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# ROCHESTER INSTITUTE OF TECHNOLOGY

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Computer Graphics Design  
School of Design  
College of Imaging Arts and Sciences  
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## **Flutter-by Interactive Butterfly**

Using interactivity to excite and educate children  
about butterflies and the National Museum of Play  
at The Strong's *Dancing Wings Butterfly Garden*

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## 01 ABSTRACT

The National Museum of Play at The Strong's *Dancing Wings Butterfly Garden* is a tropical rainforest that allows visitors to step into the world of butterflies, but lacks a more comprehensive educational element to teach visitors additional information about butterflies. *Flutter-by Interactive Butterfly* is a thesis project designed to enhance younger visitors' experience of the *Dancing Wings Butterfly Garden* with an interactive educational application that aligns with The Strong's mission of encouraging learning, creativity, and discovery. This was accomplished through a series of fun and educational games and animations, designed for use as a kiosk outside the garden and as a part of The Strong's website.

Content, planning, and organization of this project has been completed through research and observation of the garden in the following areas: its visitors, butterflies, best usability practices for children, and game elements that educate and engage children. *Flutter-by Interactive Butterfly* teaches users about the butterfly's life cycle, anatomy, and characteristics as well as their life in the *Dancing Wings Butterfly Garden*. Through the use of the design programs Adobe Illustrator, Flash, and After Effects; the programming language ActionScript3.0; a child-friendly user interface and design; audio elements and user takeaways, *Flutter-by Interactive Butterfly* appeals to children of all ages, interests, and learning styles.

The project can be viewed at [lydiapowers.com/Thesis/FlutterByButterfly.html](http://lydiapowers.com/Thesis/FlutterByButterfly.html)

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## 02 INTRODUCTION

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### 2:1 Thesis Statement

**Would an interactive game at the National Museum of Play at The Strong excite and educate young visitors about butterflies and the *Dancing Wings Butterfly Garden*?**

The *Dancing Wings Butterfly Garden* is an indoor tropical rainforest that is home to more than 1,000 butterflies, both native and tropical. Currently, *Dancing Wings Butterfly Garden* is the only year-round indoor butterfly garden in Upstate New York, providing visitors a glimpse into a whole different world—the world of butterflies.

The goal of the project *Flutter-by Interactive Butterfly* is to enhance younger visitors' knowledge of butterflies and the *Dancing Wings Butterfly Garden* through a series of fun and educational games and animations. It is designed for use as a kiosk outside of the garden as well as a part of The Strong's website, so it can be used before or after visiting the garden or at home.

The content, interaction, and design were decided through research of frequently asked questions about butterflies, ways that children learn and interact with digital media, and visual considerations when designing for children. *Flutter-by Interactive Butterfly*'s target audience is 5 to 12 year olds. It is an instructional multimedia tool designed to teach children about the butterflies in the garden and reinforce the rules of the *Dancing Wings Butterfly Garden*.

With children becoming more comfortable using computer-based technologies, I believe they will respond positively to this interactive tool. Pairing this multifaceted project with the *Dancing Wings Butterfly Garden* experience will not only help to promote The Strong's mission to encourage learning, creativity, and discovery, but will strengthen the exhibit as a whole.

Factors taken into consideration when designing this project were different learning styles, reading and age levels, game interests, and time factors. The end result is an instructional tool that combines different interactive and creative elements, audio accompaniments, and user takeaways within a focused set of educational goals.



## 2:2 Dancing Wings Butterfly Garden

The Strong®  
National Museum of Play®  
*Dancing Wings Butterfly Garden®*



The Strong's Mission: The Strong explores play and the ways in which it encourages learning, creativity, and discovery and illuminates cultural history.

Figure 2.2.1  
Left: The National Museum of Play at The Strong, view from the front. Photo courtesy of The Strong.



Figure 2.2.2  
Right: View of the Dancing Wings Butterfly Garden from the outside. Photo courtesy of The Strong.



Figure 2.2.3  
Left: Entrance to Dancing Wings Butterfly Garden. Photo courtesy of The Strong.



Figure 2.2.4  
Right: Inside the Dancing Wings Butterfly Garden. Photo courtesy of The Strong.



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## 2:3 Background

The National Museum of Play at The Strong's *Dancing Wings Butterfly Garden* is the only year-round indoor butterfly garden in Upstate New York. At 1,800 square feet, this tropical rainforest packs in over 1,000 butterflies, 150 species of tropical plants, moths, Chinese Button Quail, Society Finches, Gouldian Finches, hummingbirds, honeycreepers, turtles, goldfish, tortoises, and a toucan. At any given time there are 50-75 species of butterflies in the garden, 175 over the course of a year. Five- to eight-hundred chrysalises are flown in from all over the world each week and displayed in the garden. Visitors can watch the butterflies emerge from their chrysalises before joining the other butterflies in the garden.

Due to the high volume of visitors to the garden and for the safety of the garden residents, a maximum of 40 visitors at a time are allowed in the garden for 20-minute increments. This provides a more relaxing environment for the butterflies.

Butterflies may be startled into hiding by fast movement and loud noises. They quite often stop to rest or sip water from the walkways and can be injured by being stepped on, touched, or grabbed. It is important for the safety of the butterflies as well as the visitors enjoyment of the garden that all are made aware of these facts. Currently there is a child-friendly video serving this purpose and reminders from the host prior to entering the garden. During my first visit, I noticed that due to the excitement and noise of the group about to enter, sometimes both sets of instructions were not heard. This is what first made me think that there may be a need for an interactive application to supplement the *Dancing Wings Butterfly Garden* experience.

When entering the garden, visitors can pick up a butterfly and plant identification guide, in order to locate and identify the different species. Outside of the garden there is a touch-screen kiosk about Monarch butterfly migration, a bookshelf of children's books about butterflies, two butterfly image puzzles, a panel on how to make your own butterfly garden, and a shadowbox case highlighting the main species of butterflies in the garden.

After observing the questions about butterflies posed by the guests to the hosts—what they eat, how long they live, and many others—I thought an educational tool to educate and inform children about the butterflies would be a positive addition to the *Dancing Wings Butterfly Garden*.

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## 2:4 Preliminary Planning Meeting

Since *Flutter-by Interactive Butterfly* was meant to provide extra educational content to supplement the *Dancing Wings Butterfly Garden* exhibit, I approached the museum about this project. I met with several National Museum of Play representatives and entomologists to gather insight about the functionality, goals, and content of the project.

During this meeting I learned more about the National Museum of Play, the *Dancing Wings Butterfly Garden*, the evolution of the exhibit area and educational elements that had been implemented in the past, as well as ideas and suggestions for the project's content, placement, and avenues of research to pursue. The entomologists regularly meet with school groups, so they were a good resource for questions specifically asked by children and child-friendly answers to these questions.

When the *Dancing Wings Butterfly Garden* first opened in 2006, there were five versions of the "rules of the garden" video playing in the queuing area. Once they started assigning visitors a time for their visit, there was no longer a need to entertain such a large queue of people. Currently there is one video outside the entrance, which is difficult to hear because of distractions in the surrounding area.

At one point the garden staff tried to place a time-lapse video of a butterfly emerging from a chrysalis in the garden near the emergence chamber. Unfortunately, there was no way to wirelessly project the video from the back area, because of the thick concrete walls. They also tried placing screens inside the garden to provide more educational content, but because of the humid conditions, the hardware did not last.

Across from the entrance to the garden where the "American Comic Book Heroes: The Battle of Good vs. Evil" exhibition is now located, they had another interactive game for the butterfly garden. It was an interactive projection of butterflies that responded to silhouettes, causing the butterflies to move away from the "person." This application kept malfunctioning, so they discontinued its use.

Currently, visitors arrive at the front entrance five minutes before their appointed time. When instructed, visitors enter the containment area, which is required by the USDA to prevent butterflies from leaving the garden. When everyone is gathered in this area, the host starts the video and then restates the rules of the garden before allowing visitors to enter. When visitors exit the garden, they find themselves in the gift shop. It was suggested that this might be a good place to have a kiosk to answer any questions visitors have after experiencing the garden. This is a good suggestion, but is not very practical due to limited space. The gift shop does, however, lead back to the entrance of the garden, which does have space for a kiosk. Visitors that may not have had time to use the project before entering would have the opportunity to return to it afterward.

It was suggested that the kiosk could be placed in other parts of the museum as well, since the *Dancing Wings Butterfly Garden* itself is located in the back of the museum. One idea was to place it near the admissions line, so that children could play with it while their parents are waiting in line. It might even prompt parents to purchase tickets for the butterfly garden. It was recommended that I research the Spy Museum and amusement parks like Disneyworld, which successfully entertain and educate visitors waiting in long ticket lines.

My initial idea of targeting children for my project was met with agreement. Not only is this an application for the National Museum of Play, whose main target audience is children, but it seems that they are not as engaged in the experience as the adults who visit the garden. Everyone in the meeting agreed that the children think the garden is fun, but ultimately it is mostly the adults who want to visit the garden and who ask more of the educational questions.

Elements that the group wanted me to research and possibly include in my project were:

- Game elements
- Action/reaction types of game interactions
- New ways to experience/hear/look
- Paratelic state: to be engaged, not bored, lower anxiety, focused, settled, but still excited.  
Some places solve this by screening a movie in a dark room before visitors enter an exhibit; one example is the Butterfly Conservatory in Niagara Falls. Presently the approach to entertaining children is action-filled and engaging. The better approach, according to research, is slower and engaging.
- A way to record usage and dwell time for each section.

There were many ideas about the content of the project, such as:

- Types of butterflies
- Where butterflies come from
- Make your own butterfly garden
- Build your own butterfly collection
- Find the butterfly in the picture—for butterflies that blend in with its surroundings
- Butterfly scientific and common names
- A search activity that engages the child
- Drawings and stories of butterflies

This was a good place to start since I am creating the project in hopes that they will use it in the National Museum of Play. It also gave me a better idea of past successes and failures as well as elements that are important to include when designing an interactive project for a museum.

## 2:5 Observation

The next place I went to gather information was to the *Dancing Wings Butterfly Garden* itself. I walked through the *Dancing Wings Butterfly Garden* at different times and days of the week in order to observe groups of varying sizes and age ranges. My goal was to find out the questions and comments visitors have before entering, while inside, and after exiting the garden. I also spoke to the garden hosts to find out what questions they answered most often and more fun facts about butterflies.

### **Questions and comments I overheard from the children:**

*About the newly emerged butterflies in the drying cage:*

"Are they dead?"

"They do not want to fly out?"

*About the chrysalises:*

"I saw one wiggle."

"When are they gonna come out?"

*General:*

"They're just so beautiful."

"Butterflies are cute."

"Just like at the zoo."

"Do they come out one color and then colors come out? Or do they come out that actual color?"

"If you hold your arms out like this they will land on you."

"Mommy, I'm scared."

### **Questions and comments I overheard from the adults:**

*Parent to child:*

"Do you remember how a caterpillar turns into a butterfly?"

"Remember, that's like what you did!" (referring to having a caterpillar that turned into a butterfly at home).

"Gotta be quiet and gentle—OK."

"They might come down and tickle you."

"Hold your hand out."

"Pick him up by his wings."

"Remember, make sure you don't step on any."

"Look, they have an eye."

"Do you see them dancing?"

*Parent to host:*

“You grow them here too?”

“What’s the rate of fatality with all of these people?”

“What’s the difference between moths and butterflies?”

**My general observations while in the garden:**

- I did notice that quite a few children were scared of the butterflies.
- People liked the turtles and small birds running around in the garden.
- Visitors were using the laminated butterfly sheets trying to find the butterflies or picking out their favorites. Two boys were trying to find the rare Luna moth.
- Many were trying to get butterflies to land on their hands.
- The purpose of the loofas was a common question.
- Mainly the adults asked for more information about the life cycle and chrysalises in the emergence chamber.

**Information I learned from the hosts answering questions from the visitors:**

- It takes 2-6 hours for a butterfly to dry depending on their size.
- There are 2-3 releases a day of newly emerged butterflies.
- There are no natural predators in the garden.
- The quail are an all-natural pest control.
- Butterflies are attracted to scent and bright colors.
- Butterflies feel with their feet.
- Butterfly coloring is in its wing structure; it is not color at all; it is the way light reflects.
- Moth’s coloring is on wings, and will fade in time.
- The caterpillar’s egg is its first meal.
- There are no plants in the butterfly garden that caterpillars like to eat, otherwise there would be no more garden, since caterpillars eat a lot.
- Normally you’d see the chrysalis on a plant.
- Some butterflies eat from the fruit and some eat from the loofas.
- Moths are fuzzier than butterflies and are nocturnal.

## 2:6 Survey

I spent several days surveying groups coming out of the garden to find out more about people's motivation for coming to the *Dancing Wings Butterfly Garden* (Appendix 7.5.1–7.5.6). I also wanted to know if and why they used the National Museum of Play at The Strong's website to plan their visit.

### **Is this your first visit to the Museum?**

- Half of the groups surveyed said this was their first trip to the National Museum of Play. These individuals were all from out of town—Albany, Buffalo, Fort Drum, Toronto—or were Rochester residents entertaining out-of-town guests.
- The other half had memberships to the museum and generally visit anywhere from 1-2 times a month to 1-2 times a year.

### **Is this your first visit to the Butterfly Garden?**

- Out of the groups that had been to the museum before, about half had not yet been to the *Dancing Wings Butterfly Garden*. The other half of the groups said that some of the members in the group had and some had not.
- Only one group of people were going for the second time for everyone in the group; this family's 9-year-old son is currently fascinated with butterflies.
- There were two groups I questioned that were not going to the garden that day; one group said they got there late and would visit another day; the other group said they would go when their 5-year-old daughter grows out of wanting to grab the butterflies.

### **How did you first find out about the Butterfly Garden?**

- Most of the frequent visitors to the museum said they found out about the garden from a previous visit to the museum.
- Out-of-town guests said that they found out about the National Museum of Play and the *Dancing Wings Butterfly Garden* mainly through word of mouth or web searches on "things to do with kids in Rochester."
- A few said they heard about it through magazine and television ads.

### **Did you visit the website before coming to the museum? Did it help you plan your day here?**

- All but one of the groups said that they had visited the website.
- Most looked over the website more thoroughly prior to their first visit, but still go back to check hours, events, and current exhibits and to get directions.
- One group said they like receiving emails of events; another said that they like going to the museum's Facebook page for information.

**Who made the decision to go to the Butterfly Garden?**

- It was fairly even between the adults and the children prompting the trip to the *Dancing Wings Butterfly Garden*.

**What is your favorite part of the Butterfly Garden?**

- All groups thought the experience was beautiful, unique, and something different to do! They loved the butterflies, how pretty they are, seeing them up close, and watching them eat.
- Everyone also really liked the little Chinese quail running around the garden floor.
- The group from Toronto had been to the Butterfly Conservatory in Niagara Falls. They thought that the *Dancing Wings Butterfly Garden* was more intimate and they really liked having the hosts in the garden to answer questions.
- Another family said that their 6 month old liked looking at the butterflies, their 3 year old wanted to stomp on the butterflies, and their 6 year old wanted the butterflies to land on him.



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## 2:7 Frequently Asked Questions

Here is a list of frequently asked questions and answers that are currently located on the National Museum of Play at The Strong's website:

**Why do you have a butterfly garden in a history museum dedicated to the study of play?**

The butterfly garden and other living collections at the museum represent a type of play called "nature play." This form of play can positively affect people by helping them to slow their pace and relax. With the presence of gardens and aquariums, the National Museum of Play recognizes this important aspect of play.

**How many butterflies are there in the garden?**

Though it varies day to day, there are approximately 1,000 butterflies flying in the garden at any given time.

**Can I take pictures in the garden?**

Of course! Taking pictures does not harm the butterflies.

**How many different species of butterflies are in the garden?**

On average you will find 50 to 75 butterfly species flying in the garden on any given day. Over the course of a year, we may introduce more than 175 different species.

**What types of plants will I see in the garden?**

You can find 150 species of tropical plants in Dancing Wings Butterfly Garden, including epiphytes, orchids, and water plants.

**What other animals call *Dancing Wings Butterfly Garden* home?**

In addition to the butterflies, the garden is home to several Chinese Button Quail, Society Finches, Gouldian Finches, turtles, goldfish, and a couple of tortoises.

**What are the little birds in the garden?**

Chinese Button Quail! The small quail are not only fun to watch, they help to keep some of the insects in the garden under control, providing an environmentally friendly way for the museum to control pests.

**How long do the butterflies live in the garden?**

Butterflies live, on average, about 10 days in the garden.

**Can I watch butterflies emerge from the chrysalis?**

Yes! The emergence chamber has a clear glass front so you can watch as butterflies emerge from their chrysalises.

**What is the emergence process like?**

When butterflies first emerge, their wings are small and folded. To expand their wings large enough for flying, a butterfly has to hang upside-down so that blood can pump into its wings. Once the wings are fully expanded and hardened—this process can take a couple of hours or more—the butterfly is able to fly. When enough of the butterflies are ready to fly, the museum's entomologists gather them into a small cage, which is brought into the garden where the butterflies are released.

**What is the life cycle of a butterfly?**

The butterfly is a type of insect that undergoes complete metamorphosis. This means its life cycle has four stages:

- **Stage one:** The egg. Much like chickens, all butterflies start out in an egg surrounded by a hard shell before becoming a caterpillar. Oftentimes these eggs have beautiful designs on them.
- **Stage two:** The larva or caterpillar. Caterpillars are long and wormlike. They like to eat plants—lots of them.
- **Stage three:** The pupa or chrysalis. When in the chrysalis stage, butterflies do not eat. They can barely move at all in this stage.
- **Final stage:** The adult winged butterfly. In this stage, the insect flies around and uses its long proboscis to drink from flowers, fruit, and other fluids.

**Where do the butterflies come from?**

The butterflies in Dancing Wings Butterfly Garden come to the museum from butterfly farms in tropical regions all over the world. These butterfly farms are ecologically sustainable and help to protect local rainforests. The museum's indoor garden features butterflies from Central and South America, Africa, and Asia.

**How do the butterflies get to *Dancing Wings Butterfly Garden*?**

Each week the museum receives 500 to 800 pupae from butterfly farms all over the world. The chrysalises arrive in specially padded packages and, upon arrival, are carefully counted and checked for health. Those that pass inspection are sorted by species and attached to rods for hanging in the emergence chamber.

