Olmstead, the former director of Cinergy Children's Museum (11), Libby Hagen, current director (5), and Kelly Rickenbaugh, manager of marketing communications (13), we determined what functionality they wanted to see in the Web site. The Web site should include the following:

- Be friendly enough for children considering the fact that children do not like complicated descriptions and confusing links;
- Have one to two interactive activities for each museum, where children can learn of some exhibits virtually;
- Reflect the exhibits of all the museums and Omnimax Theatre;
- Have a teachers'/parents' section where they could sign up and log in to, to read more information about activities they can perform with children;
- Have gathered login information securely;
- Allow for print out of activities that teachers and parents can perform together with children;
- Not require heavy technical support.

Our product is user-friendly for children with easy-to navigate interfaces, which are designed using Adobe Photoshop, interactive games, activities, and animation. The

interactivity is created using Macromedia Flash, as this product can implement graphics, music, and animation all at once. It is also an effective tool for delivering low-bandwidth animations (6). Our main goal is to provide children with a Web Site that they will call their own.

Our Web Site also fosters a broader knowledge of the museums by providing a tour of all the exhibits of all three museums and interesting facts about the museums and Omnimax Theatre.

The Web site has a space where teachers and parents can learn more about what they can do with their children to help them learn and grow. They can easily print this information out. To view these pages teachers and parents have to log in. If they are not registered yet, they have to register. The information gathered from registering will help the Museum Center to see where the interested users live and whether they would like to receive mail and e-mail about new events and exhibits. Microsoft SQL Server 2000 database was used to collect registration information. To connect to the database and to check the login, ASP.NET was used. It is designed to create dynamic and interactive HTML pages for Web sites. This new Microsoft technology also provides capability to ensure that the connection to the database is secure (12).

As children are one of the targeted audiences for the Museum Center, the application helps to promote long-term branding of the Cincinnati Museum Center through interactive activities.

## **2.1 User Profile**

Our Web site is designed for three categories of users who have different levels of information technology (IT) literacy: children, teachers and parents, and the Web site

administrator, who is responsible for maintaining the database and e-mailing campaigns. All users are expected to be familiar with Web browsers. See descriptions and examples of the design in the next section.

Since children are the main targeted users for our Web site, the graphical interface is designed with children in mind. Bright colors and easy navigation is the first consideration. Children usually have only basic knowledge of computers; we realize that they do not like long descriptions and confusing links. Considering this, the navigation for our site is simple. In most cases children won't have to go through more than two to three mouse clicks to get to a location or game. Even though we try to make the navigation as simple as possible, we hope that younger children from ages 2 to 5 will get help from their parents to get to the Web site and access location or game. The older children will find not only the activities on the Web site, but also the interesting facts and information about all the museums and Omnimax Theatre.

Only a few pages were designed for the next category of users, teachers and parents. This category of users is also broad and it is possible that users may either have high levels of IT literacy or low levels of IT literacy. Thus the interface is simple and does not require special skills other than general knowledge of an Internet browser. These pages include the informational pages with the option to print them, and registration and login pages with forms that are easy to fill in.

Our last group of users are people who will maintain the Web site after we are done supporting it. We considered that Cincinnati Museum Center doesn't have a full time IT person who will maintain the site, so most of the site will not need maintenance because it doesn't have a lot of changing information. The only part that will require

constant support will be the members' database that eventually will be combined with the existing Museum Center's members' database. To maintain the Web site the person must have HTML skills and familiarity with Microsoft SQL Server 2000.

## **2.2 Design Protocols**

The main graphical interface for the site was created using Adobe Photoshop 6.0. Adobe Photoshop is a perfect tool for graphics creation and for editing digital photographs. Adobe Photoshop is a powerful visual communication tool, which makes it easier to create, resize, crop the images, and correct their color, both for print and for the Web. Beyond that, "it provides a laboratory for synthesizing textures, pattern, and special effects that can be applied to photos, graphics" (3). The graphical interface is designed for 800 by 600 screen resolution, which is mostly used today.

Macromedia HomeSite was used for HTML, DHTML and ASP.NET hand coding. HomeSite uses a customized user interface for site building, management, and deployment. Site management tools like Productivity Wizards are also included. This product allows a developer to have complete control of the productivity, usability and interactivity of a site's Web content (6). We chose to hand code HTML and ASP.NET pages for several reasons. First, we felt it provides better control of the code and better readability. Secondly, in a professional environment our experience is the industry's preferred way of Web site development. Lastly, hand coding significantly improved our knowledge of HTML, JavaScript, and ASP.NET.

Games and animations were created using Macromedia Flash 5.0. As we mentioned earlier, this product can implement graphics, music, and animation all at once, and is an effective tool for delivering low-bandwidth animations. Also over 98 percent of

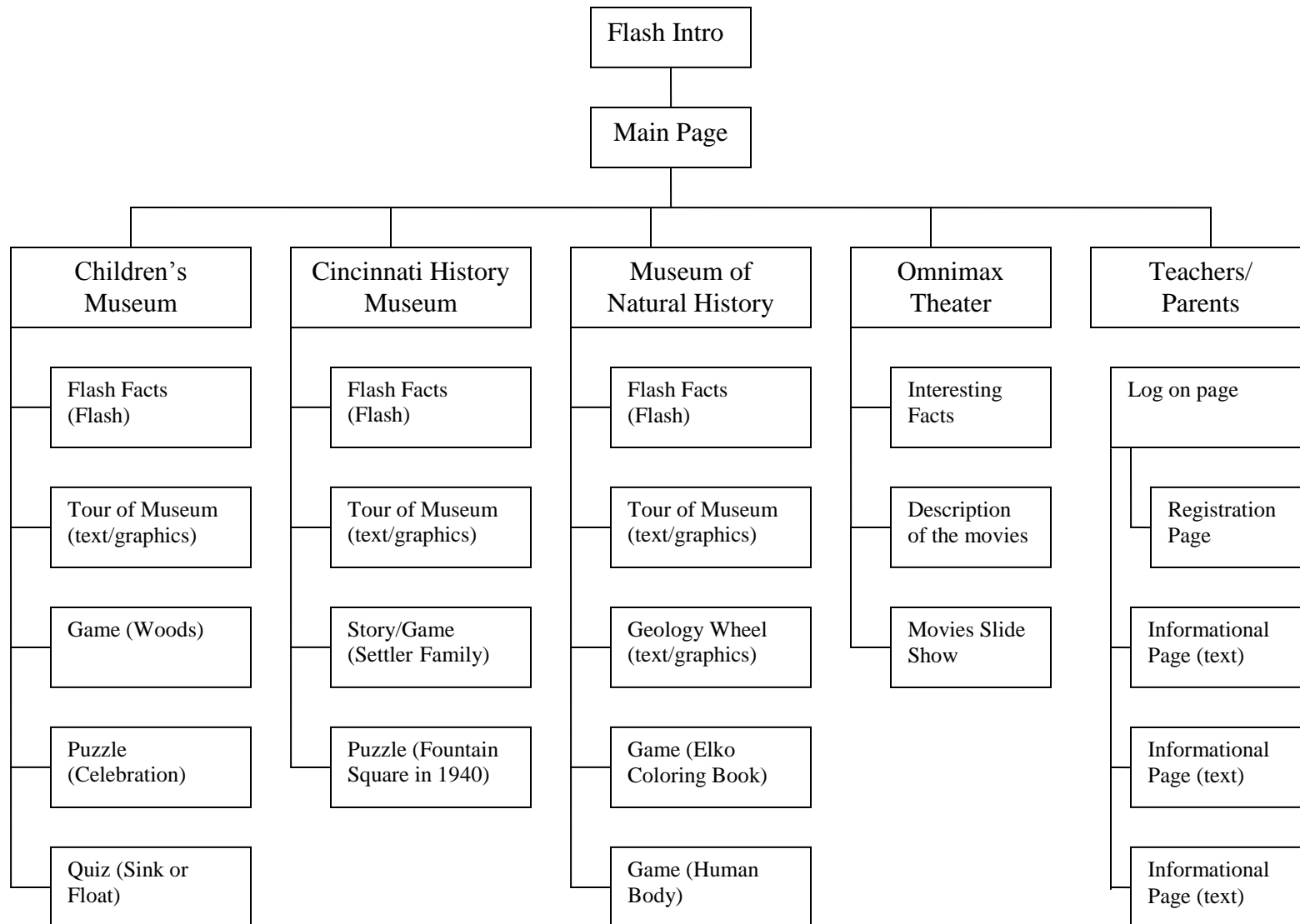
on-line audiences can seamlessly view flash content once the Macromedia Flash Player is loaded (6). While this is a powerful authoring tool, we found the learning curve challenging and time consuming. Also, graphical editing in Flash turned out to be not as flexible as we expected.

Microsoft SQL Server 2000 was used to collect voluntary mailing list information from teachers or parents. Microsoft SQL server provides more scalability, reliability, and security than MS Access. SQL Server 2000 is a fully Web-enabled database that provides support for Extensible Markup Language (XML). SQL Server 2000 has a high level of default security and introduces a collection of sophisticated security features such as auditing, event tracking, and network encryption (9).

ASP.NET (Active Server Pages.NET) was used for login and accessing the database. ASP.NET is not the only technology that can be used to implement connectivity but it is one of the most current, increasingly popular in the industry, and also one of the fastest (12). ASP also provides capability to ensure that the connection to the database is secure.

Our Web site has a Main page with a Flash introduction. There is an option to skip the introduction. From the Home page there are five links, links to each museum, Omnimax Theatre, and teacher's/parent's pages. Each museum has links to two or three games and to the tour of the Museum page with graphics and text, and flash facts page with Flash animation. The Web site contains seven games and interactive activities, descriptions of which can be found in Proof of Design section. Children's Museum's Link page also has a link to Children Just Like me section where children can read about children all over the world. Omnimax Link Page has links to interesting information

about the theatre and a Flash slide show. The teachers and parents section contains a member sign up and member login and informational pages. The outline of the Web site can be found below (See Figure 1.).



**Figure 1. Just For Kids Outline**

The first page of the teacher's and parent's section has a member login. If the user enters correct information he/she will be redirected to the page with links to information about various activities. If the login information is incorrect an error will appear indicating an unauthorized login and giving the option to sign up for a new account. A new member registration page will come up when the user clicks on the Register link. After completing the information correctly the user will be redirected to the page with links to information about various activities. An SQL database contains the following information acquired voluntarily from users: First Name, Last Name, Phone, Address, Organization, Email, User ID, and Password.

The users can easily navigate with the help of buttons. Buttons are designed to look like Web buttons so that children can clearly see them. Game buttons are supported by pictures representing the games, which helps to identify them visually for younger children.

All pages are linked to a style sheet, which contains the font and colors setup for the whole site. The color scheme of the Web site was chosen to reflect the hues of the monumental tundra mosaic murals created by the German born artist Winold Reiss that adorn the walls and ceilings of the Museum Center. The murals, commissioned during the Great Depression, were intended to uplift spirits by showcasing strong and hardworking Americans (7). While Reiss depicted harsh industrial scenes, he used soft rainbow hues. These hues are the palette used and are consistent with the Museum Center's main Web site. See the comparison of the Main page for the kid's section with the Main page for Cincinnati Museum Center's site below. (See Figure 2. and Figure 3.)



Figure 2. Just For Kids Main Page



Figure 3. Cincymuseum.org Main Page

### 3. Deliverables

In order to provide a well-organized project certain items were considered necessary for a child-friendly site. During the design phase of this project the following deliverables were defined:

- Visually appealing Flash Introduction
- HTML user interfaces that represent each museum and allows simple user navigation
- Cinergy Children's Museum, Cincinnati History Museum, and Museum of Natural History and Science sections that contains tour, facts, and games pages
- A minimum of six different games divided among three museums' sections
- An Omnimax informational section with Flash advertisement
- A parents and teachers section providing information about the activities they can perform with children
- Secure login, authenticated by the SQL Server 2000 database, and registration pages for the parents & teachers section using ASP.NET to communicate between the client and database
- An SQL database that collects user registration data from ASP.NET registration page

## **4. Design and Development**

The next sections describe the project's timeline, overall budget with hardware, software, and book costs.

### **4.1 Timeline**

The project involved several challenges, learning mistakes/opportunities, and accomplishments. Below are our achievements of the Senior Design sequence.

#### **4.1.1 Senior Design I Accomplishments**

During Senior Design I we accomplished the following:

- Analyzed high-rated children's Web sites
- Performed research of client's needs
- Considered the specific needs of the targeted audience
- Increased knowledge of Web authoring tools
- Structured site design and layout
- Began the development process
- Developed our proposal and oral presentation

During research and gathering of information we spent hours studying what other museums', zoos', and aquariums' Web sites had to offer children. We also looked at many Web sites that were created just for children. During that research we found several inspiring examples that significantly increased our desire to work on this project and produce a good result. Some of the Web sites that inspired us most are listed in Appendix A. When we looked at these Web sites we were trying to notice what kind of activities they had for children, what color schemes they used, how their activities reflected their exhibits. This research significantly helped us to prepare for our

conversation with Cincinnati Museum Center representatives and determine the client's needs and create a visually appealing design.

#### **4.1.2 Senior Design II Accomplishments**

During Senior Design II we accomplished the following:

- Designed database with Web connectivity
- Created user interface
- Started development of interactive games and activities
- Prepared Design Freeze documentation and oral presentation

Designing the Web site and game interfaces, collecting the necessary images, adjusting them to the site's need took an unexpectedly long time. There were two different mindsets involved during the developing of the project. Programming was an integral part of interactive game design, while graphic design was necessary to create a visually appealing site. The balancing of the two disciplines proved to be time consuming and tedious. On the other hand, we found that Flash ActionScript event driven capabilities to be useful in graphical game and activity development.

#### **4.1.3 Senior Design III Accomplishments:**

During Senior Design III we accomplished the following:

- Completed game programming
- Tested site design
- Modified project as needed
- Completed documentation for the project
- Presented the final project

During the initial acceptance testing process we discovered that the loading time of Flash games on 56Kb modems was longer than expected. Because of this we had to investigate PhotoShop, Flash, and Premiere settings and we were able to accomplish significant reduction of final file sizes. The detailed timeline can be found in Appendix B., Timeline.

## 4.2 Budget

The budget for the project is shown in the table below. Because we had academic licenses for most of the software required for this project the prices listed below are real world costs of software pricing and were not actually our purchase prices. Machine costs were already incurred prior to the conception of the project (See Figure 4.).

<b>Software</b>	
<b>Item</b>	<b>Cost</b>
MS SQL Server 2000 (9)	\$1299.00
Visual Studio.NET (8)	939.00
Macromedia Flash (6)	399.00
Macromedia HomeSite (6)	100.00
Adobe Photoshop (1)	545.00
Books and Graphics CDs	300.00
MS Windows 2000 Server (10)	999.00
Total Software:	\$4581.00
<b>Hardware</b>	
<b>Item</b>	<b>Cost</b>
Machine 1 Estimated Value	\$2000.00
Machine 2 Estimated Value	900.00
Total Hardware:	\$2900.00
<b>Grand Total:</b>	<b>\$7481.00</b>

**Figure 4. Budget**

## 5. Proof of Design

The next section shows in detail how deliverables of the project were fulfilled and what challenges we encountered.

### 5.1 Flash Introduction

The first impression of the site is important. Therefore, a visually appealing Flash introduction welcomes users to the Web site. A child-friendly animation of the train comes out of the Museum Center's Union Terminal and invites children to explore what exciting features the Museum Center has to offer (See Figure 5.).



**Figure 5. Splash Screen**

### 5.2 HTML User Interface

After the introduction runs or the user chooses to skip it, the main page with the HTML user interface appears. Screen shot of the Home page and its description was mentioned in the Design Protocols section. The rest of the pages that include the information about all three museums and Omnimax Theatre are also HTML pages with some JavaScript. Only the teacher's/parent's pages of the site have an ASP.NET

extension of .aspx. This section contains the connection to the database that requires server-side backend programming which was performed with ASP.NET. To make the navigation as easy as possible no confusing links were used and buttons were used way to navigate between pages and access games. All the game links are supported by the descriptive pictures which show what the user can expect from the game.

### 5.3 Three Museums' Sections

The third item in the Deliverables section states that Cinergy Children's Museum, Cincinnati History Museum, and Museum of Natural History and Science sections would contain tour, Flash facts, and games pages. The user can easily get to all these pages once she opens the main links page for the specific museum where all the links-buttons are supported by the pictures. A screen shot of the links page for Cincinnati History Museum is shown below (See Figure 6.).



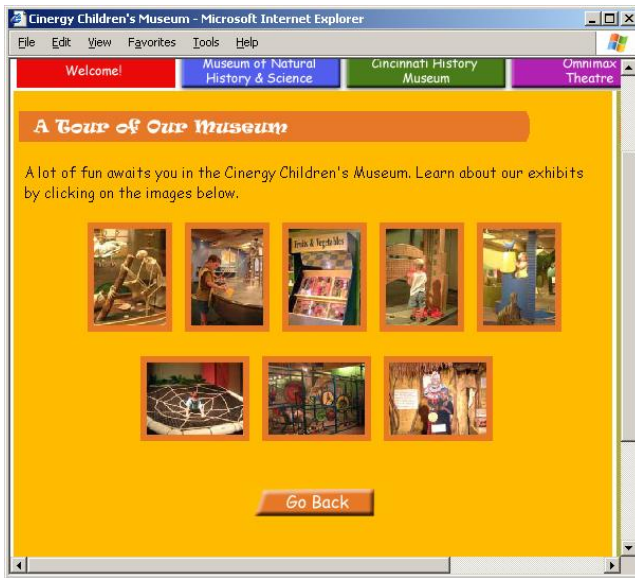
**Figure 6. Cincinnati History Museum Links Page**

The user can get to the links page for a specific museum from any page as the navigation bar is present on all the pages (See Figure 7.).

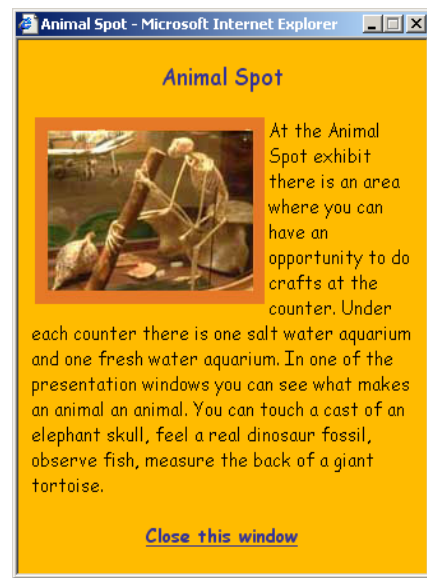


**Figure 7. Main Navigation Bar**

By selecting the link “Take a Tour of Our Museum” the user finds himself/herself on the page with pictures representing the exhibits of the museum. When the user rolls over the picture it displays the name of the exhibit. After the user clicks on the picture it opens a small window with interesting information about the specific exhibit. So that children would know that they should click on the pictures, each facts page has instructions on it (See Figure 8. and Figure 9.).