**What do butterflies eat?**

Adult butterflies eat a variety of liquid foods. The majority of the butterflies in our garden feed on nectar from flowers and the juices from fruit.

**What are the loofas for?**

Loofas are sprayed with a mixture of Gatorade and honey and serve as a food source for the butterflies, providing them with sugars and salts that they need to remain active.

**What is the temperature in the garden?**

The temperature in the garden is kept at a stable 80 degrees Fahrenheit during the day and 74 degrees at night.

**How big is the garden?**

*Dancing Wings Butterfly Garden* is approximately 1,800 square feet.

**What is the difference between a butterfly and a moth?**

It can be difficult to tell the difference between a butterfly and a moth, but there are a few general features that may help you recognize the difference. One of these is to look at the antennae. Butterflies tend to have antennae that are straight with a slight bulge at the tip while moths have completely straight or feathered antennae. Also, butterflies tend to be active during the day, while moths are primarily active at night.

**How do I raise my own butterflies?**

There are a variety of butterfly rearing kits; several are available in the museum shops. You can also learn how to create an outdoor butterfly garden by visiting the [Create Your Own Butterfly Garden](#) page.

**Do you rent the garden out for group events?**

*Dancing Wings Butterfly Garden* is available for rental. Please see the [Facility Rentals](#) page for further details.

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## 2:8 Conclusion of Preliminary Research

After gathering preliminary research and feedback at the National Museum of Play at The Strong and the *Dancing Wings Butterfly Garden*, I decided to focus on the following topics and goals:

- Include and reinforce the rules of the garden throughout the game.
- Explain the life cycle of a butterfly, making sure to include the time each stage takes.
- The anatomy and naming of a butterfly.
- Familiarize users with butterfly species and other creatures in the garden.
- Include some kind of coloring section.
- Incorporate some kind of user take-away into the games for users to collect and bring into the garden with them the next time they visit.

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## 03 REVIEW OF LITERATURE

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### 3:1 Advisory Resources

**Allison McGrath****Director of Online and Graphic Media Services | The Strong**

As a member of my thesis committee, Allison was my National Museum of Play at the Strong contact throughout the life of the project. She also provided great feedback and suggestions throughout the development of the project.

**Andrea O'Keefe****Master of Education | Childhood Education**

As an honorary member of my thesis committee, Andrea provided excellent feedback on the project as it applies to my target audience, children ages 5-12.

**Chris Jackson****Graduate Program Director | Computer Graphics Design and Graduate Graphic Design  
Rochester Institute of Technology**

As my thesis committee advisor and professor, Chris was instrumental in the planning and implementation of my project as well as providing excellent ideas and solutions to technical issues.

**Carol Fillip****Assistant Professor | School of Design  
Rochester Institute of Technology**

As a member of my thesis committee, Carol provided feedback and insight for the design of my project. As a design professor and avid researcher of design and typefaces for children, her input was important to the look and feel of my project. She also provided me with well-designed and useful children's web sites to research.

**Derek Kellogg, Chief Entomologist****Tad Yankoski, Entomologist****The Strong | Dancing Wings Butterfly Garden**

Derek and Tad were both helpful during my preliminary planning stage, as well as checking the accuracy of my butterfly facts.

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## 3:2 Literary Resources

**Affective and Emotional Aspects of Human-Computer Interaction:  
Game-Based and Innovative Learning Approaches**  
edited by Maja Pivec  
IOS Press 2006

This book is a series of articles that presents to the reader how psychology, educational science, cognitive science, communication, human computer interaction, computer science, interaction design, and educators can all make important contributions to game-based learning approaches. The article that I found most useful was “Didactic Analysis of Digital Games and Game-Based Learning” by Matthias Bopp, which discusses didactic analysis in the beginning stages of educational game design.

**The Art of Interactive Design: A Euphonious and Illuminating Guide  
to Building Successful Software**  
by Chris Crawford  
No Starch Press 2003

This book interprets interactive design through its fundamentals, design, theory, and social and artistic issues. It is written for the programmers and designers creating the interactive interface and software. The author contends that to truly engage the user, more thought is required on the part of designers and programmers to simulate a person-to-person learning experience with a person-to-computer actuality. This resource is educational because it dissects interactivity down to its most basic level and takes the reader through each facet.

**The Art of Producing Games**  
by David McCarthy, Ste Curran, and Simon Byron  
Cengage Learning 2005

This publication is split into five parts: introduction to game development, preproduction, production, postproduction, and business and finance. While this book is ultimately geared towards designers of commercially produced games, it was still helpful to look at the steps and process, which I applied on a smaller scale. It also takes a look at the seminal games and game design for the 1980's and '90's and into the 21st century.

**Butterflies and Moths: Eyewitness Handbooks**  
by David Carter  
Dorling Kindersley, Inc. 1992

This book is geared towards butterfly enthusiasts and contains a plethora of factual information on butterflies and moths. A page of information was written on each specific type of butterfly and moth, which was helpful when trying to find information on the species living in the *Dancing Wings Butterfly Garden*.

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**Butterflies of the World**  
**by Valerio Sbordonì and Saverio Forestiero**  
**Arnoldo Mondadori Editore, S.p.A. 1984**

This book is geared towards individuals who are interested in a more scientific look at butterflies. It is very technical, which was helpful for finding more specific information.

**Butterflies of the World**  
**by Myriam Baran, photos by Giles Martin**  
**Harry N. Abrams 2006**

This book is very detailed about all aspects of butterflies, getting into some of the more technical aspects of a butterfly's life, anatomy, self-defense mechanisms, mating habits, and much more. It provided a lot of information that many sites and books did not.

**Challenges for Game Designers**  
**by Brenda Brathwaite and Ian Schreiber**  
**Cengage Learning 2009**

This book offers exercises to the user to improve game design through challenges and brainstorming exercises. It was written for anyone interested in game design—professionals, aspiring designers, or students. This resource covers the building blocks, chance and skill, and concepts as well as additive and subtractive design. This resource was a good place to start brainstorming the components and functions of my project. I found the chapter on “Games as a Teaching Tool” to be especially helpful.

**Designing for Children: Marketing Design That Speaks to Kids**  
**by Catharine Fishel**  
**Rockport Publishers, Inc. 2001**

This book is a guide to understanding the consumers of a multi-billion-dollar industry—children, and is intended for marketing and design professionals. The author reviews brands that work from the genres of toys, literature, media, destinations, and consumables. She also covers age cues and design clues of motor and physical development, social skills, and intellectual and cognitive development for children ages 2-3, 4-5, 6-7, 8-9, and 10-12. The author presents successful products from the viewpoint of who produces the product, how they market it, and what makes the product successful. It includes a 5-page section on the Children's Museum of Manhattan in the destinations section, which has tips and input from the exhibition's designers.

**Designing for User Engagement: Aesthetic and Attractive User Interfaces**  
**Alistair Sutcliffe**  
**Morgan & Claypool Publishers 2010**

This book looks at how the process of design for engagement and user experience can not only be usable, but aesthetically pleasing as well. It delves into the psychology behind user engagement from the perspective of design and analyzes different examples of engaging websites. It covers many different game scenarios and ways to engage the user. Chapter 4, “Design Principles and Guidelines,” was especially helpful when starting to plan out my project.

**Don’t Make Me Think: A Common Sense Approach to Web Usability**  
**by Steve Krug**  
**New Riders 2006**

This book is intended for web designers of all levels. It offers a truly common sense approach to web usability, enlightening the reader to what they may not have realized makes effective web usability. It offers an approach to usability design for everyone, analyzing how people use the web and how to design accordingly. This is a reference I consult regularly for other projects as well.

**The Ecology of Games: Connecting Youth, Games, and Learning**  
**edited by Katie Salen**  
**The MIT Press 2008**

This book mainly looks at more complex games and analyzes how young people use them and learn from and with them. A section written by Mizuko Ito called “Education vs. Entertainment: A Cultural History of Children’s Software” that delves into children’s software for learning that I found useful.

**Foundation Game Design with Flash**  
**by Rex van der Spuy**  
**Friends of Ed 2009**

This book is a tutorial on Flash game design elements. It is intended for an individual learning to build games in Flash. The author includes detailed and practical examples and case studies to lead the user through the process step by step. This resource was helpful when beginning to build my project’s structure as well as during the process of building the application.

**Growing Graphics: Design for Kids**  
**by Vicky Eckert, Efrén Zúñiga, and Ana Freixas**  
**Index Book SL 2009**

This book is a showcase of designs and product designs for children. It is intended for designers or anyone interested in design. It is split into age categories: 0-1, 1-3, 3-6, 6-9, 9-12 and all ages. This book was great for age-specific design inspiration.



**HCI Beyond the GUI: Design for Haptic, Speech, Olfactory and Other Nontraditional Interfaces**  
**by Philip Kortum**  
**Morgan Kaufmann Publishers/Elsevier 2008**

This book discusses human computer interaction as it applies to graphical user interfaces, specifically nontraditional kinds. It is geared toward professional use as a reference source, as well as for upper-level undergraduate students and graduate students to introduce them to the nontraditional interface technologies available to them. The author reflects that since the advent of the internet, graphical user interfaces are the most common interface used, both for designers and for the user. This is a useful resource of different types of interfaces, including the information needed to design, build, and test the interfaces. Many of the interfaces described in this book were beyond the needs of my project and functionality of the hardware, but the chapter on auditory interfaces was helpful, since I used narration and sound effects in my project.

**How Children Learn Through Play**  
**by Dorothy Einon**  
**Barron's Educational Series, Inc. 2004**

This book provides activity examples for pre-K and kindergarten children with an explanation of how each one is educational. It is designed for parents of toddlers and instructors of pre-K and kindergarten classes. The author provides activities for ages 2-6 that include word and number games, music games, and craft projects. Although this only covers a portion of my intended audience, it is good to see what younger children are capable of. This book covers eye-hand coordination, as well as language and learning cues of 2-6 year olds.

**Human Computer Interaction Research in Web Design and Evaluation**  
**by Panayiotis Zaphiris and Sri Kurniawan**  
**IGI Global 2007**

This book reports on the user's interaction with the web, to analyze behaviors in order to more successfully design a user-friendly web site. The intended audience is educators, university administrators, researchers, lecturers of human-computer interaction and user-centered design, web system managers, instructional designers, and anyone interested in human-computer interaction and web design. The authors declare that the variety of web sites and design, as well as the variety of the users' goals, makes the task of deciding the best approach challenging.

**The Lives of Butterflies**  
**by Matthew Douglas**  
**The University of Michigan Press 1989**

This book contained very detailed and labeled drawings and diagrams of the anatomy of a butterfly, and was a helpful reference for the anatomy section of my project.

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**Museums in a Digital Age**  
**edited by Ross Parry**  
**Routledge Taylor & Francis Group 2010**

This book is a collection of materials written by more than 50 different authors, spanning 20 years and many countries dealing specifically with digital heritage, or digital media in the cultural heritage sector, specifically museums. Not all the essays apply to my project, but I found the section on “Interpretation: Communication, Interactivity and Learning” to be quite informative. This is a unique resource since it talks about interactivity in a museum setting, which is exactly what my project entails. It also talks about virtual visits to museums through the web, which is another aspect of my project, since users will be able to use my application before coming to the museum. I also found one particular paper by Ben Gammon, “Visitors’ Use of Computer Exhibits: Findings from five grueling years of watching visitors get it wrong,” to be particularly informative.

**Perceiving Play: The Art and Study of Computer Games**  
**by Torill Elvira Mortensen**  
**Peter Lang Publishing, Inc. 2009**

This book analyzes play, computer games, and the art behind computer games. It was interesting, especially because of the importance it places on aesthetics when designing a computer game and the detail provided on the central elements of play.

**Rules of Play: Game Design Fundamentals**  
**by Katie Salen and Eric Zimmerman**  
**The MIT Press 2004**

This book observes why people play games and why some games are loved more than others. It provides the tools for understanding games. The authors hope to help game designers create their own games, concepts, methodologies, and strategies through understanding play. This resource was very helpful in my research, especially since I was new to game design and how individuals learn through play.

**Usability of Websites for Children: 70 Design Guidelines**  
**by Shuli Gilutz & Jakob Nielsen**  
**Nielson Norman Group 2002**

This book goes into great detail about the results of a study testing how children use the web, which included children of varying ages, ethnicities, and sexes. Although this book is dated, the information provided from the study still applies and was invaluable when working on the interface and design elements of my project.

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### 3:3 Electronic Resources

**Association of Children's Museums**  
**[www.childrensmuseums.org/index.htm](http://www.childrensmuseums.org/index.htm)**  
**2009**

This website is a portal for anyone who wants to see what children's museums exist and how they are making an impact. The site's intended audience is children's museum employees, enthusiasts, and just curious individuals. This resource has a page showing the different museums that are making an impact, with links to each individual site and a description of new exhibits. The pressroom page provides links to articles about children's museums. This was a helpful resource to discern what other children's museums are doing by way of interactivity.

**Butterflies and Moths of North America**  
**[www.butterfliesandmoths.org](http://www.butterfliesandmoths.org)**  
**by Paul A. Opler, Kelly Lotts, and Thomas Naberhaus**  
**Big Sky Institute 2009**

This website provides an in-depth database of butterflies and images. This website is geared towards anyone wanting to know more about butterflies, related terms, or butterflies in the news, and is an excellent resource for anyone who is already an expert on butterflies. The information about each butterfly is very extensive—flight, life history, wing span, food, habitat, and location in the U.S.—and is accompanied by very detailed images. This resource helped with the content and imagery for my project, especially since it has an excellent image database.

**The Children's Butterfly Site**  
**[www.kidsbutterfly.org](http://www.kidsbutterfly.org)**  
**by Paul A. Opler, Kelly Lotts, and Thomas Naberhaus**  
**Big Sky Institute 2009**

This website provides many resources when it comes to butterflies and teaching children about them. The intended audience for this website is children as well as educators and parents. From the design and the text-heavy content, it seems to be geared toward the latter. This resource was useful for the educational aspect of my project because of the links to teaching and learning tools as well as links to butterfly-specific sites. It also covers frequently asked questions and information on the butterfly life cycle.

**Creation of a Flash coloring book**  
**<http://www.emanueleferonato.com/2010/03/18/creation-of-a-flash-coloring-book/>**  
**Emanuele Feronato**  
**March, 2010**

This site was very important in the creation of the coloring part of my Create Your Own Butterfly Section. Although my coloring section is more complicated than the tutorial, this was my starting block.

**Explore Butterflies**

**[www.ansp.org/museum/butterflies/new\\_interactive/butterflies.html](http://www.ansp.org/museum/butterflies/new_interactive/butterflies.html)**

This website is an entirely interactive website devoted to butterflies. The intended audience is children, but I think anyone would appreciate learning about butterflies in a fun interactive way. There are four different sections: “Test Your Butterfly Smarts” (which is a multiple-choice quiz), “Build a Butterfly Habitat” (where you get to add plants to see how many butterflies you attract), “Field Observation” (which analyzes the parts of the butterfly and what they are used for), and “Butterflies & Climate Change” (which analyzes climate change’s effect on butterflies). This was a good resource to see what other interactive butterfly applications are out there.

**Flash Kit: A Flash Developer Resource for Adobe Flash**

**<http://www.flashkit.com>**

Flashkit is an Adobe Flash development support site, which came in handy for figuring out how to fix some of my coding problems.

**Kirupa.com: Flash and HTML5 Tutorials for Designers**

**<http://www.kirupa.com/>**

Kirupa is another designer and developer help site containing articles and blog posts which helped me find solutions to some of my coding issues.

**LD Pride**

**Learning Styles and Multiple Intelligence**

**<http://ldpride.net>**

This website from the Vancouver Island Invisible Disability Association addresses invisible disabilities, such as learning disabilities and attention deficit disorder. It is geared toward adults with invisible disabilities. The specific page on Learning Styles and Multiple Intelligence is helpful for all age groups. This section of the site goes into detail about learning styles and multiple intelligences and has tests for both. It also has a link to download the book *Understanding Your Learning Style* for free. This was a good resource to make sure that I was covering all learning styles in my project.

**Mickey Mouse Clubhouse**

**<http://disney.go.com/disneyjunior/mickey-mouse-clubhouse>**

This is good example of a well-designed and well organized website for children.

**Niagara Parks Butterfly Conservatory****<http://www.niagaraparks.com/garden-trail/butterfly-conservatory.html>**

The Niagara Parks website is not extensive. It is a single page on the Niagara Parks site, but it does have a downloadable teaching guide. I found this resource helpful, since it also a butterfly garden that deals with children and school groups on a daily basis.

**Scholastic****[www2.scholastic.com](http://www2.scholastic.com)****2009**

Scholastic's website is an excellent resource for teachers, parents, children, and anyone looking to understand anything related to teaching. This was a great resource for understanding the best way to relay the informational aspect of my project to children.

**siteInspire****<http://siteinspire.com/>**

siteInspire is a good resource for web design inspiration or current usability ideas. You can search many different categories, from greyscale to colorful, cute, fun, illustrative, or busy. The site also has a category of just Flash sites.

**Sue's Butterfly Haven****[www.SuesButterflyHaven.com/](http://www.SuesButterflyHaven.com/)**

This site is the personal website of Sue Allie, which contains information on butterflies.

The intended user is anyone interested in butterflies. The part I found useful for my research process is the "Butterfly Exhibits" page, showing permanent and temporary butterfly exhibits across the U.S.

**Technology Timeline for Kids****by Warren Buckleitner****DisneyFamily.com (<http://family.go.com/hot-topics/pkg-kids-technology/tech-timeline/2/>)**

This interactive age timeline shows the different skill levels of technology that children possess from ages 6 months to 16 years. The article/interaction is written for parents to help them assess the proper applications for their children's age. It could also be helpful for parents to know when to introduce new technologies. This was a good resource for my project, making sure the technology I used for my project was appropriate for the intended age range.

**TweenMax****<http://www.greensock.com/tweenmax/>**

This site is intended for Flash developers who would like to use TweenMax. This is a great resource for the TweenMax files and code.

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## 04 PROCESS

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### 4:1 Project Goals

The goal of *Flutter-by Interactive Butterfly* is to excite and educate child visitors about butterflies and the National Museum of Play at The Strong's *Dancing Wings Butterfly Garden*. Intended for use as a kiosk in the museum and accessible through The Strong's website, the project introduces and reinforces the rules of *Dancing Wings Butterfly Garden* as well as familiarizes visitors with the butterfly species and other creatures they will find when visiting. Additionally, it will educate younger visitors about the life cycle, anatomy, naming, and characteristics of butterflies, utilizing different interactive elements to appeal to multiple ages and learning styles.