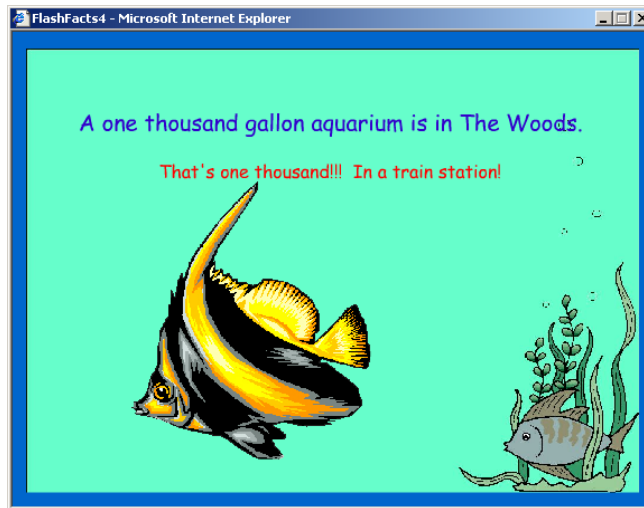
**Figure 8. Cinergy Children’s Museum Tour Page**



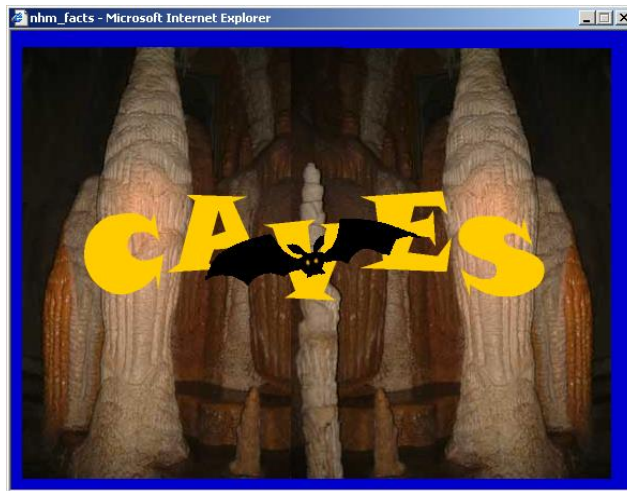
**Figure 9. Animal Spot Exhibit**

Flash facts pages are different for each museum, but they’re all created using Macromedia Flash. When the user clicks on the “Flash Facts about Our Museum” link, the Flash animation displays fun facts about the Museum’s exhibits which should be interesting for children. The pictures used in animations were either taken by us during

our visits of the museums or were used from the clipart gallery to help make the facts that are usually boring for kids more visually appealing (See Figures 10., 11., 12.).



**Figure 10. Cinery Children's Museum Flash Facts**



**Figure 11. Museum of Natural History and Science Flash Facts**



**Figure 12. Cincinnati History Museum Flash Facts**

The games created for the Web site are described in the Analysis of the Games section below.

#### **5.4 Analysis of the Games**

One of the Deliverables listed a requirement of a minimum of six different games distributed among three museum's sections. There are seven games in the Web site. Three of them are for Cinergy Children's Museum, two for Natural History Museum, and two for History Museum. The majority of the pictures used in the games were designed and created by us.

##### **5.4.1 Games for Cinergy Children's Museum**

Three games were created for the Cinergy Children's Museum section: water quiz Sink or Float, The Woods game, and the Celebration puzzle.

###### **5.4.1.1 Sink or Float**

The first game for Children's Museum, the Sink or Float quiz, was created to reflect its Water Works exhibit. This exhibit has a "river" that runs through the gallery and "becomes a hydraulics laboratory where children can experiment with power of

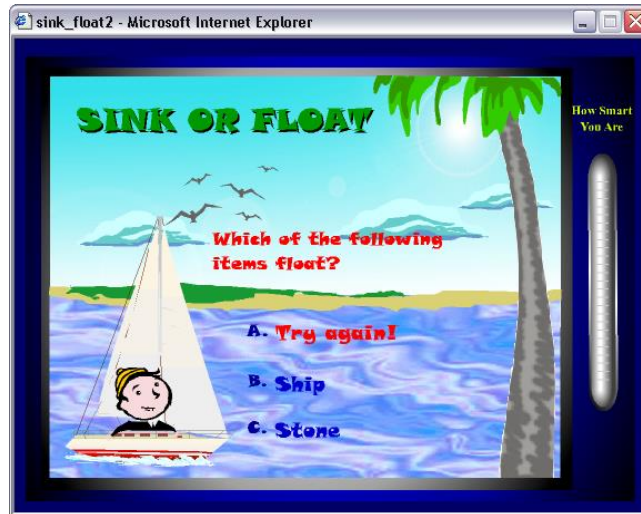
water” (museum’s website), to see if objects will sink or float, to make rain, and to perform other activities.

Sink or Float quiz contains ten questions about what sinks, what floats and about water in general. Some of the objects that are used in the questions are the objects in the exhibit itself; some are just a part of our life. The water scene background was created to support the topic with a sunny sky and a ship with conductor Billy, who travels through the exhibits together with kids. The game consists of three scenes. The first scene is the loader (See Figure 13.).



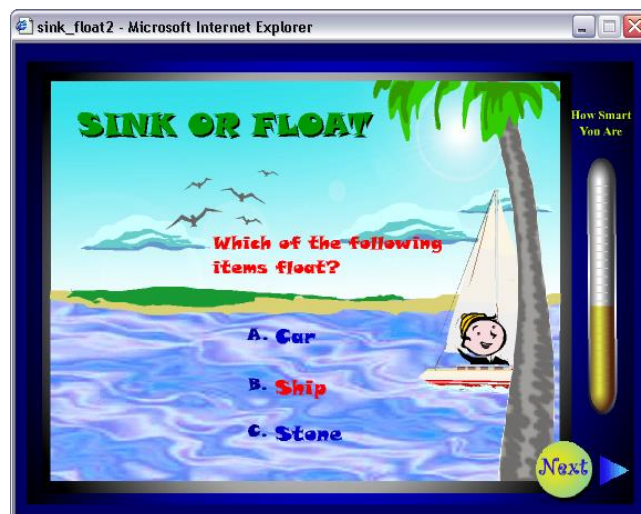
**Figure 13. Sink or Float Loading Screen**

The second scene is the quiz itself. As children prefer to get positive rather than negative feedback this quiz is designed so that after answering a question incorrectly the player gets notified to “try again” until he/she gets the right answer (See Figure 14.).



**Figure 14. Sink or Float Incorrect Answer Screen**

When player answers the question correctly, positive feedback “Good Job!” is heard, a sound clip is played, a small animation takes place, and the “Next” button appears. At the same time, when a question is answered correctly the bar that indicates the score goes up and shows the child how clever he/she is. To achieve this, Meter movie was created to show the score. Programmatically the meter’s score is incremented with each correctly answered question and the Meter movie is played. Below is the screen shot of correctly answered question with the meter in action on the right (See Figure 15.).



**Figure 15. Sink or Float Correct Answer Screen**

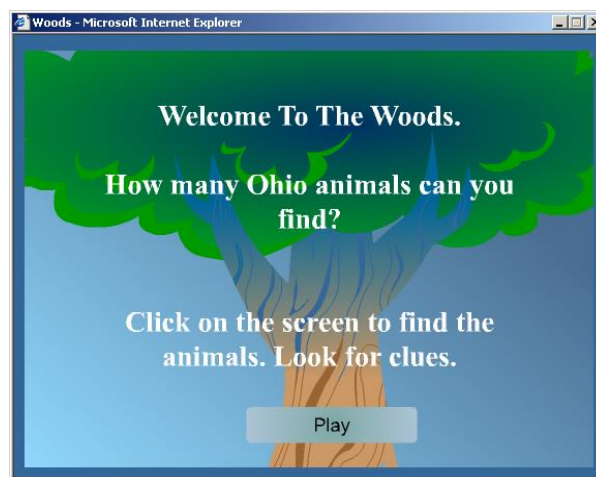
After all the questions are answered, the final screen comes up with positive feedback “Good Job!” and an option to play again (See Figure 16.).



**Figure 16. Sink or Float Positive Feedback Screen**

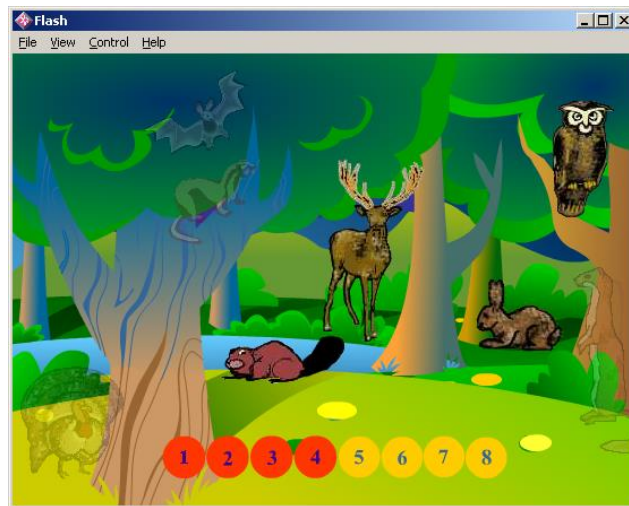
#### **5.4.1.2 The Woods**

The next game, The Woods, was designed to reflect the Cinergy Children’s Museum’s The Woods exhibit. The first scene of the game is the splash screen, which contains game instructions, and a “Play” button, that will take a child to the game. The focal point of this screen is one large tree graphic, which is reminiscent of the Children’s Museum three story hollow climbing tree (See Figure 17.).



**Figure 17. The Woods Splash Screen**

The first level of the game depicts a lush woodland landscape, which is intended to reflect native forest environments of the Ohio River Valley. This is the first level of the game. The user can see eight animals that are set to only 25 percent transparency. This is the simpler of the game's two levels. A child can click on any of the animals to see them appear in full color. This event then increments a visible number counter located on the bottom of the screen. After each animal is selected a sound clips signifies how many animals the user has found so far with each corresponding number of the counter changing color. This is intended to help a young child's counting skills. The animals on the screen reflect animals indigenous to the Ohio River Valley. The game is modeled after the exhibit's animal finding activities (See Figure 18.).



**Figure 18. The Woods Level 1**

The second level of the game is more complicated. The scene depicts the woods at night, creating a more perilous feeling. The scene is composed of dark blue colors, with a full moon reflecting drops of moonlight on a graphical pond. The animals in this level are now set to 0 percent transparency to make it more difficult. This scene also contains more animals than the first scene. The animals in this scene are a bit more

sinister, such as a wolf, a mouse and a snake. The second level also increments the number of animals that a child has found. On both levels, when a child has reached the maximum number of animals contained in a scene two new movie clips disguised as buttons appear which allow the child to toggle between levels. In this way a child can replay a scene as many times as he/she wants (See Figure 19.).



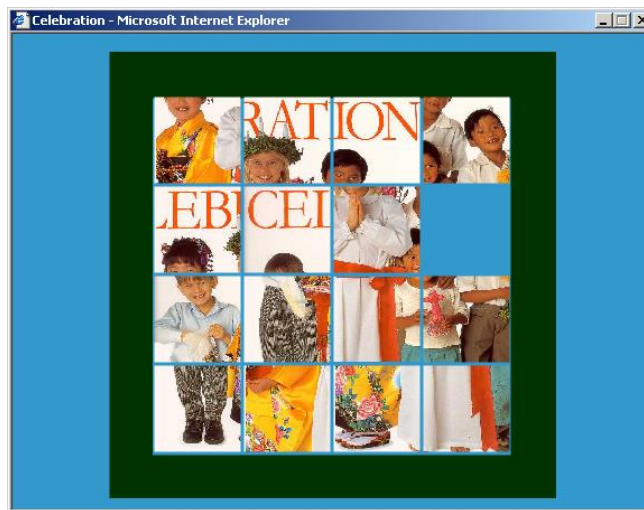
**Figure 19. The Woods Level 2**

Both levels of The Woods are organized in the same way programmatically. Each scene has an Action movie clip, which controls all of the elements within the scene. The Action clip contains all of the code for the movies events, such as loading events, and mouse events. The method of program organization greatly simplifies the development and maintenance process because otherwise each separate movie clip or all of the animals in the scene would require the same code.

### **5.4.1.3 Celebration**

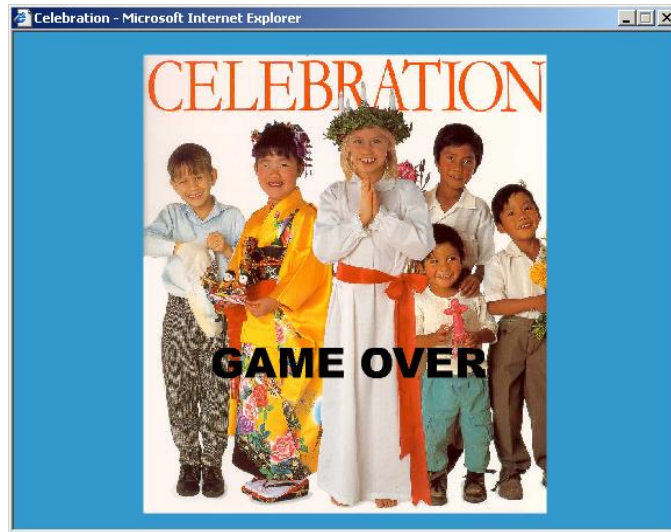
The puzzle Celebration is modeled after the Children Just Like Me Cinergy Children's Museum's exhibit. This exhibit is based on a series of books published by UNICEF. This exhibit is geared to an audience between 8 and 12 years of age. The

backdrop of the puzzle is the cover from a book in this series entitled *Celebration*. This picture was chosen for the puzzle because it has an uplifting scene that contains a demographic of children from different international locations representing their favorite celebration. The Flash puzzle is designed after the classic plastic sliding puzzle that many children have spent many hours laboring (See Figure 20.). It contains 15 different movie clips that represent each piece of the puzzle. The difficulty of this game is at a level intended for the targeted age group.



**Figure 20. Celebration Sliding Puzzle**

Once a child has completed the puzzle and all pieces are in the correct location, another scene loads, signaling that the game is over. This required the use of two arrays recording both the x and the y values for location of the mouse after each puzzle piece slide. Two separate arrays were needed because ActionScript doesn't support multidimensional arrays. First the array positions were recorded at the beginning of the game's loading event before the pieces are randomly scattered. This original array value is then compared with a new array that is build through and iterative loop that checks all pieces. See Appendix C 1. If the two pieces match, the game is over (See Figure 21.).



**Figure 21. Celebration's Game Over Screen**

The last scene also provides a Flash motion tween animation to reward the child's efforts.

#### **5.4.2 Games for Museum of Natural History and Science**

The Museum of Natural History and Science's section of the Web site contains the educational animation The Geology Wheel and two games: Elko Coloring Book and The Human Body.

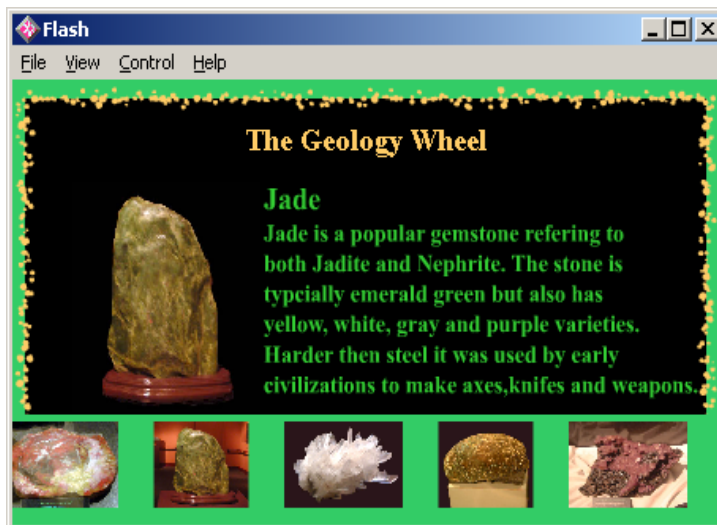
##### **5.4.2.1 The Geology Wheel**

The Geology Wheel was designed to reflect the museum's wealth of geological exhibits. All pictures in the Flash animation were taken directly from museum exhibits using a high quality digital camera. We wanted to showcase the minerals in a manner that would be visually appealing to child but would also allow for the textual display of information about each element. For this purpose a sliding wheel, which scrolls in the directions of the user's mouse location, was chosen. A black background mimics the atmosphere in the Museum and allows the best visibility. The viewing area is framed in a bright green that reflects similar hues in the site's color palette (See Figure 22.).



**Figure 22. The Geology Wheel**

The animation contains ten separate elements that a child can select by clicking them with a mouse. When a child has clicked the desired picture information appears above to educate a user about the selected element (See Figure 23.).



**Figure 23. The Geology Wheel Information Display**

#### 5.4.2.2 The Human Body

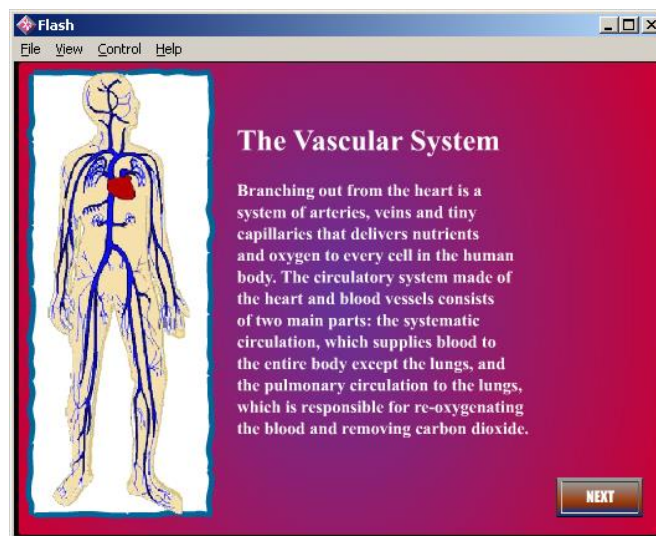
The Human Body game was inspired by the All About You exhibit of the Museum of Natural History and Science. The first scene is a click and switch animation

that provides information about the different systems in the human body. The backdrop is a sanguine red with a deep blue radial gradient. First the user is instructed to click on an outline of a human body to see what lies inside (See Figure 24.).



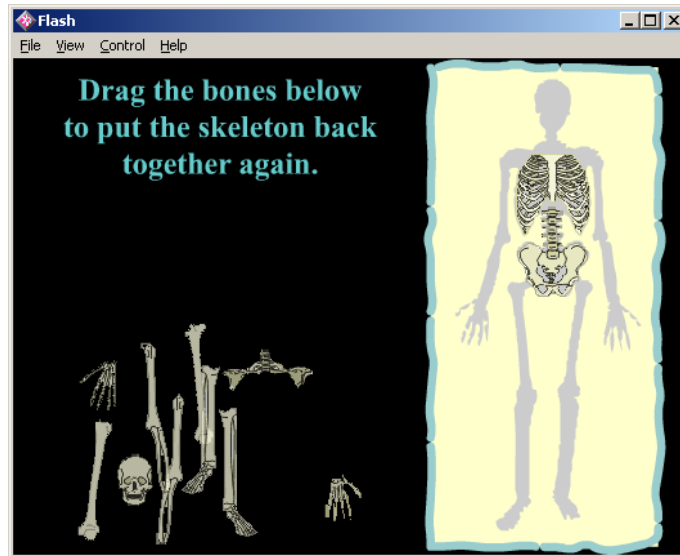
**Figure 24. The Human Body Part 1**

After each click the correlating body system appears. When all systems have been selected, the Next movie clip pops up which will take the user to the next scene (See Figure 25.).