The kiosk could be used prior to entering or after exiting the garden to enhance the educational aspect of the exhibit. If a visitor is interacting with the project prior to entering the garden, it needs to have elements that are quick to use in order to gain information, since when using it, the visitor will probably be waiting for their scheduled time in the garden. If the user is accessing this application from the website, it will give them a view of the *Dancing Wings Butterfly Garden* and entice them to come in and see the garden for themselves, now equipped with the knowledge they acquired from the project.

A trading card takeaway as a prize for winning each game will attract the user to play the project more than once, striving to collect all the cards. The trading cards could be printed and brought with them when they visit the *Dancing Wings Butterfly Garden*.

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## 4:2 Research

**“Didactic analysis traditionally deals with three main questions that are important to educational game design:**

1. What actually is and what should be learned (learning goals)?
2. What is and should be the material/themes used to reach these goals (learning content)?
3. How should this learning content be learned (learning and teaching methods)?”

(Bopp, 10)

Since I had already gathered information from the National Museum of Play at The Strong and the *Dancing Wings Butterfly Garden* to find out what visitors were curious about, my first step in researching outside sources was to learn more about butterflies. By deciding the content and dialog of the project, I could then figure out the best way to present this information.

My main focus when researching was to learn more about the life cycle, species, families, and naming conventions, anatomy, and coloring of butterflies. Since I knew which butterflies were most common in the garden, I researched those individual species as well.

My next step was to decide how best to organize and present the information in a fun interactive way, which would appeal to children of different ages, interests, reading levels, learning styles, and attention spans. I researched best usability practices for children, how children learn, different learning styles, games and online sites geared towards children, children’s butterfly books, design considerations for children, other interactive butterfly websites for children, interactive design and how to produce games for children, and Flash/ActionScript3.0 options for interaction.

After more research into the content and functionality of the project I decided on four main sections, Welcome, The Life Cycle of a Butterfly, Create Your Own Butterfly, and Trading Cards. Each section contains different user interactions, time factors, and educational goals.

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## 4:3 Target Audience

Many of the resources I found dealing with age cues for development, reading levels, and design sensibilities generally broke age ranges down to increments of 6 months to 1-2 years, which is beneficial for a more in-depth look.

The authors of *Usability of Website for Children: 70 Design Guidelines* split their age focus into two groups, children ages 5-12 and teens ages 13-18. They indicated that there are many difference between children and teen users in terms of web usability and focus (Gilutz & Nielson, 6). Because I wanted to appeal to younger visitors of the Dancing Wings Butterfly Garden I chose my target audience to be children ages 5-12 from a content and usability standpoint.

Users over 12 years old will also be able to use this interactive project, but my goal was to make the vocabulary, usability, and design expressly to attract and educate younger visitors. There is narration for all written text, so that children younger than 5 can follow along with an older sibling or parent. I wanted to design the application for children under the age of 12 to peak their interest in butterflies and give them a new perspective of the butterflies in the *Dancing Wings Butterfly Garden*; especially since I noticed many of the younger visitors were either scared of the butterflies or trying to grab them.



## 4:4 Project Development

“Designing for people with small feet is no small feat.” (Fishel, *Designing for Children*, 11)

My first step in the project development stage was to create a structure and dialog based on the content and functionality I wanted in each section of the project. During this time I also decided on the interactions and animations I wanted for each section of the project, which will be covered in the following four documentation sections (Sections 4:5–4:8). In this documentation section I will be covering the size, structure, design, user interface, color, and typeface choices.

### Size

The size of my project was based on the kiosk size that we would be using in the National Museum of Play, which is 1280 x 720px. This size also works for the web, since it would be a link from The Strong’s site instead of having to fit into the size of their website.

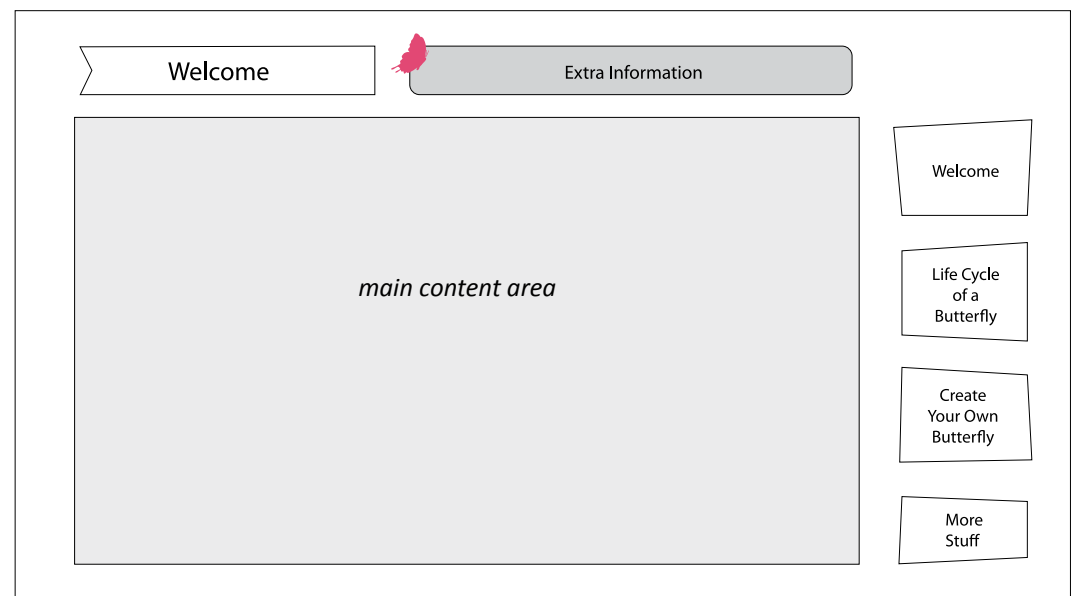
### Structure

After several iterations of navigation and functionality, the final main page is a shell that has four navigation buttons on the right (Figure 4.4.1). Because of the size of the interactive-heavy files, I created each as a separate Flash document that loads into the main content area when called by the navigation buttons. The size of each of these files is 950 x 540px.

### Current Location Indicators (Breadcrumbs) and Instruction

The title of the each section appears at the top of the page. It is color-coded to match the navigation button and border of the main content area, visually indicating to users which section they are utilizing. Any instructions for the section will remain at the top in the extra information bubble, so that it is always available to users.

Figure 4.4.1  
Main page wireframe



### Mascot

Many current games and digital applications for kids have a mascot or character to guide them through the application. The author of *Designing for User Engagement* says that this type of presence creates a more positive experience and engages the user (Sutcliffe, 10). For *Flutter-by Interactive Butterfly*, I chose to use Beatrice the Butterfly as my mascot. You can see her and her instructions in the extra information area of the main shell (Figure 4.4.2) as well as a larger representation of her in the Welcome section (Figure 4.5.1). The voice of her narration stays consistent throughout. She also plays on the user's sense of familiarity with family in asking for help to get her cousin Morphy through the four stages of his life cycle.

### Design Style

The next step in my design project development was to create a design style. I chose asymmetrical boxes for my navigation and content border to complement the design that The Strong currently employs (Figure 4.4.2). Earlier iterations of my project attempted to pack much more information into each section by utilizing the border for more content (Figures 4.4.3 and 4.4.4). This ended up being too busy and distracting, so all but the Life Cycle of the Butterfly sections have a simple border. The content loaded into each section through the main content area is very colorful and busy, so I chose a sky blue color with clouds as the background. This is appropriate for the subject of butterflies and I also used them in the Life Cycle of the Butterfly section animations. The clouds are slowly moving to attract users to the kiosk, but not so much as to defer from the main content.

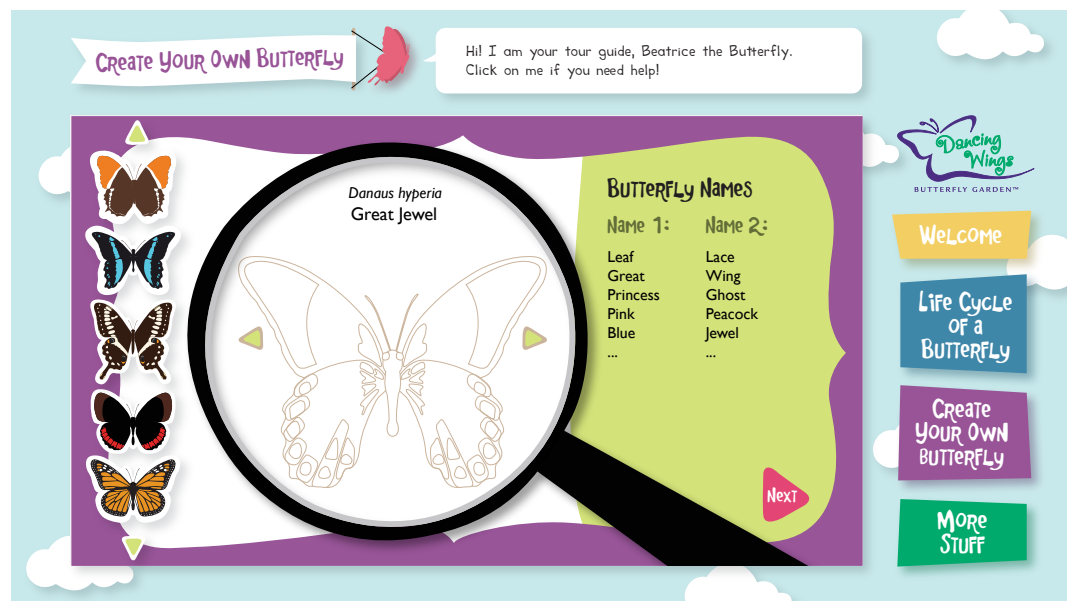
Figure 4.4.2  
Main page design



Figure 4.4.3  
Older iteration of the  
main page, which was  
crowded



Figure 4.4.4  
Older iteration of the  
Create Your Own  
Butterfly Section,  
which was too busy



### Illustrative vs. Photographic

Originally I was uncertain about whether to do a more illustrative or more photographic style, because I wanted the content to be realistic and recognizable by the younger viewers, but I also wanted to attract their attention. The illustrative look took a lot longer to design because of the individual elements in the garden and butterfly wing patterns, but ultimately allowed for more flexibility in the design of the animations and content. I decided to go with a “sticker” look for the butterflies, to help them stand out from the garden background, which is incorporated throughout the project.

I did, however, find a balance between the two by using photographs in the trading cards. These photographs, which were taken in the garden by myself and entomologist Tad Yankoski, display the butterfly and the plant on which they are resting. Not only will visitors with trading cards be able to find the butterfly on their card, but the plant as well. It may even give them clues as to where to find the butterfly depicted on their card.

I did use photographs of the garden I took from different angles and stitched together as a reference for the garden illustration. I used photographs of the butterfly species and other creatures in the garden found in my literary and online resources for reference as well.

### Color

The colors in the game are bright and cheerful. Since the butterflies and plants in the garden are colorful and cheerful, it made sense to emulate those colors. One of the educational goals of this project is recognition of butterfly species in the garden, as well as a glimpse into the *Dancing Wings Butterfly Garden*. The colors assigned to the plants and butterflies match their real-life counterparts. Even Beatrice the Butterfly and her cousin Morphy retain the color of their species.

The colors I chose for the navigation buttons, other buttons and screen backgrounds throughout the project are also colorful, complementary, and consistent throughout (Figures 4.4.5 and 4.4.6). I used drop shadows throughout to give the game a bit more dimension and make more important and interactive elements stand out.

Figure 4.4.5  
Main navigation and  
background colors



Figure 4.4.6  
Other colors used  
throughout project



## Typefaces

The two main typefaces being used in the project are Marker Monkey (Figure 4.4.7) for the titles and Sassoon Infant Regular (Figure 4.4.8) for the body copy. Sassoon Infant Bold (figure 4.4.9) and Sassoon Sans Slope Regular (figure 4.4.10) were also used for any bold and italic needs for the body copy. Both these typeface work well together and compliment each other, but provide a good contrast as well.

Figure 4.4.7

**MaRKer MoNKey**

ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890

*Designed by Brad O. Nelson*

This typeface is a bit more reflective of the feeling of the project. Its funky handwritten quality gives it a more approachable feel. It is also a typeface that will appeal to the older of my target audience since they respond more to mood represented through typefaces (Fishel, 156).

Figure 4.4.8

**Sassoon Infant Regular**

ABCDEFGHIJKLMNOPQRSTUVWXYZ  
ÀÁÊËÔÖÜabcdefghijklmnopqrstuvwxyz  
àáêëöü&1234567890(\$£.,!?)

Figure 4.4.9

**Sassoon Infant Bold**

ABCDEFGHIJKLMNOPQRSTUVWXYZ  
ÀÁÊËÔÖÜabcdefghijklmnopqrstuvwxyz  
àáêëöü&1234567890(\$£.,!?)

Figure 4.4.10

**Sassoon Sans Slope Regular**

ABCDEFGHIJKLMNOPQRSTUVWXYZ  
ÀÁÊËÔÖÜabcdefghijklmnopqrstuvwxyz  
àáêëöü&1234567890(\$£.,!?)

*Designed by Rosemary Sassoon and Adrian Willams, 1988–1998*

My committee member Carol Fillip, who has done a lot of research on typefaces when designing for children, recommended this font. This typeface is specifically designed for children, hence part of the name being infant. It also is representative of how children learn to write, so it is easily recognizable by beginning readers. The design itself is legible and friendly.

**Learning Styles**

Since my target audience is 5 to 12 year olds, I wanted to make sure to accommodate varied reading levels as well as different learning styles. The imagery and animation will appeal to visual learners. The narration and sound effects will help the auditory learners better absorb the information that is being visually displayed. It also helps aid children who are not yet reading or at a beginning reading level. Different voices were used in the Welcome garden section to make the butterflies each feel like a different character. The same voice was used throughout for the mascot Beatrice the Butterfly for consistency and familiarity. Different sound effects were used throughout to indicate sleeping, slurping and a bird squawking. The tactile/kinesthetic learners benefit from the variety of interactions, ability to explore the interface at their own pace, and will especially enjoy the Create Your Own Butterfly section.

**Implementation**

The final part of the project was creating and implementing the files. All the design elements were created in Adobe Illustrator. The animations were created using Adobe After Effects. The sound was recorded and edited using Adobe Soundbooth. The final product was constructed in Adobe Flash with ActionScript3.0 for functionality and interactivity.

## 4:5 Section 1, Welcome

Figure 4.5.1  
Beatrice the Butterfly  
welcoming users to  
the Dancing Wings  
Butterfly Garden



### Section 1: Welcome

The educational goals of this section are to familiarize users with some of the butterflies—visually and by name—that they will see in the *Dancing Wings Butterfly Garden*, and to familiarize them with the rules and characteristics of butterflies.

The welcome section gives users a quick peek into the garden. They can spend as much or as little time in this section as they wish. They are able to scroll around the garden and “talk” with the butterflies and other inhabitants in the garden by rolling over them with the mouse to get a narrated pop-up bubble of dialog (Figures 4.5.2–4.5.21). The cursor changes to a magnifying glass, as to not make the user think that they are touching the butterflies, but are instead merely observing. Beatrice tells the user when the section begins that there are 17 of her friends that you can talk to in the *Dancing Wings Butterfly Garden*.

This interaction is a good way to make the butterflies less scary to younger children. By giving the butterflies a personality and enabling the younger users to “talk” to the butterflies as friends, children can connect with the butterflies and relate to them on a new level. Each butterfly has a different voice narration, both male and female, which also lets the user feel that they are all different. This reinforces the rules of the garden in a way that portrays the butterflies as friends, to be treated with care.



Figure 4.5.2  
Left: Atlas Moth

Figure 4.5.3  
Right: Scarlett Mormon



Figure 4.5.4  
Left: Paper Kite

Figure 4.5.5  
Right: Red Rim



Figure 4.5.6  
Left: Thaos Swallowtail

Figure 4.5.7  
Right: Blue Ganded Fritillary



Figure 4.5.8  
Left: Zebra Longwing

Figure 4.5.9  
Right: Emperor Swallowtail



Figure 4.5.10  
Left: Mocker Swallowtail

Figure 4.5.11  
Right: Chocolate Malachite

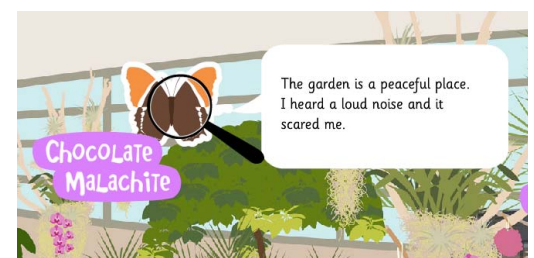


Figure 4.5.12  
Left: Morpho

Figure 4.5.13  
Right: Green Malachite





Figure 4.5.14  
Left: Button Quail

Figure 4.5.15  
Right: Flower



Figure 4.5.16  
Left: Giant Owl

Figure 4.5.17  
Right: Giant Owl interaction on mouse roll-over



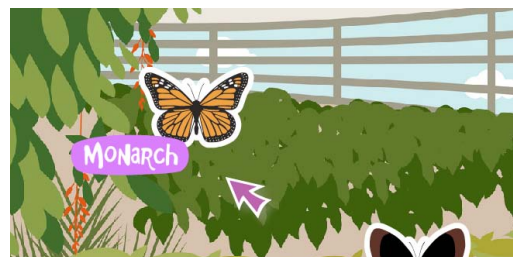
Figure 4.5.18  
Left: Indian Dead Leaf

Figure 4.5.19  
Right: Indian Dead Leaf interaction on mouse roll-over



Figure 4.5.20  
Left: Monarch

Figure 4.5.21  
Right: Monarch interaction on mouse roll-over



## 4:6 Section 2, Life Cycle of a Butterfly

The educational goals of this section are to show how the butterfly goes from egg to butterfly, emphasizing the time each step in the biological process takes, while also involving the user in the process.

Beatrice the Butterfly asks the user to “Please help my cousin Morphy through the stages of his life cycle so that he can come live here with us in the garden!” This section is broken up into four stages: egg, caterpillar, chrysalis, and butterfly.

### Stage 1: The egg

This section plays an animation explaining about host plants, how the mother butterfly attaches the egg to a leaf for protection, the time it takes before the caterpillar can emerge, the caterpillar emerging, and the caterpillar eating its shell as its first meal (Figures 4.6.1–4.6.8).

Figure 4.6.1



Figure 4.6.2



Figure 4.6.3



Figure 4.6.4



Figure 4.6.5





Figure 4.6.6



Figure 4.6.7



Figure 4.6.8



### Stage 2: The Caterpillar (or Larva)

This section first plays an animation to explain how caterpillars need to eat a lot to grow and shows how to play the caterpillar game (Figures 4.6.9–4.6.16). Using the arrow keys, the user can move Morphy the Caterpillar around to eat the leaves to gain energy. There is an energy panel to show how much he has eaten, which needs to be full to have enough energy to change into a butterfly. He also gets larger as he eats more leaves. There is a timer panel to show that he has 14 days to eat enough food. He also needs to avoid the bird that is looking for a caterpillar treat.

Figure 4.6.9

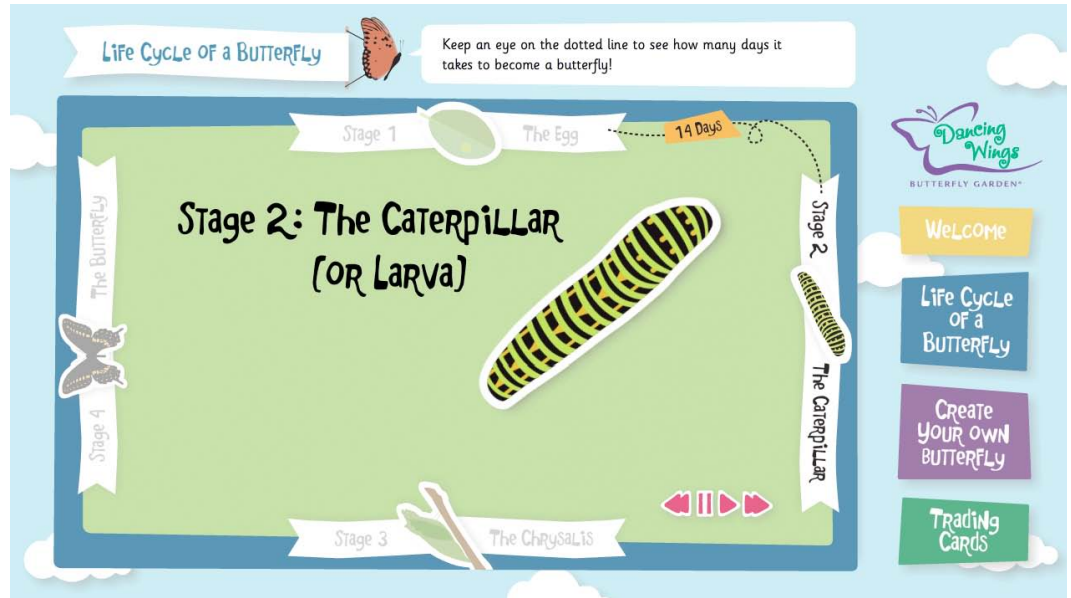


Figure 4.6.10

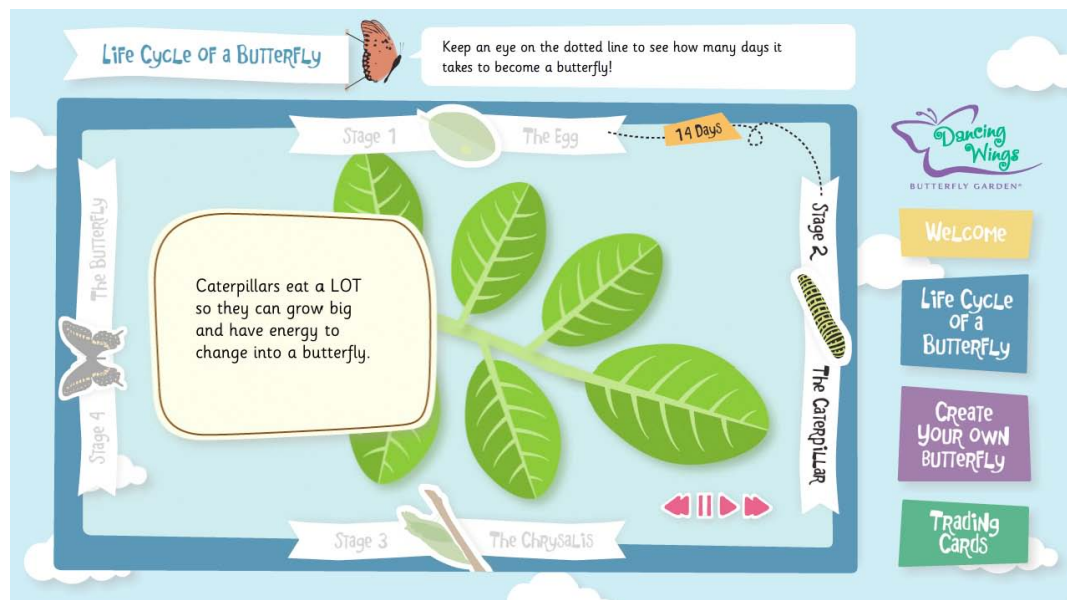


Figure 4.6.11



Figure 4.6.12





Figure 4.6.13



Figure 4.6.14



Figure 4.6.15  
Caterpillar game



Figure 4.6.16  
Caterpillar game



### Stage 3: The Chrysalis (or Pupa)

This section plays an animation explaining and showing how the caterpillar finds a safe place to hang out, forms into a chrysalis and then emerges as a butterfly (Figures 4.6.17–4.6.24).

Figure 4.6.17

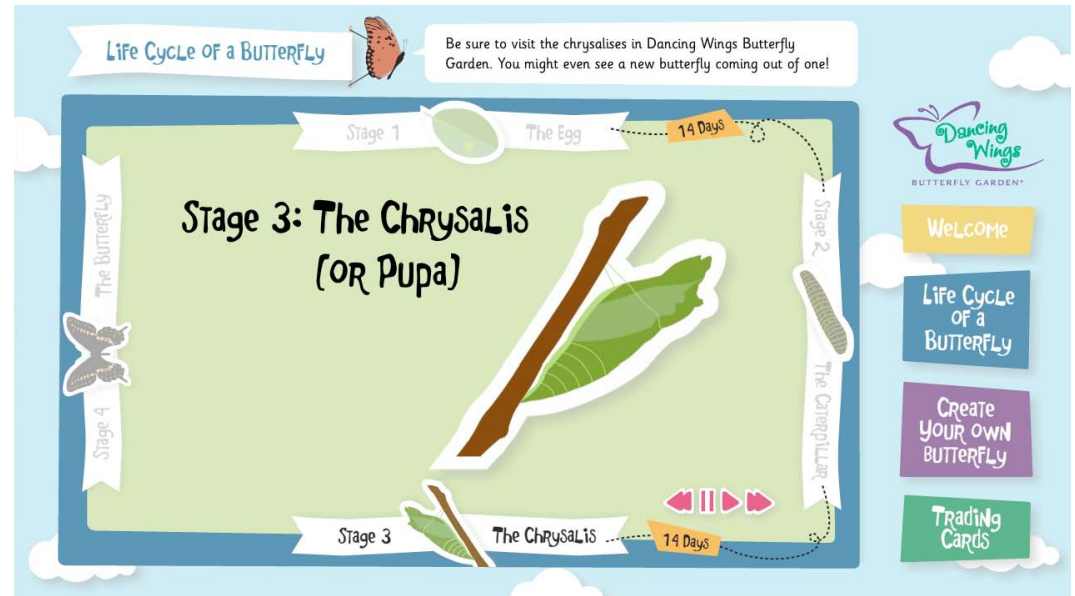


Figure 4.6.18

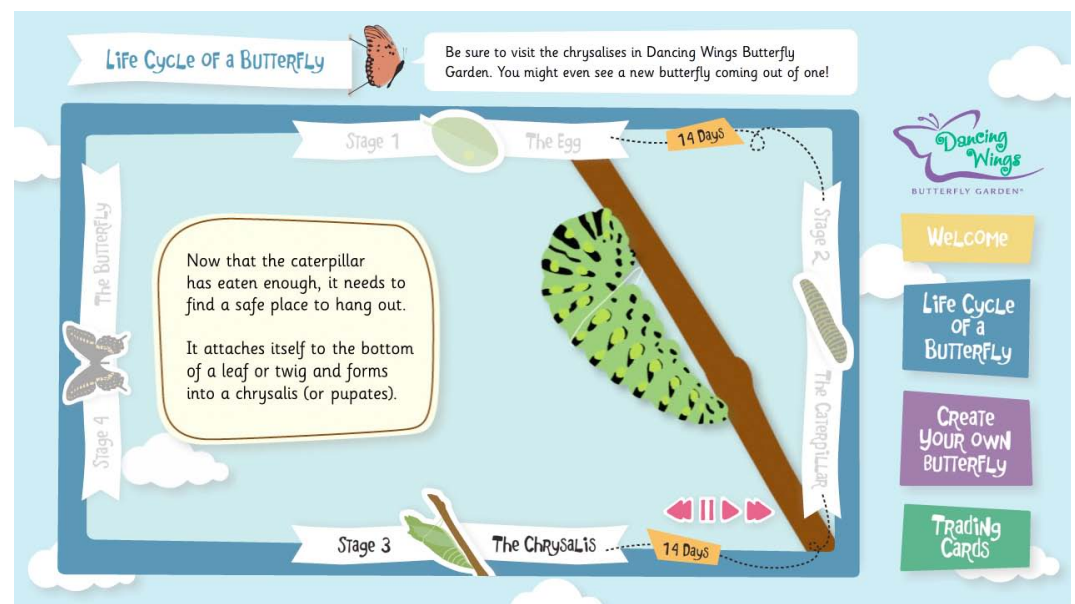


Figure 4.6.19

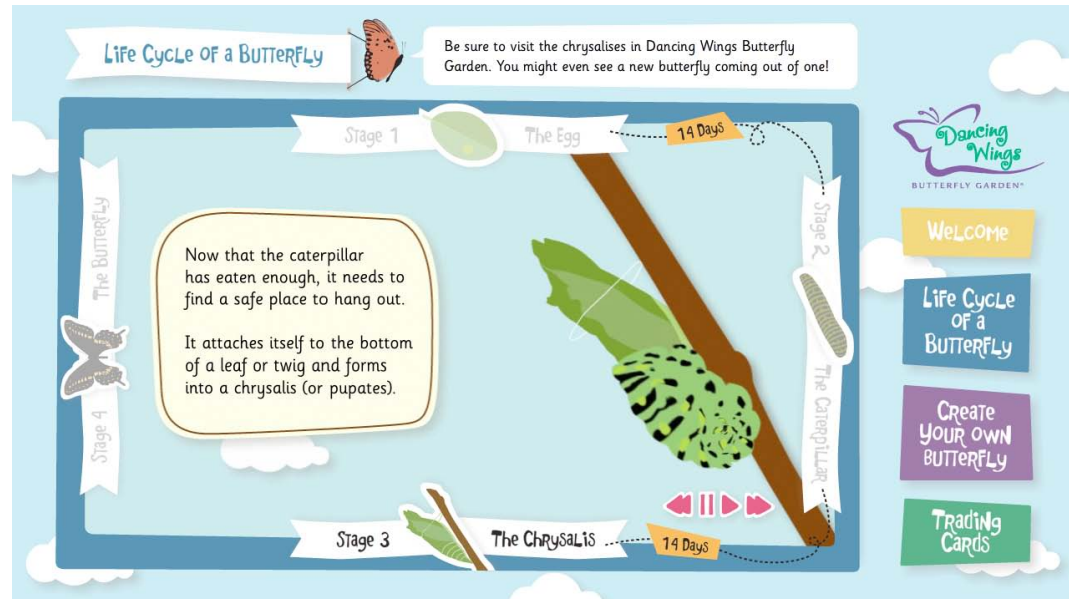


Figure 4.6.20





Figure 4.6.21



Figure 4.6.22

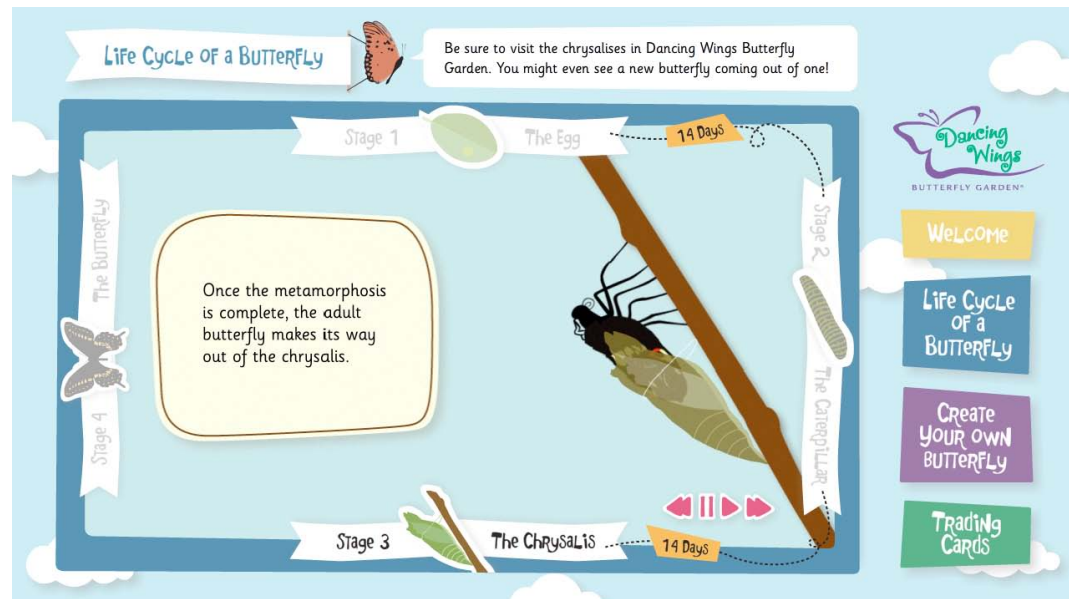
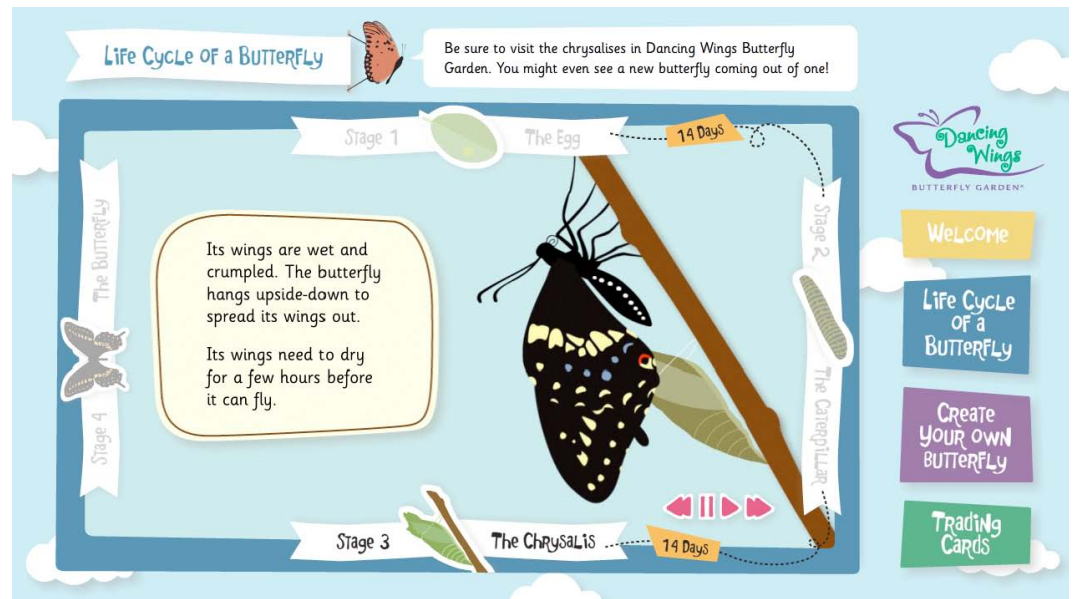


Figure 4.6.23



Figure 4.6.24



#### Stage 4: The Adult Winged Butterfly

This section first plays an animation explaining what type of butterfly Morphy is and what food he eats (Figures 4.6.25–4.6.26). It then shows how to play the game (Figures 4.6.27–4.6.32), which is similar to the caterpillar game, to avoid any confusion. The main differences are there are fewer days to complete this stage and when Morphy flies, he uses energy, which he must replace by drinking nectar from brightly colored flowers. He also must avoid any hands trying to grab him, which is a reinforcement of one of the rules of the *Dancing Wings Butterfly Garden*, which is not to touch the butterflies.

Figure 4.6.25

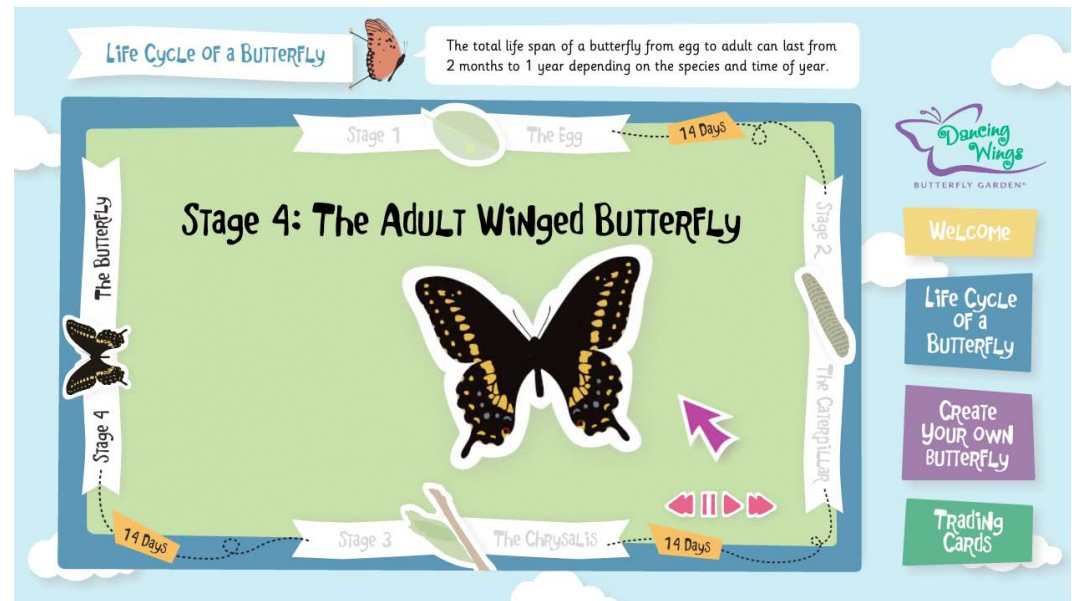


Figure 4.6.26





Figure 4.6.27



Figure 4.6.28





Figure 4.6.29



Figure 4.6.30



Figure 4.6.31  
Butterfly game



Figure 4.6.32  
Butterfly game



The animations were all created in Adobe After Effects. The caterpillar coming out of the egg, turning into a chrysalis, and the butterfly coming out of the chrysalis were all created using the puppet pins and distortion mesh tools.