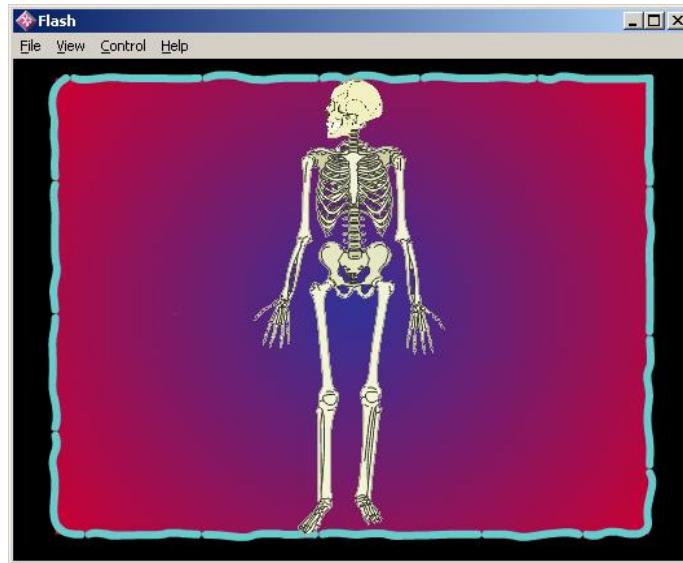
**Figure 25. The Human Body System Information**

The second level is a drag and drop game that lets a child create his/her own skeleton. A black background is used to create a macabre atmosphere. The bones fragments are set to 50 percent transparency until dragged to the proper location then the fragments brighten to 100 percent transparency (See Figure 26.). Each time a bone is put into place a sound plays to give the user feedback.



**Figure 26. The Human Body Skeleton**

After all the pieces are selected and the skeleton has been completed, an animation of a moving skeleton appears on the original sanguine background. After the animation is finished a flashing game over scene automatically appears (See Figure 27. and Figure 28.).



**Figure 27. The Human Body Skeleton Animation**

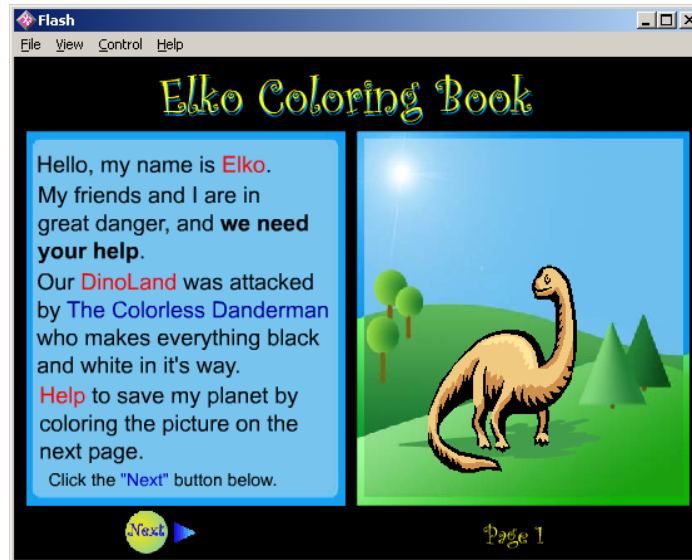


**Figure 28. The Human Body Game Over Screen**

### **5.4.2.3 Elko Coloring Book**

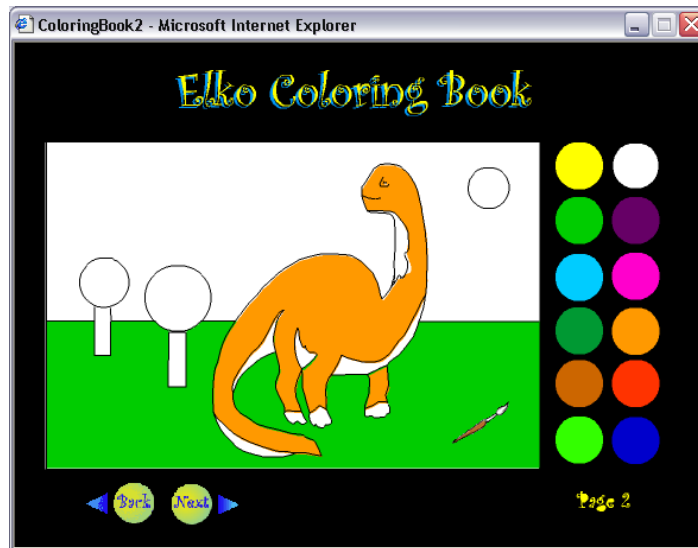
The next game for the Museum of Natural History and Science is a coloring book, called "Elko Coloring Book". This game was created for the museum's Dino Hall exhibit, which contains a lot of prehistoric animals. The game starts with a short story about dinosaur, Elko, who asks the user to color the next screen because his DinoLand

was attacked by The Colorless Danderman who makes everything in his way black and white. This is the first screen of the game. Rich and bright colors are used on the black contrast background to show how pretty the DinoLand can be if it is colored and at the same time to show that it is in danger. Small animation of the dinosaur takes place as well as some dramatic music in the background (See Figure 29.).



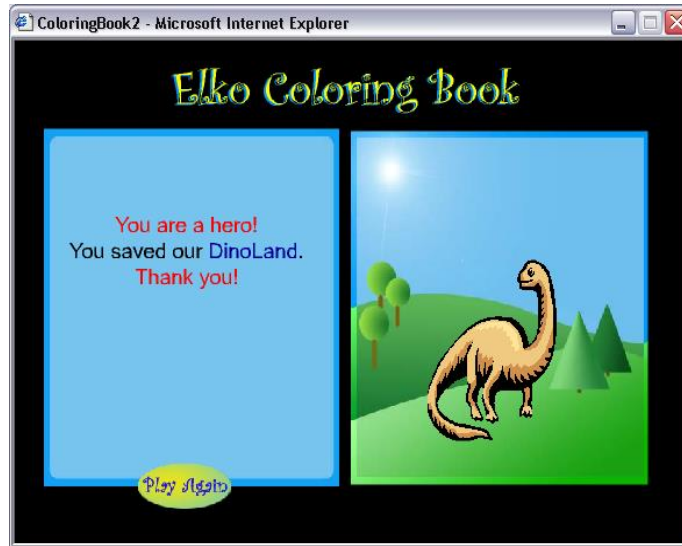
**Figure 29. Elko Coloring Book Introduction Scene**

After the user clicks on the “Next” button a coloring book screen appears. This screen contains a black and white picture that has to be colored and few color swatches that can be used. All of the color swatches have the same code behind them, only the colors hexadecimal numbers are different. To create these swatches only one Color Swatch movie was used and then the instances were created for each color. To make the coloring book work properly, the separate sections that have to be colored were produced as separate movie clips with buttons inside them. These movie clips had to be placed on a separate layer from an outline layer. Below is the main scene of the game (See Figure 30.).



**Figure 30. Elko Coloring Book Main Screen**

To make coloring more fun, the regular mouse cursor was changed to a paint brush cursor by hiding the mouse and assigning mouse properties to the paintbrush picture. The cursor changes back to regular cursor when the user rolls over the navigation buttons of the scene. To achieve this effect on(RollOver) and on(RollOut) events were inserted into the code of the buttons. See the code snippet in Appendix C 2. The final screen of the game is the positive sound and text feedback with an option to play the game again (See Figure 31.).



**Figure 31. Elko Coloring Book Final Screen**

### **5.4.3 Cincinnati History Museum**

There are two games in the Web site for Cincinnati History Museum. One of them is Settler's Family story-game and another is the Fountain Square 1940 puzzle.

#### **5.4.3.1 Settler's Family**

The story-game called Settler's Family tells the story of early an German settler's family, and how they decided to move from Pittsburgh to Cincinnati in search of better life. The game reflects the History Museum's "Cincinnati: From Settlement to 1860" exhibit. This exhibit is very big, so we concentrated on a couple of parts of it that we noticed attracted children's attention most, during our few visits to the Museum and conversations with its directors, the flatboats and traveling along the river. The exhibit has "activities especially for children including negotiating a canal boat through a 50-foot model of the Miami and Erie Canal or imagining floating down the Ohio River on a child-sized flatboat" (2). Therefore, in the middle of the story telling of the game kids are required to help Schultz's family to put only necessary belongings on a small flatboat. The game has a background music that is suitable for the story. We wrote our own little

story but it closely follows the facts from the exhibit. The background used for the game looks like an old paper with the feather that writes the story.

There are seven scenes in this story-game. The first two scenes tell the story about Schultz's family and how they decided to make a journey from Pittsburgh to Cincinnati on a flatboat (See Figure 32 and Figure 33.).



Figure 32. Settler's Family Story Screen 1

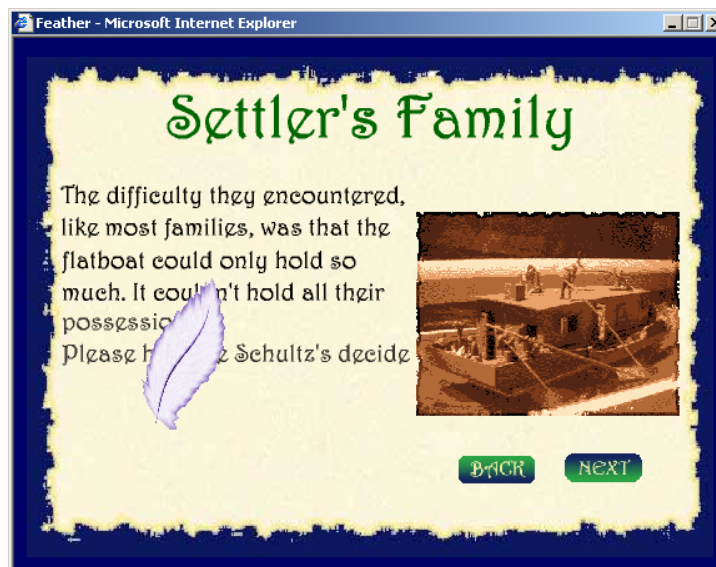


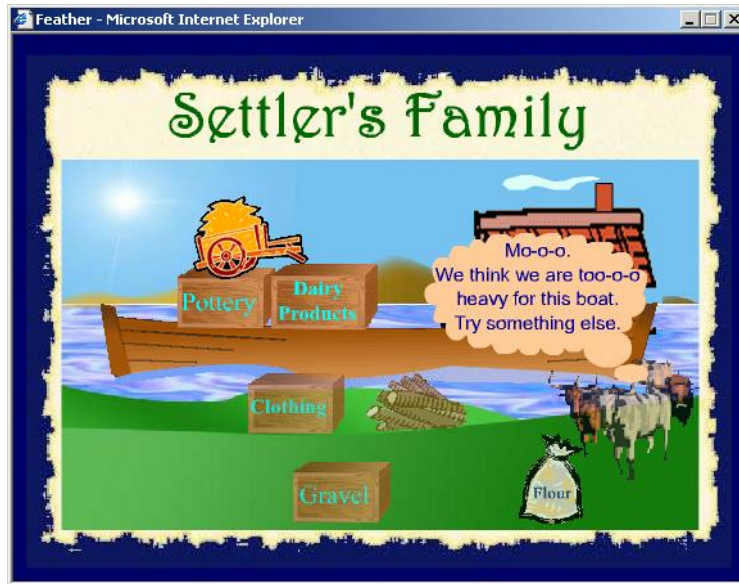
Figure 33. Settler's Family Story Screen 2

The next scene has instructions for the upcoming game. It is important for the user to read these instructions; so to attract user's attention to them we put an effect in the text that makes it change its size and color (See Figure 34.).