The animations are all narrated by Beatrice the Butterfly. The words appear (or fade-up) on the screen as she is saying them. Any important words are shown in bold. Once the description is done, the animation of the description begins. It is broken up into small parts of text and animation as to give the user small bits of information at a time.

This section takes the longest to complete if the user watches each of the animations all of the way through and plays each game. To allow users to play/use at their own pace, each animation has back, pause, play, and forward buttons. If the user missed anything, they can start again; if they have already seen the animation and simply wish to play the games, they can do that as well.

As aforementioned, this is the only section in which I included extra functionality around the main content area's border. Banners around each side show the four stages of the life cycle and serve as buttons to get to each stage independently. After each stage is finished, there is also another set of graphics that begin to appear between the stage banner/buttons. There is a progress dotted line, much like you'd see on a map, to indicate how long each stage took Morphy once it has been completed.

The games are designed to allow for the user to take part in Morphy's life cycle, letting them be a caterpillar in nature and a butterfly in the garden.

Each game has a win and lose screen (Figures 4.6.33 and 4.6.37). The win screen allows you to go to the next stage (or in the case of the last game, returns you to the Welcome section). The lose screen lets you replay the game or go to the next section. When a player wins they are awarded a random trading card out of the set. If they are using the kiosk, they will then be able to email the trading card to themselves. If they are at home they will be able to save the trading card to the desktop.

The trading card file that is emailed or saved is set up as an 8.5 x 11" file, so that it is easy to print out (Figure 4.6.36). It also has instructions for cutting out the card and gluing it together (since there is a front and back). This allows the user to have a tangible prize that they can collect and bring with them to the *Dancing Wings Butterfly Garden*.

Each trading card is numbered, has a photograph of a butterfly, plant or creature in the garden, its scientific name, and where they are from. The realistic image allows the younger visitors to more easily find the elements pictured in the garden.

Figure 4.6.33  
Caterpillar game:  
win screen



Figure 4.6.34  
Caterpillar game: entering  
name for trading card file





Figure 4.6.35  
Caterpillar game:  
save trading card file



Figure 4.6.36  
8.5 x 11" printable  
trading card

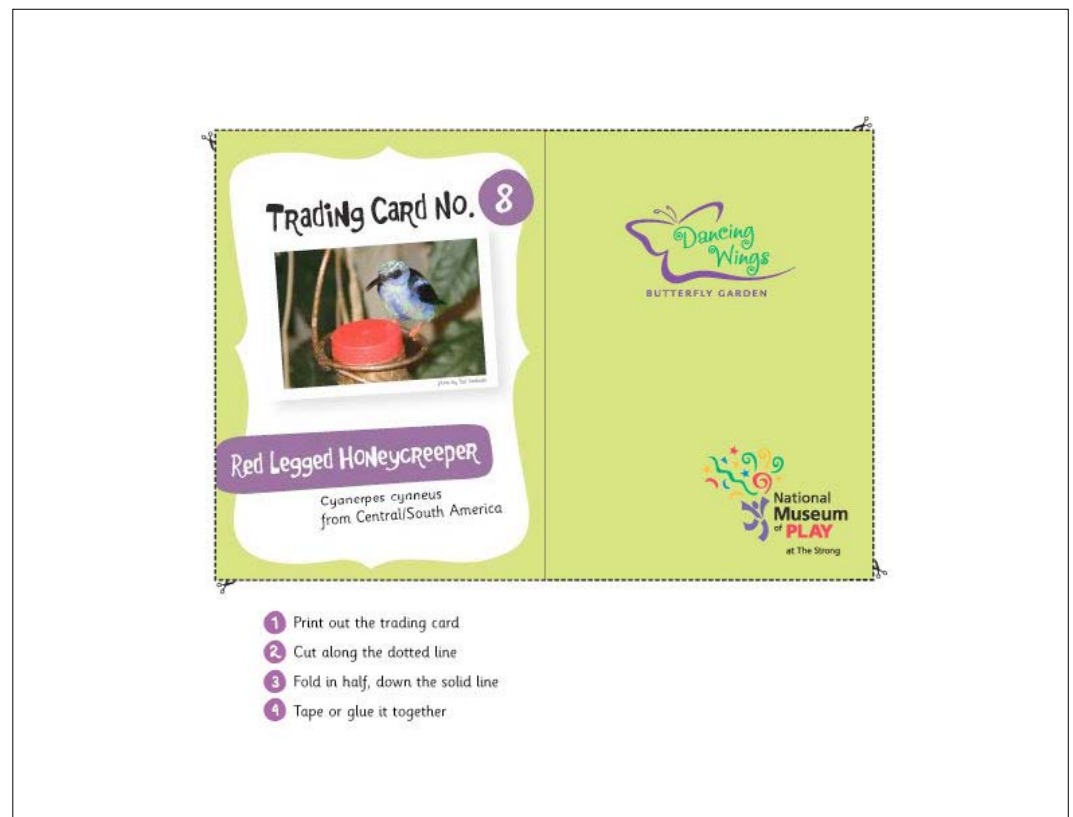
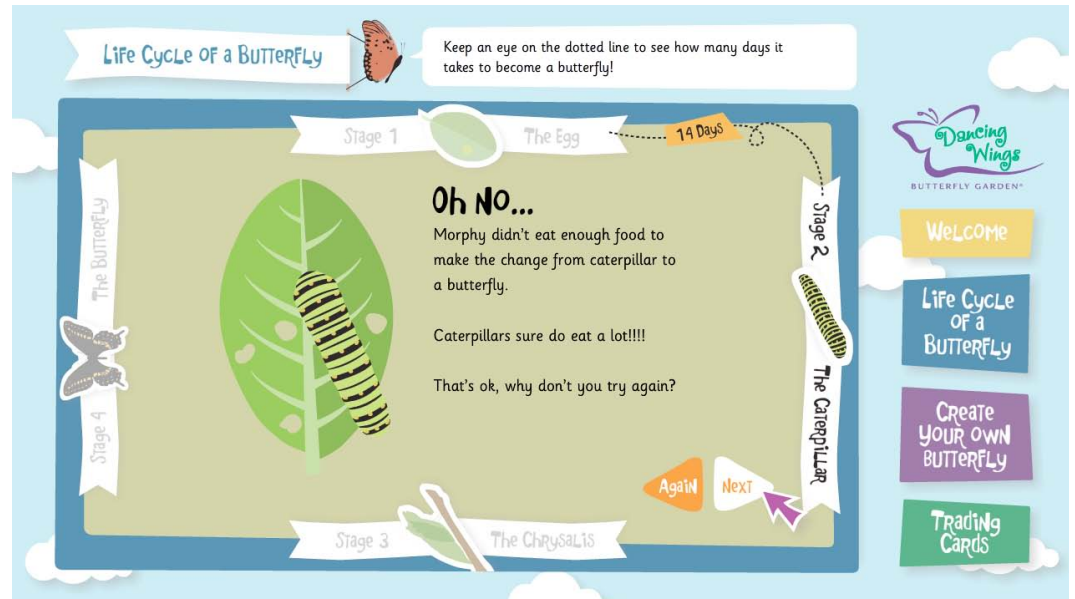


Figure 4.6.37  
Caterpillar game:  
lose screen



## 4:7 Section 3, Create Your Own Butterfly

This section allows users the freedom to create their own butterfly by mixing and matching parts, coloring and picking a name for their butterfly. The educational goals are to teach the user about butterfly anatomy as well as scientific and common names for the species. This also uses the same butterflies featured in the welcome section, so the user is becoming more familiarized with the butterfly species. This section can take as little or long as the user spends creating their butterfly. When they are finished, they are able to email or save a trading card of their butterfly for their collection.

This section includes breadcrumbs at the top of the right panel to indicate to users where they are in the process (Figure 4.7.1).

### Step 1: Pick Your Butterfly Parts

This section allows the user to click-through to pick the antennae, eyes, body, forewing, and hindwing shape and pattern that they would like to use to create their own butterfly (Figures 4.7.2–4.7.6). The user is also able to click on the part names themselves to learn more about the seven major parts of the butterfly (Figures 4.7.7–4.7.13). Arrows that show up behind the part name indicates to the user which body part they are clicking through or learning more information about.

Figure 4.7.1  
Create Your Own Butterfly  
start page



Figure 4.7.2  
Click-through to pick  
forewings



Figure 4.7.3  
Click-through to pick  
hindwings

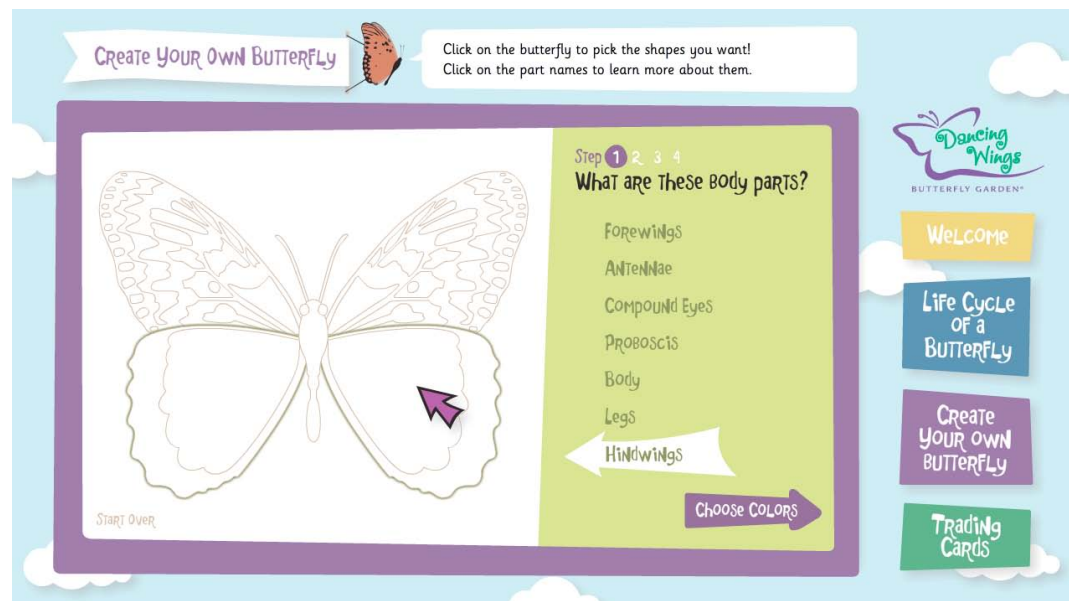




Figure 4.7.4  
Click-through to pick body



Figure 4.7.5  
Click-through to pick eyes

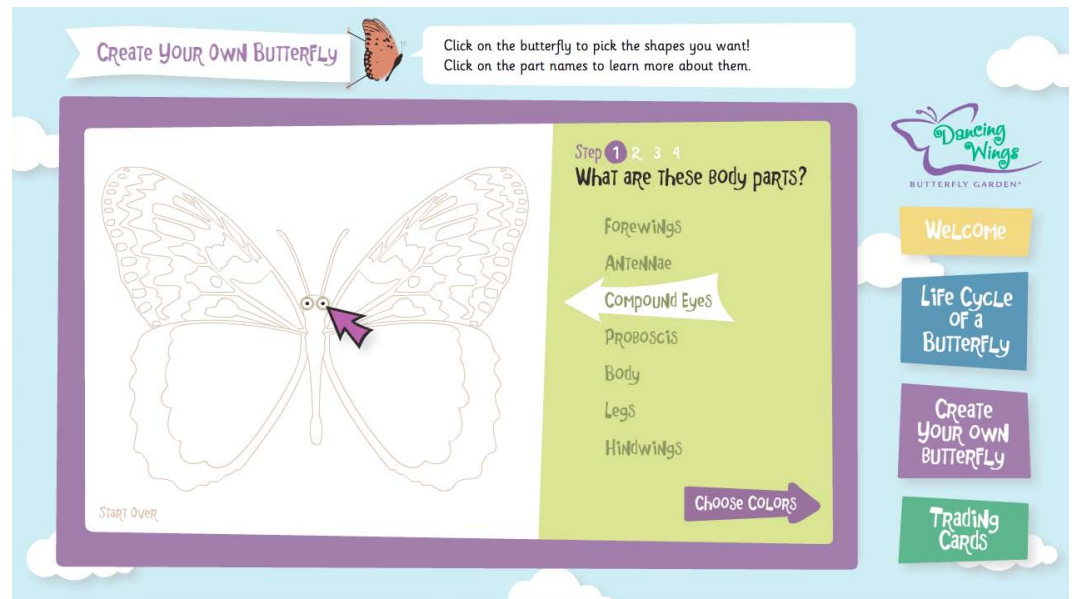


Figure 4.7.6  
Click-through to pick antennae



Figure 4.7.7  
Forewings description

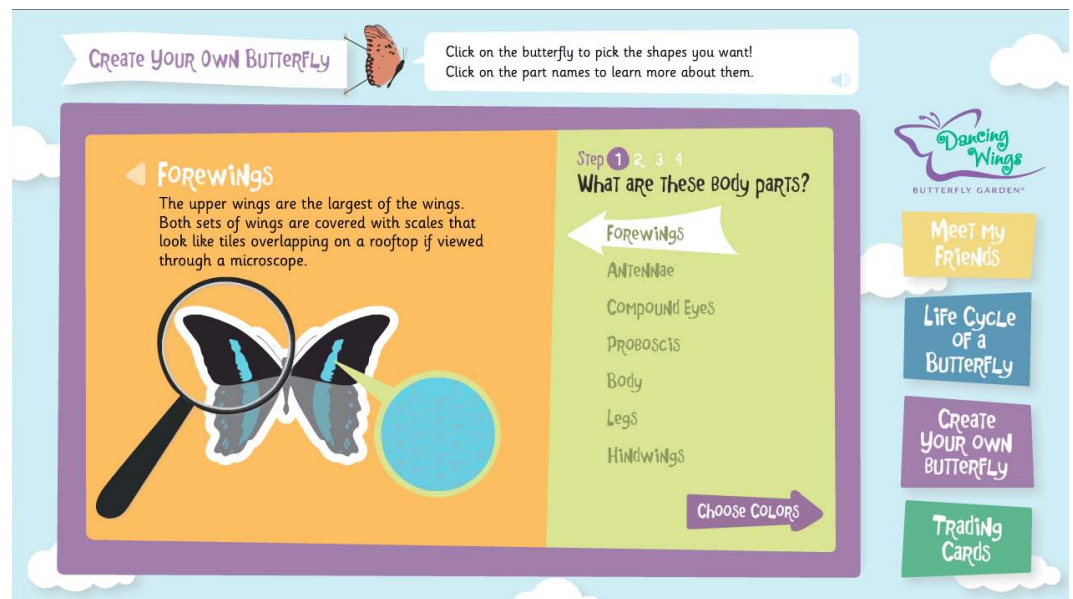


Figure 4.78  
Antennae description

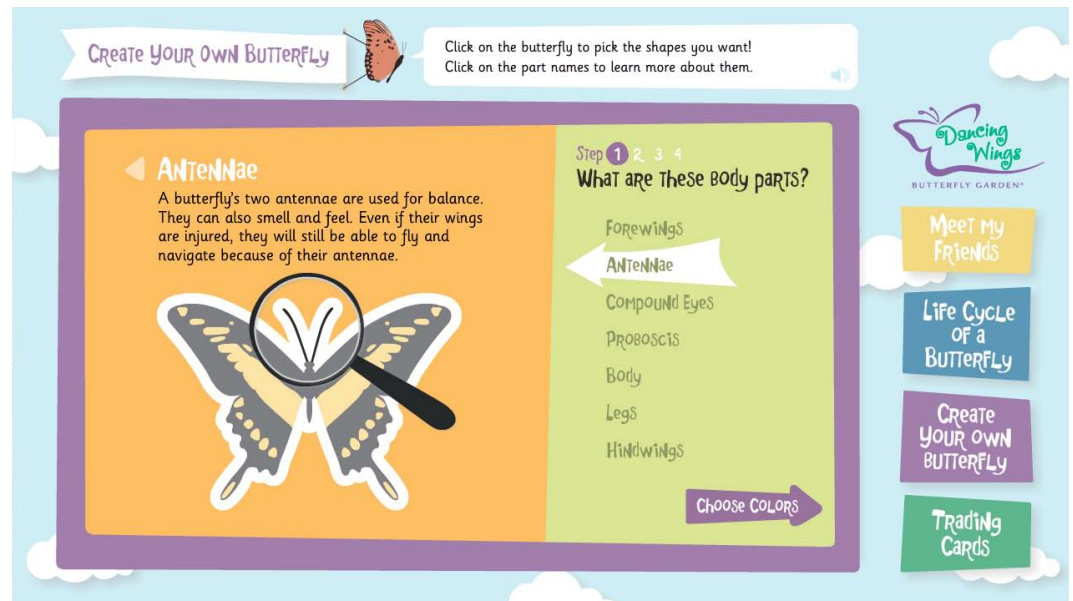


Figure 4.79  
Compound eyes description

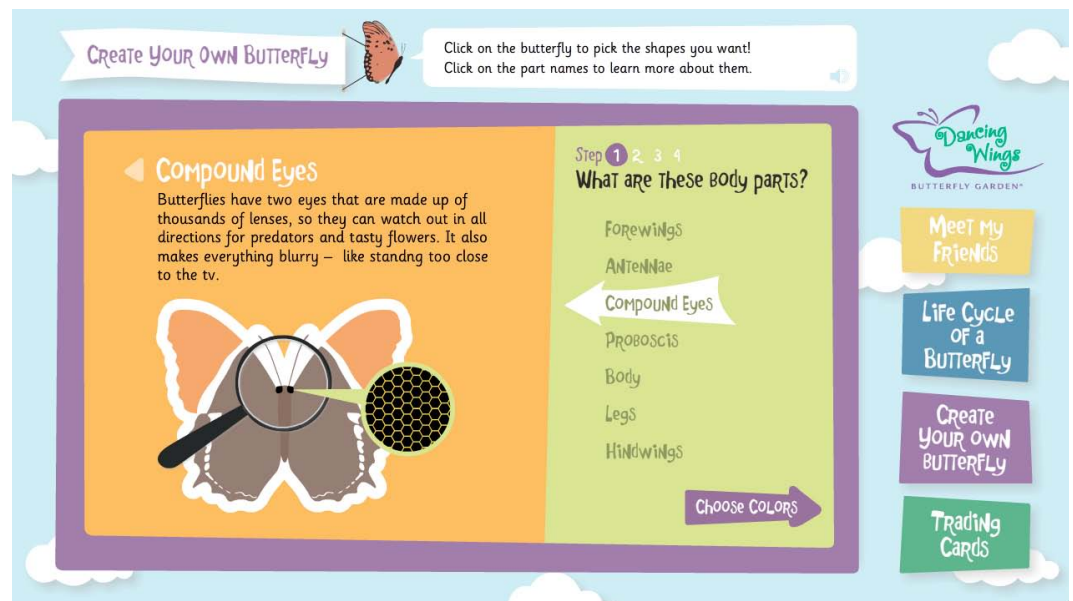


Figure 4.7.10  
Proboscis description



Figure 4.7.11  
Body description

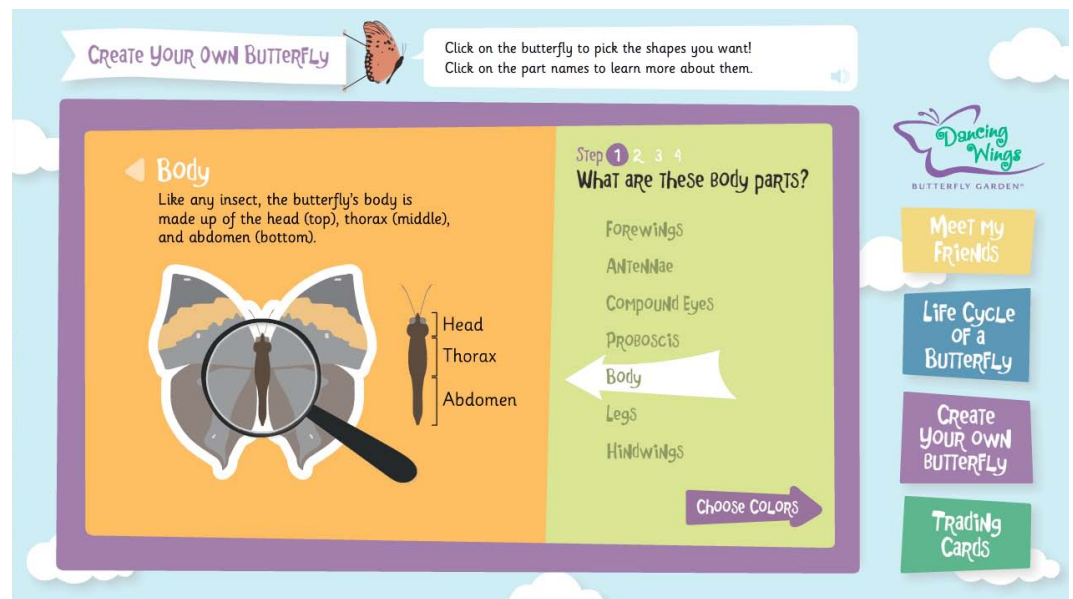


Figure 4.7.12  
Legs description



Figure 4.7.13  
Hindwings description





## Step 2: Color Your Butterfly

This section allows the user to choose colors from a palette to color in the parts of their butterfly (Figures 4.7.15–4.7.23). Since butterfly wings are symmetrical, if they color one side of the wing, the other will match. This also cuts down on the time it takes to color your butterfly. The cursor changes to a paintbrush, so the user is aware of what color they have picked (Figures 4.7.14, 4.7.15, and 4.7.20).

Figure 4.7.14



Figure 4.7.15



Figure 4.7.16

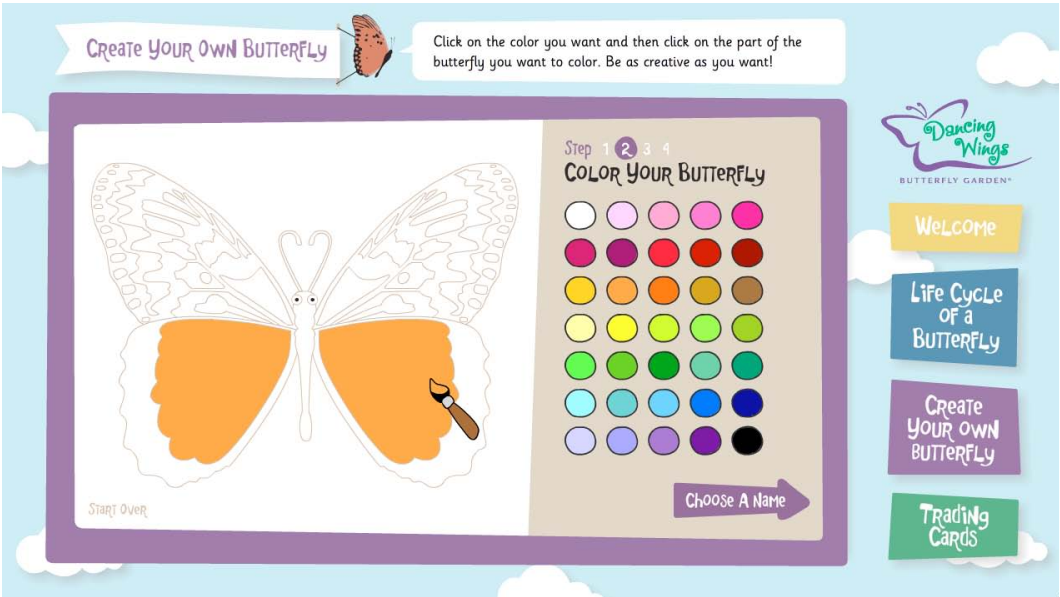


Figure 4.7.17



Figure 4.7.18

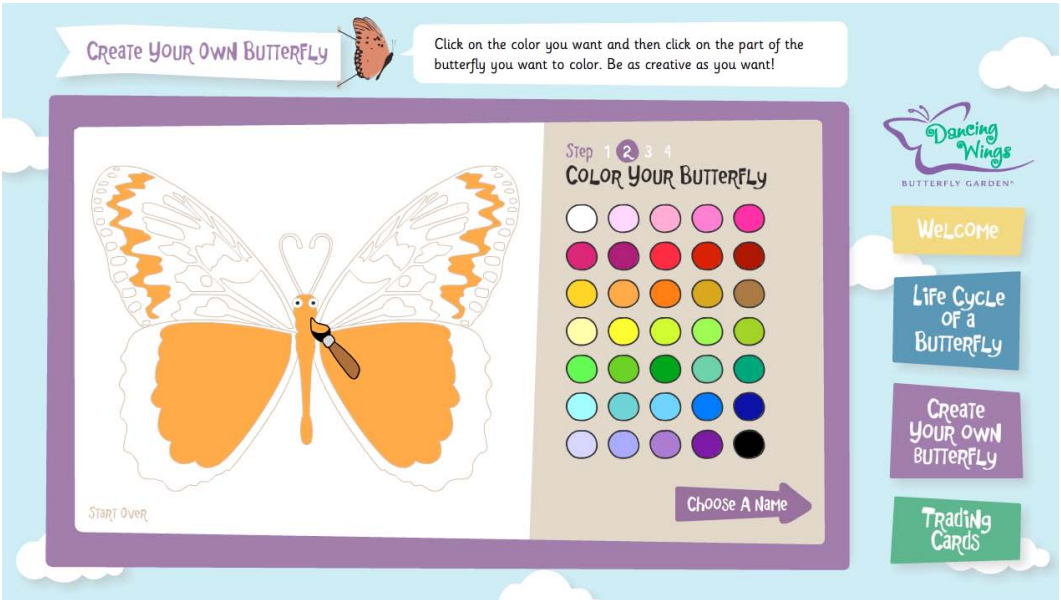


Figure 4.7.19

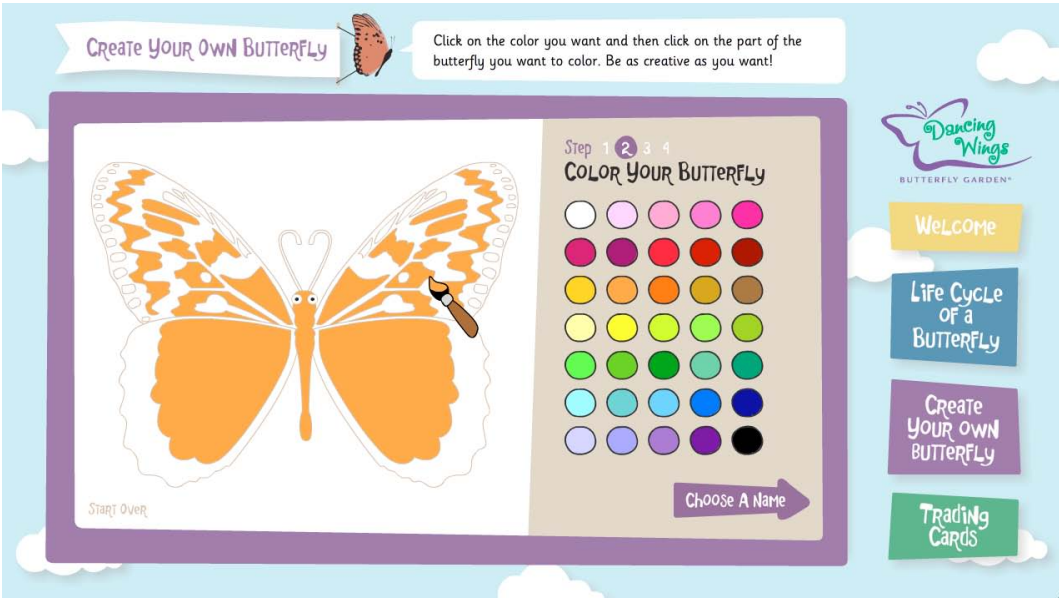




Figure 4.720



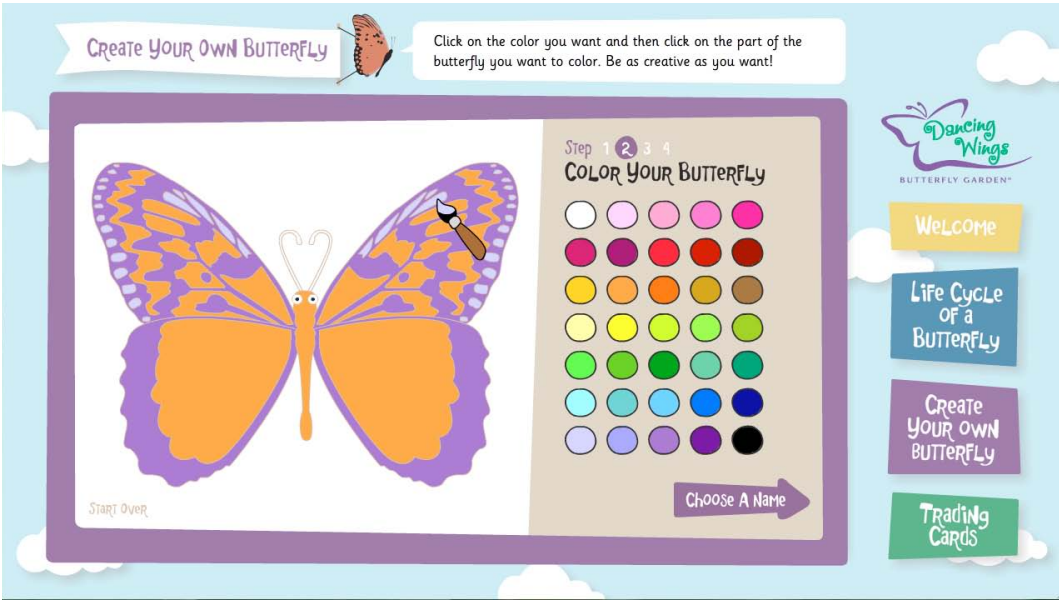
Figure 4.721



Figure 4.722



Figure 4.723



### Step 3: Name Your Butterfly

I originally wanted to go into more detail on scientific names, but this is quite complicated, so the user is made aware that each butterfly has a scientific and common name in the instructions and where the name appears on the screen (Figure 4.7.24). This section assigns the butterfly a scientific name, based on which forewings and hindwings they have picked. This screen does allow the user to pick the common name they would like for their butterfly from a list of First Name and Last Name options (Figures 4.7.25 and 4.7.26).