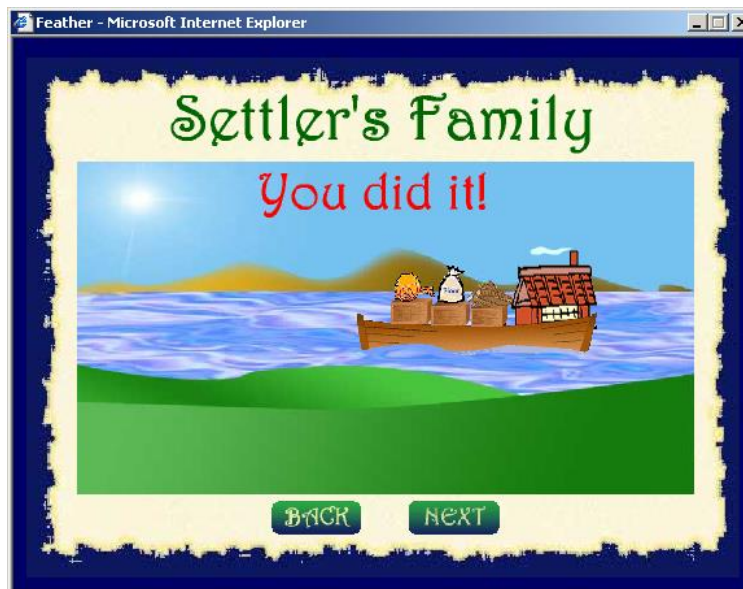
**Figure 34. Settler's Family Instructions Screen**

The next scene is the game where children have to help the Schutlzes load the boat only with necessary possessions since the flatboat can hold only so much. A user has to click and drag the item to a specific place on a flatboat to see whether it can be taken or not. If the item can be taken and the user found the right place for it on the boat, then the object will stay in place and become brighter. If the place for the object is wrong it will snap back into its previous location. Programmatically this is done similarly to the Fountain Square game. See Appendix C 3. for an example. If a child clicks on the object that cannot be taken, then the message indicating why pops up (See Figure 35.).



**Figure 35. Settler's Family Game Scene**

After the user puts all the belongings on the boat the screen with positive information comes up and gives an option to go back and play the game again or continue with the story. A small animation with the boat takes place (See Figure 36.).



**Figure 36. Settler's Family Positive Feedback**

After pressing the “Next” button the story ends. The next scene is the final scene of the game which provides an option to repeat the game by clicking the “Play Again” button (See Figure 37 and Figure 38.).



Figure 37. Settler’s Family Story Screen 3



Figure 38. Settler’s Family Final Scene

### 5.4.3.2 Fountain Square 1940

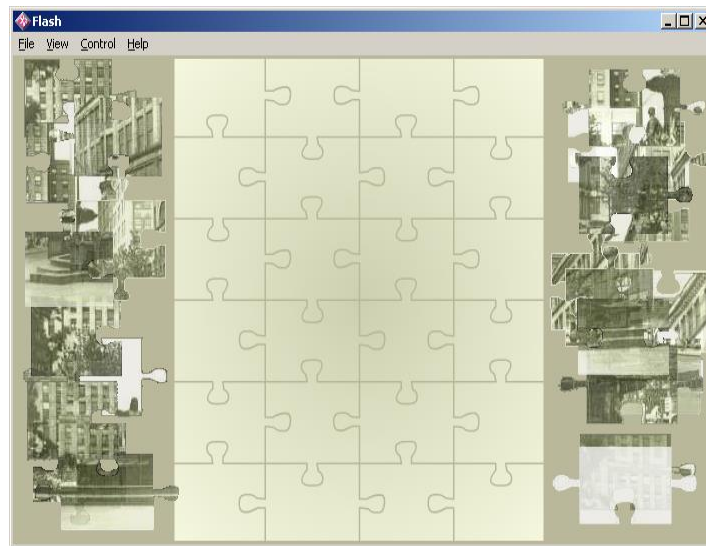
Fountain Square 1940 is a drag and drop jigsaw puzzle depicting Cincinnati's most popular landmark. The year 1940 was chosen for two reasons. First, because this was a time when passenger railroad travel and the use of Union Terminal, now the Museum Center, were at a peak. Second, this puzzle's backdrop provides a good contrast between the modern Fountain Square cityscape and the cityscape depicted in the historical puzzle. The picture is from the archives of the Cincinnati Historical Society Library housed in the basement of the Museum Center. The picture was colorized in PhotoShop to give it a beige aged tint. This was done so that the background would be more appealing visually. The game starts with a splash screen that provides directions for users (See Figure 39.).



**Figure 39. Fountain Square 1940 Splash Screen**

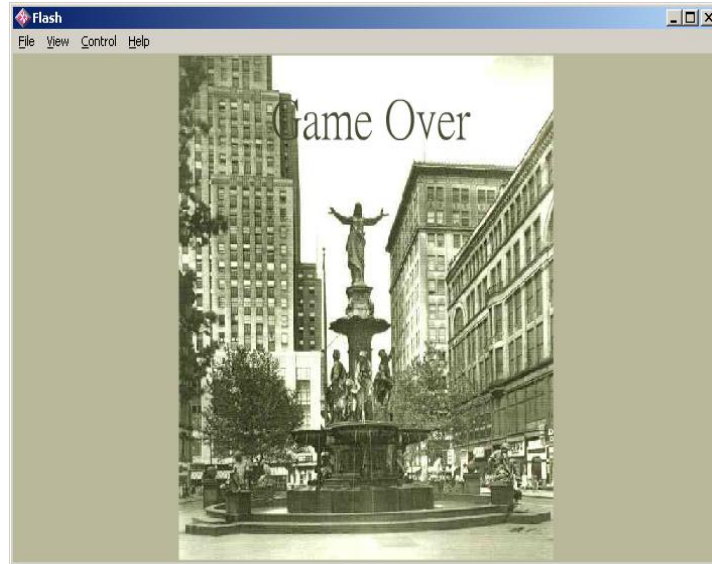
After a user clicks the "Next" button on the splash screen the main puzzle is displayed. The puzzle pieces can be dragged to the appropriate spot within the outline provided to assist the player. When a user drags a piece to the correct spot the piece becomes brighter, a click sound is played, and the piece is locked into place. The simplest

way to achieve this affect was to create two sets of puzzle pieces. There is a front set of puzzle pieces that a user drags and a back, invisible set that is used as a placeholder. This was simple because it only required comparing both sets of movie clip's x and y location values. If the distance of the two movie clips is less then 5 pixels then the movie is locked into place. The property of the front movie clip is set to invisible and the back movie clip is set to visible (See Figure 40.). In this way the counter will not be incremented incorrectly if a child clicks on a correctly placed movie clip. See code snippet in Appendix C 3.



**Figure 40. Fountain Square 1940 Puzzle**

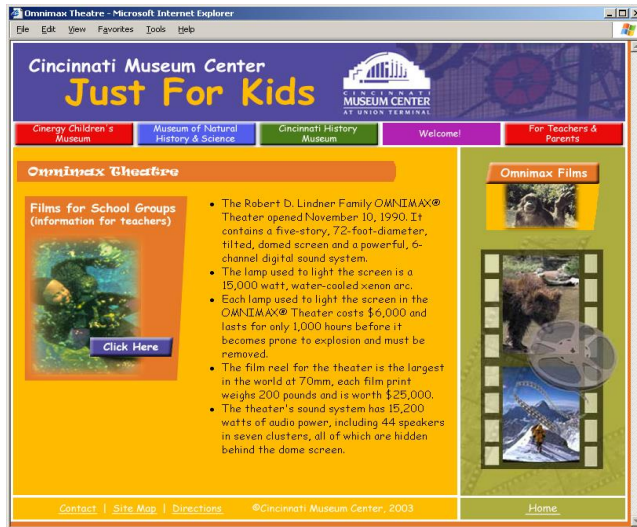
After the player has put all of the available pieces into the correct spots on the grid an animated Game Over screen appears. This screen also allows a user to see the complete puzzle picture (See Figure 41.).