Figure 4.7.24

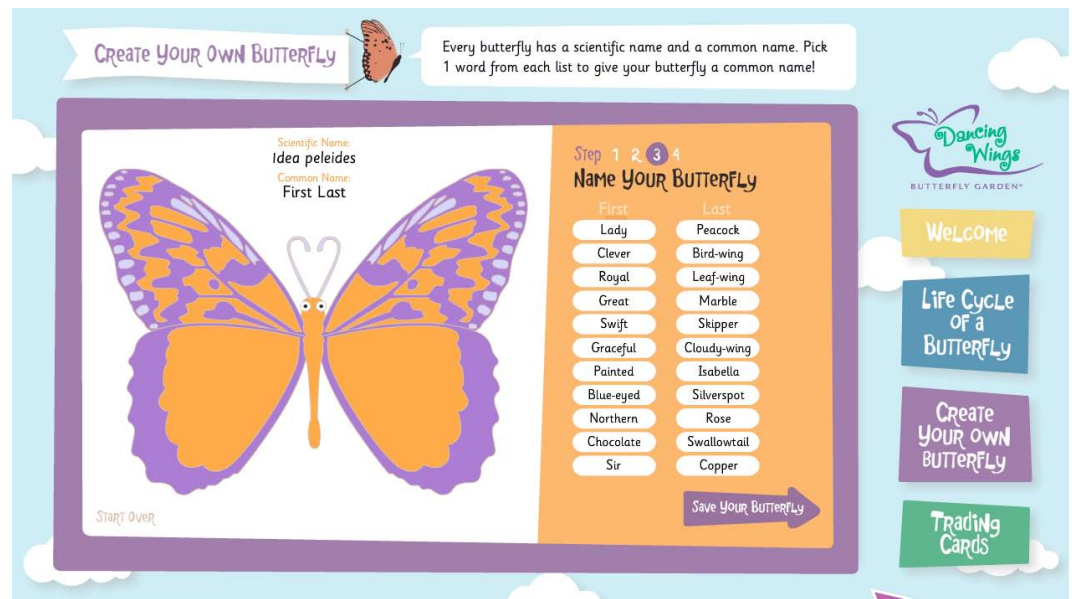


Figure 4.7.25  
Pick first name

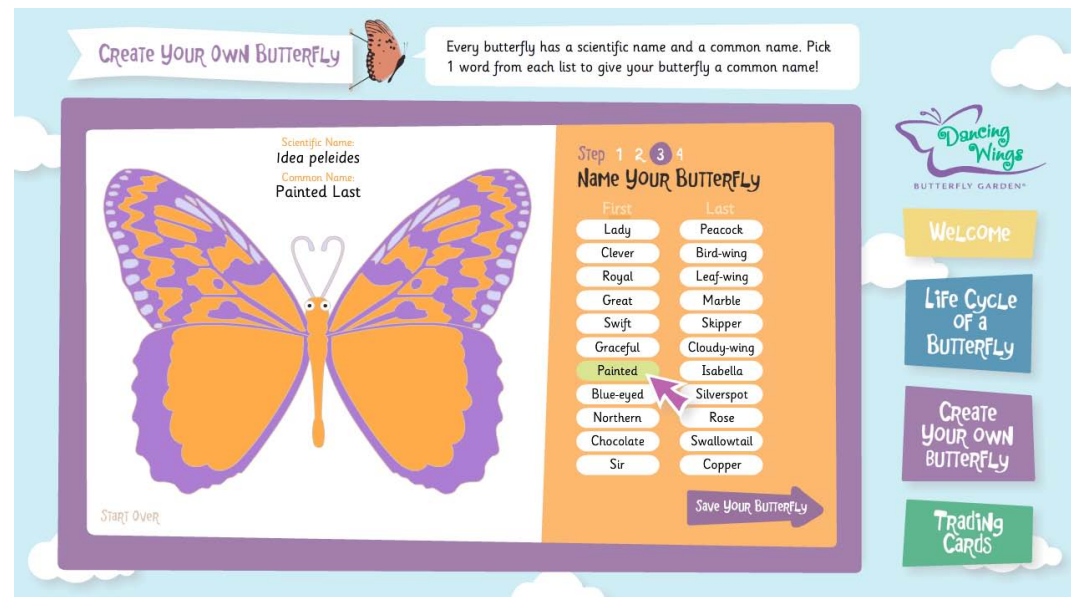


Figure 4.7.26  
Pick last name

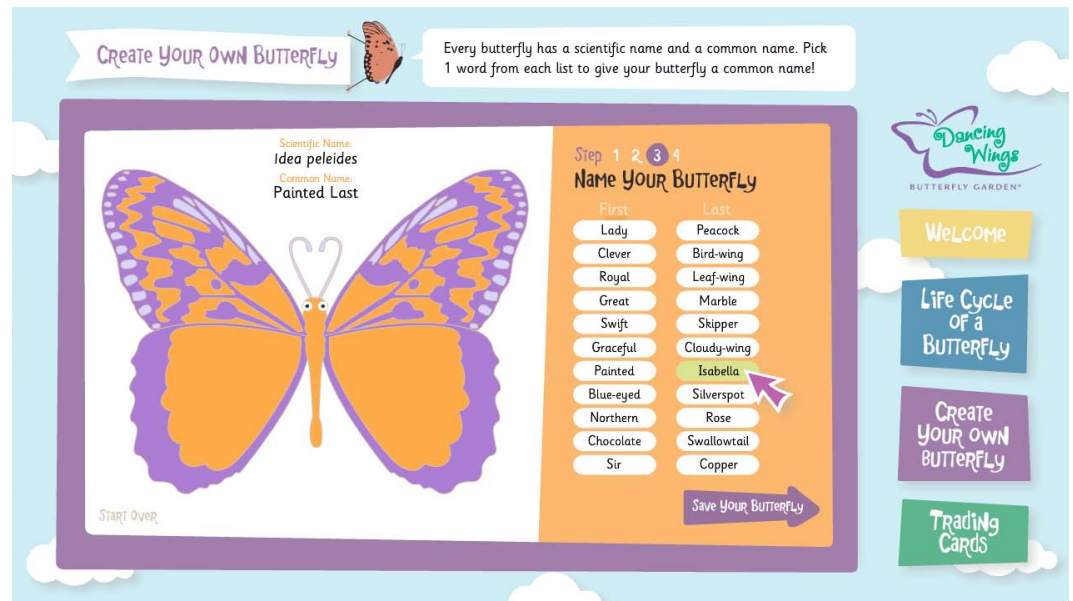
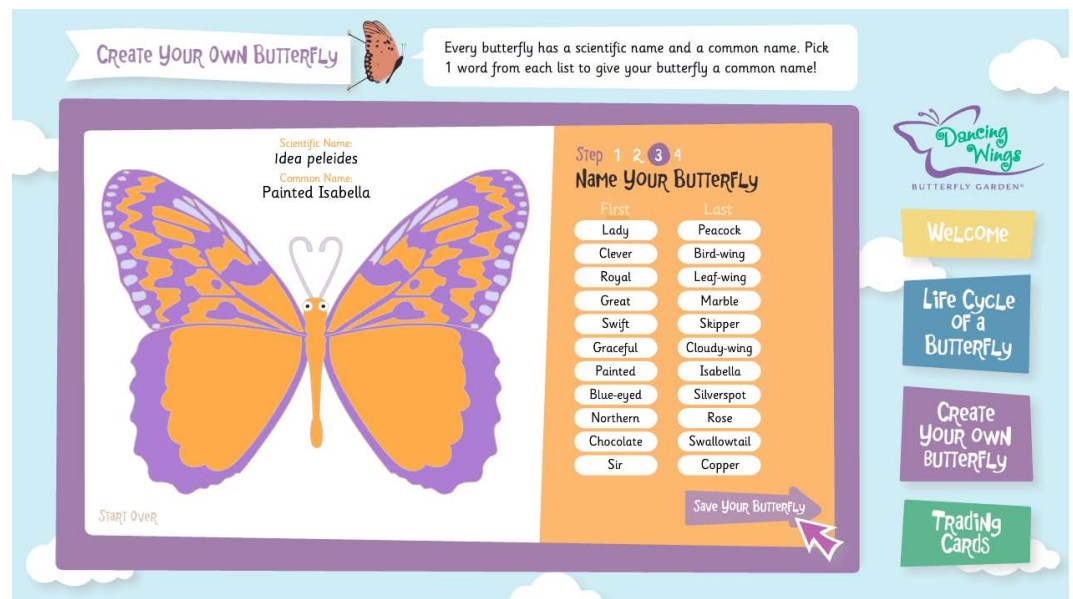


Figure 4.7.27





#### Step 4: Trading Card

The design and functionality for this trading card is consistent with the others. It can either be emailed from the kiosk or saved to the desktop if at home. It saves as an 8.5 x 11" sheet to print out with instructions on how to cut out and assemble (figure 4.7.29). This trading card has the illustrated butterfly the user created, the name they picked and the scientific name that was assigned to their butterfly (figure 4.7.28). Instead of being a numbered card it says "Created by ME!" and for the location is says "From The Strong."

Figure 4.7.28

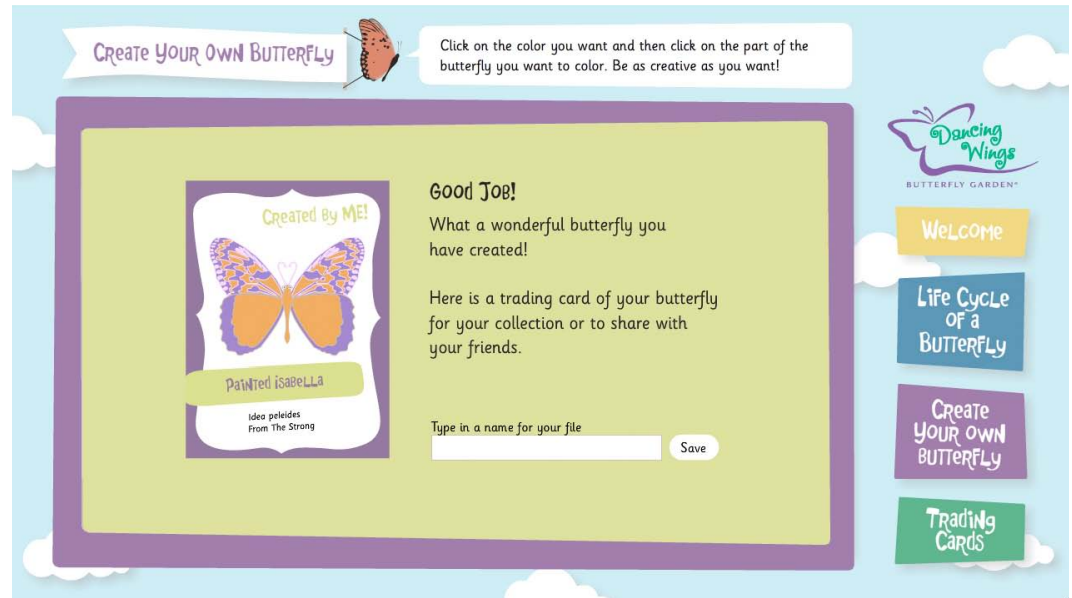


Figure 4.7.29  
8.5 x 11" printable  
trading card



## 4:8 Section 4, Trading Cards

The trading card section shows the user how many trading cards they can collect (Figure 4.8.1) and also makes them aware that there are trading cards if they have not yet played the games. The user can click on each card in the collection to view a larger image (Figure 4.8.2). The objective of the trading card is to give the user something tangible that they collect and bring with them to the *Dancing Wings Butterfly Garden*. This section shows users how many there are to collect, so that they can try to collect them all.

This section also has a link to show more information about the project itself and all those who helped along the way (Figure 4.8.4).

Figure 4.8.1

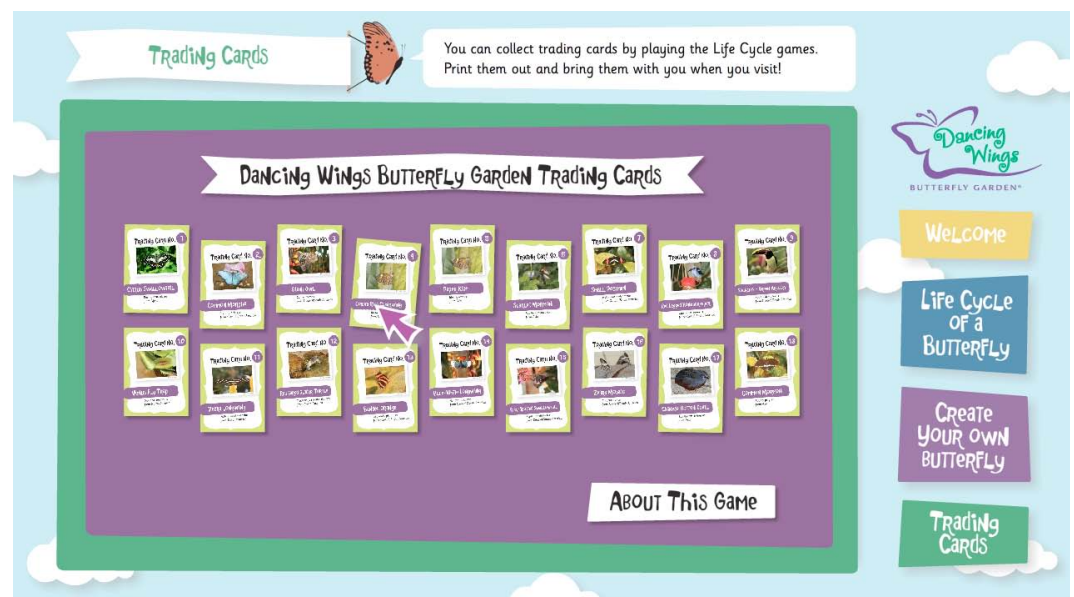


Figure 4.8.2

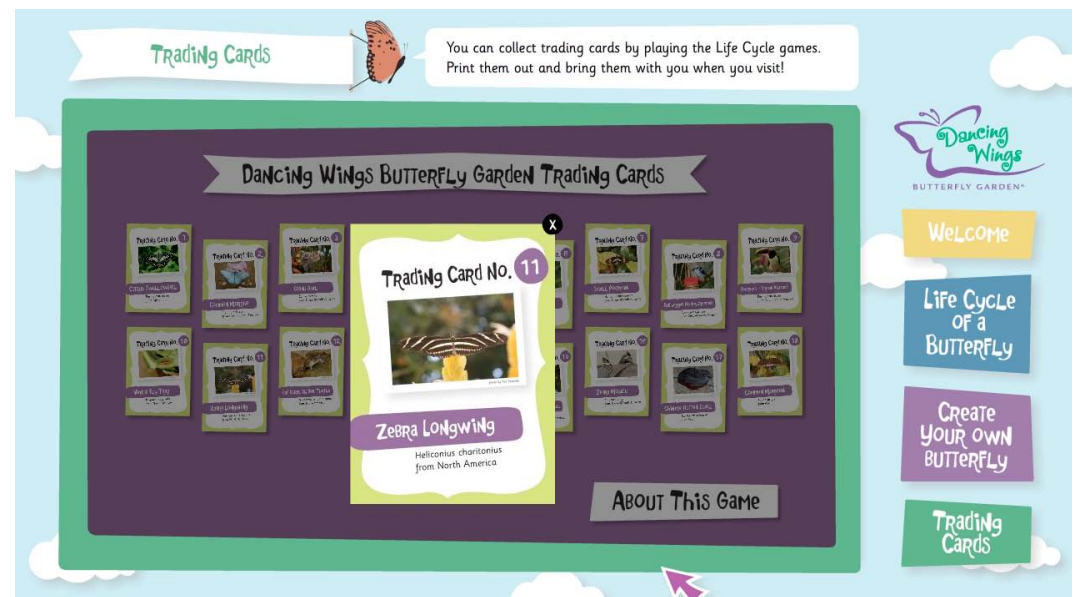


Figure 4.8.3



Figure 4.8.4





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## 05 SUMMARY

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### 5:1 Technical Issues

The first issue I ran into was with my planning and execution. I began building and coding the site without having really gotten the dialog, structure, and interactivity solidified. This did cause a bit of setback because I had to reprogram some sections, but was still a valuable lesson about the pre-production process. It also gave me more insight into what functionality I wanted to use for each section.

Because there were so many files working together and so many elements changing on the main flash shell, I did run into some problems with the parent/child relationships—specifically adding a custom mouse gave me the most trouble—since I was “calling” the mouse in the main Flash shell from the child Flash files.

Other problems I dealt with were: overlapping sound files, “hit test” areas in the games not working correctly, dialog boxes falling off the screen in the Welcome section, timing issues in the games, scrolling issues in the Welcome section, stage edges not registering in the games and Welcome section, and the color palette in the coloring section disappearing.

Changes to my dialog required me to record new audio, which had a slightly different sound to it when spliced in with the previous audio, which made me realize that recording new parts of a sentence or section does not work as well as simply re-recording the whole part.

## 5:2 Troubleshooting

Most of my technical issues along the way were ActionScript3.0 and Adobe Flash related, which were solved with help from my advisor, classmates, or Flash help sites online. Some were coding issues and some were Flash being quirky issues, which were solved by simply starting a new document and pulling the images and code in.

I also made sure to save a new version of my entire project folder each day, in case anything went wrong or I needed to go back to previous code I was using.

Creating a shell and having separate files for each section was beneficial for many reasons. It kept the application from slowing down, since each part was brought in when it was needed. There was no need for a lot of “remove child” code at the end of each section to keep extra code from running in the background, since it is closed when the user goes to a new section and reloaded when the user goes back to that section. It also made it easier to focus on each section’s layout, design, and interactions.

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## 5:3 Usability Testing

I was able to conduct two rounds of user testing, which allowed me to observe a greater age range of visitors. It also allowed me the opportunity to improve problematic aspects from the first round that users had concerns about or did not understand completely before the second round of testing.

### Round 1

My first round of testing was conducted at The National Museum of Play at The Strong. I created a dialog to tell the parents/guardians what I was doing, a survey and a poster to hang behind my station to also let people know why I was there. These materials were pre-approved by the human resources representative at the Strong before proceeding (Appendix 7.6.1–7.6.3).

This round of testing was a bit disappointing because I only had nine testers. I was setup in a larger area that was not in the flow of traffic. I was giving complimentary train/carousel tickets to participants as a way to say thank you. Unfortunately most of the people going by me were in a hurry to get to their *Dancing Wings Butterfly Garden* appointment. Since there is so much to do at the museum and most participants were with siblings and parents, most testers did not visit every section of my project. Although I did not have many users, I did get some good feedback and observations, which helped improve my project for the following round of user testing.

I was able to get feedback from the following participants:

- 7 children, ages 4-9, 5 females and 2 males
- 3 adults, ages 31-45, one was a K-8 school teacher, another a user-interaction professor

### Round 2

My second round of user testing was at the *Imagine RIT: Innovation and Creativity Festival*, where I had a station in the Computer Graphics Design lab. I received much more feedback this time, because visitors to the festival expect to go around and explore the interactive projects and games being displayed. I had many more willing participants, who were able to spend quite a bit more time going through each section of the project. Some of the participants were familiar with the *Dancing Wings Butterfly Garden* and some were not. Most all of them said that they would be excited to see the project implemented in National Museum of Play at the Strong and were prompted to go visit the butterfly garden in the future.

I was able to get feedback from the following participants:

- 12 children, ages 3-17, 9 females and 3 males
- 3 adults, ages 22-45, 1 male, 2 females, one of whom was a 2nd grade teacher, who each year teaches the students about butterflies and moths

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## 5:4 Audience Feedback

Some younger children had a difficult time with mouse movement and accuracy, which prompted me to increase target areas and make the buttons larger. I created customized cursors for each section to help with this. I added a paintbrush cursor that showed which color was clicked in the Create Your Own Butterfly section, so the user would know they had selected the desired color.

Most of the younger children listened to all the narration since they do not yet read. They did need adult assistance when naming their butterfly, since there was no narration for the name buttons, so I added this functionality.

Most of the users did not know to use the arrow keys for the games, since the rest of the project is mouse driven, so I added animated instructions for both games to explain how to play.

Several of the users' favorite part was "talking" to the butterflies. They kept rolling around to make sure they got them all. This prompted me to add names to each butterfly and indicate in the instruction dialog that there are 17 total to find. This will also help with familiarity of the butterflies' names.

I also noticed in the Welcome section that the dialog boxes were sometime off the stage when "talking" to a butterfly, so I added code that would make the dialog box appear to the right or left of the butterfly depending on what side of the screen they were on when rolled over.

I originally only had the forewings and hindwings selectable in the Create Your Own Butterfly section, but noticed that participants were trying to click all the parts, so I made the antennae, eyes, and body selectable as well. One user did not know there were several sections to the Create Your Own Butterfly section, so I added breadcrumbs to the section to indicate that there were four parts.

Being able to observe participants using the project was invaluable. It gave me insight on how different people of different ages interact with design and usability. It also made me realize that I wanted to adjust some of the parameters of the welcome scrolling, the speed of the movement of the caterpillar and the butterfly in the games, and some of the timing in the animations.

Every participant said that they had fun—and made some want to go visit the garden—and they would play again; some said they wanted to play in order to obtain more trading cards. When asked what their favorite part was, the majority of time it was the Create Your Own Butterfly section—coloring my butterfly, making my butterfly, decorating the wings—but I did get some users say the Welcome section and the Stage 2: Caterpillar game were their favorite. Users also liked the different voices in the Welcome section.

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## 06 CONCLUSION

This project has taught me how to plan out and implement a project of this size, while also essentially working with a “client,” The Strong, on content and size requirements. Through research, I learned about different ways to engage the audience, designing and usability for children, different learning styles, game design, butterflies, and the *Dancing Wings Butterfly Garden*. Through implementation of the project and trial and error, my ActionScript 3.0 knowledge grew and improved tremendously.

Based on feedback from younger and older users alike, this project has succeeded in what it set out to do—teach more about butterflies and the *Dancing Wings Butterfly Garden*, while making sure to appeal to 5-12 year olds. One of my user testers at *Imagine RIT: Innovation and Creativity Festival*, a second grade teacher who teaches this topic each year, said that it was something she would love to have available for her class.

This project placed as a semifinalist in the 2011 Adobe Design Achievement Awards. In 2012, it was included in the “A Celebration of Innovation in the Arts” exhibition and the AIGA *New York State of Design* exhibition and catalog.

I am working with the National Museum of Play at The Strong right now to get *Flutter-by Interactive Butterfly* placed in a kiosk in the museum and on their website. Once it is installed, they will be implementing a way to record usage and dwell time for each section.