**Figure 41. Fountain Square 1940 Game Over**

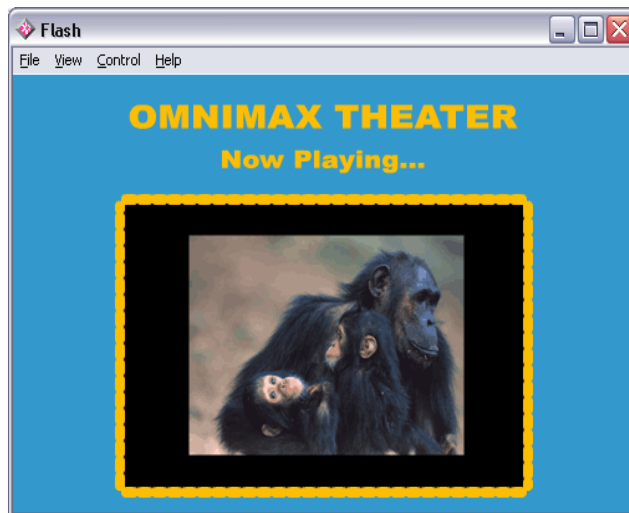
### **5.5 Omnimax Theatre Pages**

The Omnimax Theatre section of the Web site is not as big as other sections since the movies shown there change all the time. Therefore, we included informational pages that could be of interest not only for children, but teachers and parents, too. The first page describes interesting facts about the Omnimax Theatre. The second page has a list of films that school groups can order to see. The second page has a list of films that teachers and school groups can order for independent viewing in the Museum Center. The screen shot of the Omnimax Theatre Fun Facts Page is shown below (See Figure 42.).



**Figure 42. Omnimax Theatre Fun Facts Page**

This part of the site also contains a Flash slide show of the movies that played in the theatre (See Figure 43.).



**Figure 43. Omnimax Theatre Slide Show**

## 5.6 Teachers'/Parents' Pages

The last two items in Deliverables section of this paper indicated that a parents' and teachers' section would be created. This section would have a secure login. There is a teachers'/parents' section on the Web site, which provides information about activities

adults can do with children at home or at school (See Figure 44.). This information was gathered from the flyers that were developed by the Museum Center for the same reason. There are printed versions of these pieces of advice on the site for easier use (See Figure 45.).

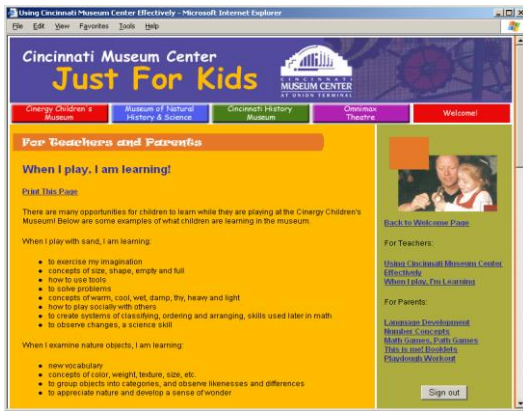


Figure 44. Teachers/Parents Tips Section

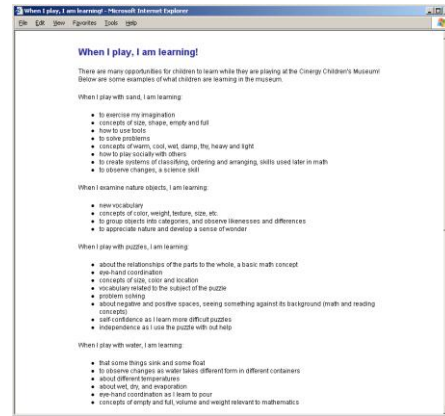


Figure 45. Printer Friendly Version

To get to these pages, users have to login first. If they don't have a login, they may register first. To store users' records a Microsoft SQL Server 2000 database was created. ASP.NET was employed as the backend tool to connect to the database and to ensure secure login by comparing the current login to the one stored in the database (See Figure 46. and Figure 47.). See example of ASP.NET code in Appendix C 4.



Figure 46. Login Page



Figure 47. Registration Page

## 6. Testing Procedures

Unit testing was an integral part of the development process. Each piece of code was tested after every update or modification by the original developer. When a module was determined to be complete by the developer it was given to the other group member for further unit testing. Unit testing helped to eliminate minor syntax errors, as well as newly created logic errors. Careful planning before, during, and after the coding process reduced development delays caused by debugging and bug fixing.

Developers typically have a skewed view of how well a program works or how it ought to work. For this reason module testing was performed after the completion of each module. When a module was complete it was given to another group member for additional testing. After any needed modifications were made, the module was given to our advisor for further review.

System testing was completed on the following Microsoft operating systems: Windows 98, 2000 and Windows XP. The following browsers were tested: Netscape 7.0 as well as Microsoft Internet Explorer versions 5.0 and later, and Mozilla.

Children in the respective age groups of intended users also tested the games. This group of users helped to acquire a different perspective about the Web site and games. Information about overall effectiveness, visual appeal and further recommendations were considered for game revisions. Younger children, ages three and younger, tended to gravitate towards the Natural History Museum's "Elko Coloring Book". One two-year old user played with the game for over half-an-hour. She was very delighted that she had the ability to change the colors of the picture on the screen at will. Primary school aged children seemed to like "The Woods", "Celebration", "Settler's

Family”, “The Human Body”, and “Fountain Square 1940”. The length of the games and the level of difficulty were appropriate for this age group. While we originally thought that finding animals in “The Woods” might be too difficult, the children proved us wrong. We also felt the puzzles “Celebrations” and “Fountain Square 1940” would also be too difficult for primary school users. To the contrary, children in this age group were able to complete these puzzles and were very excited that they could do this. A group of eleven-year olds also tested the site. This group was more critical of the games. They wanted more functionality and longer games. They also suggested that we make car games or shooting games, which we felt was beyond the scope and theme of our project.

Further beta and acceptance testing was performed by peers to test for broken HTML links and bugs in the games. The findings were noted and changed.

## **7. Conclusions and Recommendations**

### **7.1 Conclusions**

This project was created in response to Cincinnati Museum Center’s need for an addition to the current Web site aimed for children. We created a visually appealing child-oriented site that includes sections for all three museums, the Omnimax Theater, and teachers/parents. These sections are full of graphics, interesting information and Flash animations. To prepare the project we used Macromedia Flash 5 and HomeSite 5, Adobe PhotoShop 6.0 and Premiere 6.1, Microsoft SQL Server 2000, and ASP.NET. The project was completed over the three quarter Senior Design sequence. The budget of approximately \$7500 would be a real-world estimate for the completion of this project before labor costs. The project fulfilled all Design Freeze deliverables. Testing was performed to ensure the product’s usability.

## 7.2 Recommendations

While working on this project, we encountered quite a few challenges. A solid understanding of Flash development is recommended before beginning an interactive Web site like the one we created. Beginning users of Macromedia Flash need to take into account that the learning curve might be steeper than expected. We found that a period of four weeks of learning was needed in order to use the software proficiently.

There were several areas of Flash development that required extra attention. First, understanding movie clip levels was one of the most difficult areas of Flash development for us. Within a flash program there can be many different levels of movie clip instances embedded within each other. The first level or the main movie clip is level 0. In an effort to provide interactivity for our Web site we needed to programmatically control movie clips with the use of ActionScript. In order to access each movie clip instance we had to specify which level the movie was on, which caused some difficulties. Fortunately, ActionScript provides other capabilities. Developers can use the `_root` property of each movie clip that returns a reference to the root movie clip level on the Flash timeline. By using the `_root` property of each movie clip a developer can access each movie clip by reference, which greatly simplifies code and adds more flexibility while not requiring a developer to know exactly what level a movie clip is on. The following example shows a comparison of two different methods to refer to movie levels:

- `// Code explicitly using levels.`  
`mcFirst.mcSecond.test++`
- `//Code using _root property reference.`  
`_root{mcFirst}.test++`

Another area of confusion for a new Flash developer is the use of nested movie clips. Each movie clip can have a number of nested movie clips inside of it. All of the movie clips can be played simultaneously. By developing a program in this way more functionality can be added to a program, the movies timeline can be shortened, and movie clips can be reused. For instance a movie clip can be created and saved in one program and later be imported into another. This saves a developer from having to recreate the movie clip if it is needed in another Flash movie.

While the use of the Flash timeline is less complicated than programmatic control with ActionScript, a good understanding of it is needed in order to build an effective program. Use of the timeline allows a developer to use Tweened Animation. Motion tweening allows for the scrolling, fading, or moving of text, graphics and movie clips. This greatly simplifies the development process. Without the use of motion tweening a developer would need to control the x and y value of each movie clip programmatically to create scrolling text.

Another recommendation is to keep file sizes to the smallest size as possible. During our preliminary testing on 56 Kb modems we realized that the download time was too long for many of the games we created. Because of this, we had to go back, perform additional research and redo a lot of graphic and sound files. Therefore our recommendation is to always pay attention to the file size during the development process, especially while working with Flash. A user can do this in a number of ways. When using a scanner we noticed that importing images at 72 dpi was optimal; it gave us an acceptable quality of graphics at a minimal file size. We learned that adjusting the file size of the image and saving it specifically for Web in the graphic editor program was

necessary to reduce the file size of the final Flash product. We also needed to edit the length of sound files and loop the sounds within Flash; this gave the effect of continuous sound but required only a very small file.

Finally, we found Flash's graphic editing and manipulation abilities disappointing. It took a long time to adjust our needs to its capabilities. Whenever possible it is best to create images in another graphics editor and import the images to Flash, which is not always easy since Flash creates white border around the images, when isn't needed. We discovered that the only way to get rid of this border was to save the file in a photo editor, such as Adobe Photoshop, as a .gif file with Transparency enabled and Matte set to None. This will save a developer a lot of time.

After we finished the design of the Web site and tested it with children of different age groups we realized that it was created for a very broad age range. Although the Museum Center wanted to target children between the ages of 2 to 12 years we feel that targeting a specific age group such as preschoolers would be more effective. We made this conclusion by observing children involved in our testing. Older children above age 10 are interested in more sophisticated arcade games. The children that liked the site the most, and were most interested in the content were primary school users. Preschoolers were interested but needed games designed for their level of understanding. In the future if we were to create another children's Web site, we would target a more specific age group.

## Appendix A.

### Research Information

During our research of many Web sites for children museums we found that surprisingly few of them were designed actually for children or had sections for children. Only a few of them attracted our attention and inspired us to create a better project. Because of the lack of examples among the museum's Web sites, we turned to general children's Web sites that could help us with shaping our ideas about our site. Below are descriptions of few sites that we found interesting and useful.

[Http://www.childrensmuseum.org/catalog/home.asp](http://www.childrensmuseum.org/catalog/home.asp) - The Web site for the Children's Museum of Indianapolis was the first site we looked at. The former director of the Cinergy Children's Museum found it to be a good example of what she wanted their Web site to be. Even though we didn't like the interface for the main part of the site, which doesn't look very professional, we discovered that its special section for kids has links to different sections, which are actually different sites inside the main one. We concentrated on one part of it, which is designed very well and has nice games for children: Bones: An Exhibit Inside You. We spent a lot of time examining this site and it inspired us to produce something similar, something that would be well designed and would have nice activities for children. The link to this section of the site is:

[http://www.childrensmuseum.org/bones/kids\\_mazeGame.htm](http://www.childrensmuseum.org/bones/kids_mazeGame.htm)

[Http://www.mbayaq.org/](http://www.mbayaq.org/) - the Web site for the Monterey Bay Aquarium. Its Splash Zone section is designed just for children, with a lot of interesting and interactive games. This Web site looks very professional; it is a good source of educational

information and is designed with children in mind. It provided us with ideas for couple of our games.

[Http://www.nickjr.com](http://www.nickjr.com) - Nick Jr. is a Web site created by the cable television channel Nickelodeon. We thought that this site was interesting for several reasons. First, it is designed to be visually appealing to both parents as well as preschoolers, which is a considerable task. It is designed in this way because a parent will undoubtedly assist preschoolers to use the site. The site contains a number of games that were inspired from Nickelodeon's popular television characters like Blue's Clues and Dora. Besides these games the site also has information for parents such as a message boards and printable activities that they can do with children.

[Http://www.landryseafood.com/playground](http://www.landryseafood.com/playground) - The Landry's Seafood Restaurant's Web site has a children's section linked to the main Web page. This site interested us because we felt that by including a children's section on the site the restaurant was also welcoming children to their individual locations. While the games on the site are not very complex, the site at least has some interactivity for children. We felt that the level of complexity of this site's games could easily be reproduced or surpassed on our site.

## Appendix B.

### Project Timeline

ID	Task Name	Start	Finish	Q1 02		Q2 02			Q3 02			Q4 02			Q1 03			Q2 03		
				Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1	Analyzed Children's Web Sites	2/15/2002	3/7/2002	■																
2	Researched Museum Center's needs	2/11/2002	3/8/2002	■																
3	Technical Training (Flash, ASP, SQL)	2/25/2002	6/25/2002	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
4	Structured Site Design	4/10/2002	6/10/2002			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
5	Preliminary Proposal and Presentation	3/1/2002	3/7/2002	■																
6	Finished Design Plan	3/1/2002	3/8/2002	■																
7	Created Timeline	6/17/2002	6/21/2002																	
8	Designed Graphical Interface	6/24/2002	8/9/2002					■	■	■	■	■	■	■	■	■	■	■	■	■
9	Gathered Content and Graphics	6/24/2002	7/19/2002					■	■	■	■	■	■	■	■	■	■	■	■	■
10	Developed List of Games	7/8/2002	7/15/2002					■	■	■	■	■	■	■	■	■	■	■	■	■
11	Created Database Design	7/15/2002	7/19/2002					■	■	■	■	■	■	■	■	■	■	■	■	■
12	Began Testing Prototype	7/29/2002	8/16/2002							■	■	■	■	■	■	■	■	■	■	■
13	Developed Login, Registration Pages	8/1/2002	8/5/2002							■	■	■	■	■	■	■	■	■	■	■
14	Continued Games Implementation	8/2/2002	12/2/2002							■	■	■	■	■	■	■	■	■	■	■
15	Developed Design Freeze Documentation	8/2/2002	8/12/2002							■	■	■	■	■	■	■	■	■	■	■
16	Created HTML Pages	7/10/2002	8/15/2002							■	■	■	■	■	■	■	■	■	■	■
17	Prepared for Design Freeze Presentation	8/9/2002	8/15/2002							■	■	■	■	■	■	■	■	■	■	■
18	Finished Games Implementaion	12/30/2002	2/12/2003													■	■	■	■	■
19	Completed Site Development	1/6/2003	2/28/2003													■	■	■	■	■
20	Began Beta Testing	1/14/2003	2/14/2003													■	■	■	■	■
21	Made Needed Revisions	2/14/2003	2/28/2003													■	■	■	■	■
22	Tested Release Candidate	2/28/2003	3/3/2003													■	■	■	■	■
23	Made Final Revisions	3/4/2003	3/10/2003													■	■	■	■	■
24	Prepared Final Report	2/11/2003	3/10/2003													■	■	■	■	■
25	Prepared for Final Presentation	3/10/2003	3/17/2003													■	■	■	■	■
26	Presented Final Report	2/4/2002	2/4/2002																	

## Appendix C.

### Code Snippets

#### C 1. Celebration Code Snippet

In order to implement a reward for a player when completing the sliding puzzle the use of array became very helpful. Four different arrays were created in order to record the x and y position of each puzzle piece, before the pieces were randomly scattered and after each move made by the user. An x array and a y array were created separately so that a unique value could be recorded for each piece. After each move a new x and y array was created to record the new x and y locations. A compound If statement checked to see if the x arrays and the y arrays matched. If so the user had completed the game.

```
onClipEvent (load) {

//Create array to keep track of original tile locations for game over
    posArray_x = new Array();
    posArray_y = new Array();
    posArray_x2 = new Array();
    posArray_y2 = new Array();

//Second array is used to compare to the original locations of the tiles.
    for (j=1; j<16; j++) {
        setProperty (_root["btile"+j], _alpha, 0);
        posArray_x[j] = _root["btile"+j]._x;
        posArray_y[j] = _root["btile"+j]._y;
    }
}

onClipEvent(mouseUp) {
    for (i=1; i<16; i++) {
        posArray_x2[i] = _root["tile"+i]._x;
        posArray_y2[i] = _root["tile"+i]._y;
        arr_x1 = posArray_x.toString();
        arr_y1 = posArray_y.toString();
        arr_x2 = posArray_x2.toString();
    }
}
```

```

        arr_y2 = posArray_y2.toString();
        if ((arr_x1 == arr_x2)and (arr_y1 == arr_y2)){
            _root.gotoAndStop("Over", "Over"); }
    }
}

```

## C 2. Coloring Book Code Snippet

To achieve an effect of a mouse changing from a paintbrush to a regular mouse when the user is pointing to the button, we first disabled the mouse in the first frame of the scene. When a user rolls over a button, the mouse pointer is shown and the picture of the paintbrush is made invisible by changing its alpha to 0 percent. On roll out event the mouse is hidden again and paintbrush becomes visible by changing its alpha back to 100 percent.

```

on (rollOver) {
    Mouse.show();
    brush._alpha = 0;
}
on (rollOut) {
    Mouse.hide();
    brush._alpha = 100;
}

```

At the same time the following properties assigned to the paintbrush:

```

Mouse.hide();
startDrag ("", true);

```

## C 1. Fountain Square 1940 Puzzle Code Snippet

The code below is used to determine if a puzzle piece is in the appropriate spot on the stage. When a users releases the mouse and stops dragging a puzzle piece, the code checks to see if the dropped piece is within 5 pixels of another invisible piece that is used as a placeholder. If it is within 5 pixels the piece snaps into place, if not it moves back to its original location.

```

dist_x = _root["b"+i]._x-_root["p"+i]._x;
dist_y = _root["b"+i]._y-_root["p"+i]._y;
dist = Math.sqrt(dist_x*dist_x+dist_y*dist_y);
// if close enough, then set it in place
if (dist<5 and _root["b"+i]._visible) {
    _root["p"+i]._x = _root["b"+i]._x;
    _root["p"+i]._y = _root["b"+i]._y;
    setProperty (_root["p"+i], _alpha, 100);
    setProperty (_root["bl"+i], _visible, false);
    count = count+1;
    if (count ==24) _root.nextFrame();
}

```

#### C 4. Login Page Code Snippet

The next code snippet is the ASP.NET code for the Login Page. It shows the connection string to the SQL Server 2000 database, checks for successful authentication, and in case of successful authentication redirects the user to the next page.

```

<script runat="server" language="vb">
    Sub Login_Click(Src As Object, E As EventArgs)

        'Here we are creating a connection string to the database
        Dim MyConnection As String
        MyConnection =
"provider=SQLOLEDB.1;server=(local);database=SeniorDesign;uid=sa;password="

        Dim strUser As String = txtUser.Text
        Dim strPwd As String = txtPwd.Text

        'To check for successful authentication set a Boolean flag here
        Dim blnIsAuthenticated As Boolean = False

        'SQL SELECT statement goes here
        Dim strSQL as String
        strSQL = "SELECT Password FROM Registration WHERE UserName="
& strUser & " AND Password=" & strPwd & ""
        Try
            'Declare the variables
            Dim objConnect As New OleDbConnection (myConnection)
            objConnect.Open()
            Dim objCommand as New OleDbCommand (strSQL, objConnect)
            Dim objDataReader As OleDbDataReader

            'declare SQL statement against Command to fill the DataReader
            objDataReader = objCommand.ExecuteReader()

```

```
'Check the password for the same letter case
If objDataReader.Read() Then
    If objDataReader("Password") = strPwd Then
        blnIsAuthenticated = True
    End If
End If

'Close the connections
objDataReader.Close()
objConnect.Close()

Catch objError As Exception
Msg.Text = "Error accessing database.<br />" _
    & objError.Message & "<br />" & objError.Source
Exit Sub 'and stop execution

End Try

'If the flag is true, redirect the user to the next page
If blnIsAuthenticated Then
    Session("UserName") = txtUser.Text
    Response.Redirect("welcome.aspx")
Else
    Msg.Text = "Invalid credentials, please re-enter."
End If

End Sub
</script>
```

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