## 07 APPENDIX

### 7:1 Thesis Proposal

Figure 7.1.1

#### Thesis Proposal for the Master of Fine Arts Degree

**Flutter-by Interactive Butterfly:** Using interactivity to excite and educate children about butterflies and the Strong National Museum of Play's "Dancing Wings Butterfly Garden"

**Submitted by:** Lydia Powers

##### Abstract

As our world becomes more and more computer-savvy and action packed, it's becoming increasingly more difficult to gain and hold the attentions of the younger generation. A well-planned-out, kid-friendly video doesn't even seem to do the trick these days. Especially in a world where everything is flashy and movement-filled, our educational tools need to be rethought and modernized. Would an interactive game at the Strong National Museum of Play excite and educate the children visitors about butterflies and the Dancing Wings Butterfly Garden? The current setup for the Dancing Wings Butterfly Garden is tropical and fun but lacks the educational element that attracts and stimulates the children's interest! By researching the most commonly asked questions, ways that children learn and interact as well as new interactive technologies, I created an interactive game to teach kids about the butterflies in the garden and the rules of the garden to engage them in a way that would excite them about the Dancing Wings Butterfly Garden! This project not only helped to maintain Strong Museum's mission about education but will serve to keep interest in butterflies alive for future generations. Factors taken into consideration when designing the project were location, safety, height, user interaction, multiple-user format, appropriate content for a span of ages (and reading levels), and making sure the interface itself is kid-proof. The interface attracted kids and adults of all ages. It did succeed in interesting the children of all ages and get them excited about the Butterfly Garden. The younger non-reading children were not able to learn as much about the butterflies themselves but had fun using the interaction.

[www.LydiaPowers.com/Thesis](http://www.LydiaPowers.com/Thesis)

##### Problem Statement

Would an interactive game at the Strong National Museum of Play excite and educate the children visitors about butterflies and the Dancing Wings Butterfly Garden?

The Dancing Wings Butterfly Garden is an indoor rain forest, home to 1,000 butterflies, both native and tropical. The garden is 1,800 sq. ft., and only 40 people are allowed in the garden at one time, in 20-minute time increments. Entrance to the garden can be purchased for a nominal fee at the admissions desk or at the gift shop window next to the garden. After meeting with the Strong Museum representatives, it became clear that the parents are generally more excited about the Butterfly Garden than the kids, on an educational level.

I am studying how children interact with each other and learn from interactive digital games. I want to find out how to best design an interactive game to educate and excite children about butterflies, in order to make the Butterfly Garden at the Strong Museum a more educational experience.

In order to provide a safe home for the butterflies, several rules need to be explained to the children and their parents prior to entering the garden. Right now there is a kid-friendly video to serve this purpose; however, during a visit to the garden, I noticed that no one – except me – was

Figure 7.1.2

paying attention to the video. Outside of the entrance to the butterfly garden, visitors can pick up a laminated sheet with all of the species and a brief description of each. It wasn't until I exited the garden that I noticed this sheet – in the return box. The Butterfly Garden itself is located at the back of the museum, which can be easily missed or forgotten since there is so much going on all over the museum. Right now, the Butterfly Garden is a fun place to visit, as well as a good photo-opp. What's missing from this exhibit is the vehicle in which to really educate the target audience – the kids.

By researching the most commonly asked questions, ways that children learn and interact, as well as new interactive technologies, I want to create an interactive game to teach kids about the butterflies in the garden and the rules of the garden to engage them in a way that would excite them about the Dancing Wings Butterfly Garden. This project will not only help to fulfill Strong Museum's mission about education, but it will serve to keep interest in butterflies alive for future generations. The Butterfly Garden is a wonderful and unique experience, which I believe can be enhanced with an interactive educational game. Children in this digital age are comfortable with computer-based technologies, and I believe they will respond positively to this interactive tool!

Factors that I will need to consider when designing the project are location, safety, height, user interaction, multiple-users, appropriate content for a span of ages (and reading levels), and making sure the interface itself is kid-proof.

### Survey of Literature:

#### *Interactivity:*

(1)

HCI Beyond the GUI: Design for Haptic, Speech, Olfactory  
and Other Nontraditional Interfaces  
(Human Computer Interaction/Graphical User Interface)  
by Philip Kortum  
2008  
Morgan Kaufmann Publishers/Elsevier

This book discusses human computer interaction as it applies to graphical user interfaces, specifically nontraditional kinds. It is geared toward human factors professionals to use as a reference source, as well as upper-level undergraduate students and graduate students to introduce them to the nontraditional interface technologies available to them. The author reflects that since the advent of the Internet, graphical user interfaces are the most common interface used, both for designers and for the user. This is a useful resource of different types of interfaces, including the information needed to design, build, and test the interfaces.

(2)

The Art of Interactive Design: A Euphonious and Illuminating Guide  
to Building Successful Software  
By Chris Crawford  
2003  
No Starch Press

This book interprets interactive design through its fundamentals, design, theory, and social and artistic issues. It is written for the programmers and designers creating the interactive interface and software. The author contends that while interactivity has been around for millions of years,



Figure 7.1.3

automated interactivity as a new process requires a bit more thought on the part of designers and programmers to simulate a person-to-person learning experience with a person-to-computer actuality, especially to truly engage the user. This resource will be useful to my process because it will dissect interactivity down to its most basic level and take me through each facet.

(3)

Human Computer Interaction Research in Web Design and Evaluation  
By Panayiotis Zaphiris and Sri Kurniawan  
2007  
IGI Global

This book reports on the user's interaction with the web, to analyze behaviors in order to more successfully design a user-friendly web site. This book's intended audience is university educators, all educators, university administrators, researchers, lecturers of human-computer interaction and user-centered design, web system managers, instructional designers, and anyone interested in human computer interaction and web design. The authors declare that due to the variety of web sites and design, as well as the variety of the users' goals, makes the task of deciding the best approach is challenging. This resource may overlap with the previous two books, but it may provide more insight into different aspects of interactivity and usability. (It is also newer than #2 – so there is probably new information as well.)

(4)

Themed Attraction  
[www.themedattraction.com](http://www.themedattraction.com)

This is a website for professional theme-park attraction design. The intended audience is for theme-park designers and aspiring theme-park designers. This will be a good resource for my research, since waiting in line is an inevitable reality of theme parks, and my project will be for the express purpose of entertaining and educating those waiting in line for the butterfly garden.

(5)

Press On: Principles of Interaction Programming  
By Harold Thimbleby  
2007  
The MIT Press

This book concludes that interactive design can be built better if sound computer science principles are applied. This resource is written for interactive programmers. The book considers better interaction principles through examining ineffective interactive design. I believe this resource will enhance my research because not only am I the designer, but I am also the programmer for this project. I may not be aware of sound computer science principles, but I am interested in learning some of them and how they can be applied to improve my project.

(6)

Feedtank  
[www.feedtank.com](http://www.feedtank.com)  
2009

Feedtank is a company that uses new technologies to creative playful interactive spectacles. This web resource is a portfolio showcasing the company's works but could be a good resource for potential clients as well as other digital artists wanting to get ideas and see what's new! Feedtank's goal is to make interacting with technology more fun and approachable – more

Figure 7.1.4

human! This is an excellent online resource so that I can see what kinds of projects are being developed and explore different user interactive possibilities for my own project.

**Design:**

(7)

Designing for Children: Marketing design that speaks to kids  
by Catharine Fishel  
2001  
Rockport Publishers, Inc.

This book is a guide to understanding the consumers of a multi-billion-dollar industry – children. This book is intended for marketing and design professionals. The author reviews brands that work from the genres of toys, literature, media, destinations and consumables. She also covers age cues for kids ages 2-3, 4-5, 6-7, 8-9, and 10-12. This resource will be helpful for the design aspect of my project, especially when taking different ages into consideration.

**Building the project:**

(8)

Foundation Game Design with Flash  
By Rex van der Spuy  
2009  
Friends of Ed

This book is a tutorial on flash game design elements. It is intended for an individual learning to build games in flash. The author includes detailed and practical examples and case studies to lead the user through the process step-by-step. This resource will be helpful for me when beginning to build my project's structure as well as during the process of building the end product.

(9)

Rules of Play: Game Design Fundamentals  
By Katie Salen and Eric Zimmerman  
2004  
The MIT Press

This book observes why people play games and why some games are loved more than others and provides the tools for understanding games. This text is intended for game designers. The authors hope to help game designers create their own games, concepts, methodologies, and strategies through understanding play. This resource will be very very helpful in my research, especially since I am new to designing games.

(10)

Challenges for Game Designers  
By Brenda Brathwaite and Ian Schreiber  
2009  
Cengage Learning

This book offers exercises to the user to improve game design through challenges and brainstorming exercises. This resource was written for anyone interested in game design – professionals, aspiring designers, or students. This resource covers the building blocks, chance and skill, and concepts as well as additive and subtractive design. This resource will be a good

Figure 7.1.5

place for me to start to brainstorm the components and functions of my project. It also has a chapter named "Games as a Teaching Tool," which is exactly how I would define the end goal for my project.

(11)

Flash Juggler

"Interactive Butterfly"

<http://www.flashjuggler.com/files/interactive-butterfly/1509>

2008

Flash Juggler is a website for flash designers to visit and find different applications available as well as the code to make them work. Specifically, what I found on this site that will come in handy is an interactive butterfly example. The function of the example is that the butterfly will follow your mouse clicks on the page. This will come in handy while I am coming up with the interactivity features of my project, as well as later during the execution of the project.

(12)

Flash Den

"Animated Butterfly"

<http://flashden.net/item/interactive-animated-butterfly/3259>

This site is similar to Flash Juggler. It is simply a place for flash designers to come and get ideas, connect, and get code for flash. The "animated butterfly" post by John Clements makes the butterfly move when you roll over, and you can also drag and drop it to another location. This will be helpful to me when planning out and executing my project.

**Content:**

(13)

The Children's Butterfly Site

[www.kidsbutterfly.org](http://www.kidsbutterfly.org)

Paul A. Opler, Kelly Lotts, and Thomas Naberhaus

2009

Big Sky Institute

This website provides many resources when it comes to butterflies and teaching kids about them. The intended audience for this website is children as well as educators and parents. From the design and the text-heavy content, I would say it's more geared toward the latter. This resource will be very useful when working on the content of my project because of the links to teaching and learning tools as well as links to butterfly-specific sites. It also covers frequently asked questions and information on the butterfly life cycle, which will also prove useful down the line.

(14)

Butterflies and Moths of North America

[www.butterfliesandmoths.org](http://www.butterfliesandmoths.org)

Paul A. Opler, Kelly Lotts, and Thomas Naberhaus

2009

Big Sky Institute

This website provides an in-depth database of butterflies and images. This website is geared towards anyone wanting to know more about butterflies, related terms, or butterflies in the news,

Figure 7.1.6

and is an excellent resource for anyone who is already an expert on butterflies. The information on each butterfly is very extensive – flight, life history, wing span, food, habitat, and location in the US and is accompanied by very detailed images. This resource can help me to make sure I have the correct information for my project. It will also help me with the artwork creation since it has an excellent image database.

(15)

Sue's Butterfly Haven  
[www.SuesButterflyHaven.com/](http://www.SuesButterflyHaven.com/)

This website is a personal website of Sue Allie. It has a lot of information on butterflies. The intended user is anyone interested in butterflies. The part that I will find useful to my research process is the "Butterfly Exhibits" page that shows permanent and temporary butterfly exhibits across the US.

(16)

Explore Butterflies  
[www.ansp.org/museum/butterflies/new\\_interactive/butterflies.html](http://www.ansp.org/museum/butterflies/new_interactive/butterflies.html)

This website is an entirely interactive website devoted to butterflies. I think the intended audience is children, but I think anyone would appreciate learning about butterflies in a fun interactive way. There are 4 different sections: "test your butterfly smarts" (which is a multiple-choice quiz), "build a butterfly habitat" (where you get to add plants to see how many butterflies you attract), "field observation" (which analyzes the parts of the butterfly and what they are used for), and "butterflies & climate change" (which analyzes climate change's effect on butterflies). This will be a good resource when designing what interactive features and information I would like to include in my project.

#### **Children Learning**

(17)

How Children Learn Through Play  
 By Dorothy Einon  
 2004  
 Barron's Educational Series, Inc.

This book provides activity examples for pre-K and kindergarten children with an explanation on how each one teaches the children. This book is designed for parents of toddlers and instructors of pre-K and kindergarten classes. This resource provides activities for ages 2-6 that include word and number games, music games, and craft projects. This will help me when deciding how to execute my educational goals in my interactive display.

(18)

Scholastic  
[www2.scholastic.com](http://www2.scholastic.com)  
 2009

Scholastic's website is an excellent resource for teachers, parents, kids, and anyone looking to understand anything related to teaching kids. I was directed to several articles on this site through Google searches that I did on "how do children learn through play." Once I began looking around the site, I realized it would be a great resource for understanding the best way to relay the informational aspect of my project to the children.

Figure 7.1.7

(19)

Association of Children's Museums  
[www.childrensmuseums.org/index.htm](http://www.childrensmuseums.org/index.htm)  
 2009

This website is a portal for anyone who wants to see what Children's Museums there are and how they're making an impact. This site's intended audience is Children's Museum employees, enthusiasts, and just curious individuals. This resource has a page showing the different museums that are making an impact, with links to each individual site and a description of what they're doing. There's also a press room page, showing links to articles about Children's Museums. This will be very helpful in my research, since I am designing an interface for a Children's Museum of Play.

(20)

Museums, Magic & Children  
 By Bonnie Pitman-Gelles  
 1981 – out of print  
 Association of Science-Technology Centers

I found this book through the Association of Children's Museums website, because it's a book written by the group. Unfortunately, since it's out of print, I'm having trouble getting an idea of what content the book covers. I'm going to work on tracking down a copy of this book to see if it will help me. I'm not sure – because it was published in 1981; however, it was called by the website "a landmark work in museum education."

(21)

Creating Interactive Environments in the Secondary School  
 By Lois T. Stover  
 1993  
 National Education Association

This book describes the skills children are learning through interactivity in the classroom. This book is written for teachers. The book covers passive vs. interactive environments, the value of interactive instruction, and listening, speaking, reading, and writing in interactive classrooms. This will be a good resource for my project, to help me plan out interactive features as they apply to how children learn.

(22)

Technology Timeline for Kids  
 by Warren Buckleitner  
 DisneyFamily.com (<http://family.go.com/hot-topics/pkg-kids-technology/tech-timeline/2/>)

This interactive age timeline shows the different skill levels of technology that children possess from ages 6 months to 16 years. This article/interaction is written for parents to help them assess the proper applications for their children's age. It could also be helpful for parents to know when to introduce them to new technologies. This will be a good resource for my project, in order to make sure I am providing the appropriate technology modules for my targeted age groups.

Figure 7.1.8

(23)

LdPride.net

Learning Styles and Multiple Intelligence

[www.ldpride.net/learningstyles.MI.htm#Learning%20Styles%20Explained](http://www.ldpride.net/learningstyles.MI.htm#Learning%20Styles%20Explained)

This website from the Vancouver Island Invisible Disability Association addresses invisible disabilities, such as learning disabilities and attention deficit disorder. This website is geared toward adults with invisible disabilities. The specific page on Learning Styles and Multiple Intelligence is helpful for all age groups. This section of the site goes into detail about learning styles and multiple intelligence and has tests for both. It also has a link to download the book "Understanding Your Learning Style" for free. This will be a good resource for my project, helping me to make sure I'm covering all learning styles.

### Approach/Project Description

#### **Design:**

Bright, colorful, lots of movement, more graphic - less word heavy

#### **Subjects or participants:**

The Strong Museum is going to compile a list of "commonly asked questions"

I would like to go conduct my own survey

- People in line – Are you planning on buying tickets to the Butterfly Garden?
- Adults in museum – Did you buy tickets? Who wanted to go to the Butterfly Garden?
- Kids in museum – Why do you want to see the butterflies? What do you know about butterflies? What do you want to know about butterflies?

After the first prototype is finished, I will be testing it out at the Strong Museum, either in a public area of the museum or with a smaller focus group of children in a classroom setting.

The sampling procedure will be to observe different age children using the interface and keeping track of how fast/slow they figure out the navigation, which sections they stay at longest and to quiz them at the end to see how much they learned and also which sections they liked the best.

#### **Computer Graphics:**

I will be exploring alternative interaction design using a touch-screen. The graphical user interface will be designed with different age and skill-level children in mind. Motion will be used to grab the kids attention as well as to indicate where user interaction is available.

#### **Procedure:**

Research new interactive technologies: I will need to research to see what new technologies are available that can enhance the usability of this project.

Research how children interact with technology: I will need to research to find out how children understand and interact with technology, making sure to cover a range of ages, to make sure that all age levels are being exposed on some level to the educational content of the project.

Research how children interact with each other: I will need to research to find out the best methods/techniques for positive interaction between children, to enable all users of the project to feel like they are valuable participants – and that no one who wants to interact is left out.

Figure 7.1.9

Research how children learn: I will need to research to find out how children best learn to ensure that the educational objective of my project is being met.

Research what children best respond to: I will need to research to find out what visual aspects children best respond to, in order to maximize the experience for the child user.

Observe visitors to the museum: I will need to research the ebb and flow of museum visitors, what exhibits attract users, and the movements of parents and children in the ticketing area to learn how best to design and place the kiosk for maximum exposure and usage.

This part of the process should take no more than one quarter, since the prototype needs to be completed by the end of winter quarter.

**Technology:**

Software:

Flash CS4

ActionScript3

Hardware:

PC (Dell)

Elo 1739L 17" Rear-Mount Touchmonitor (or similar)

**Sketches/Examples**

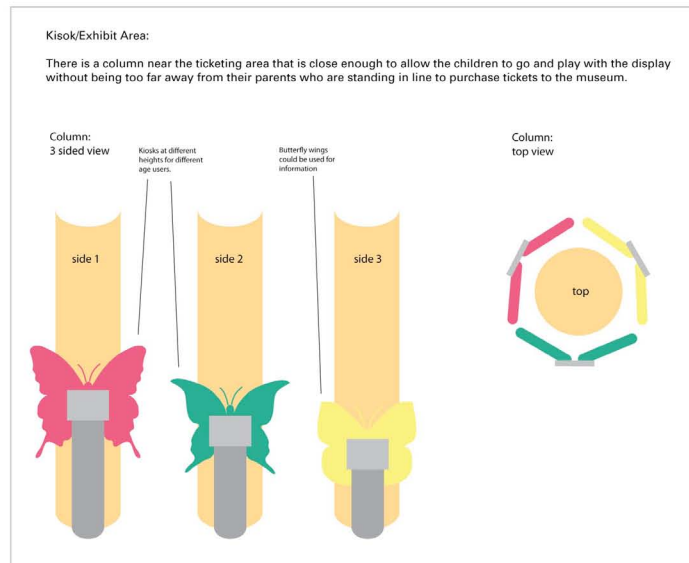
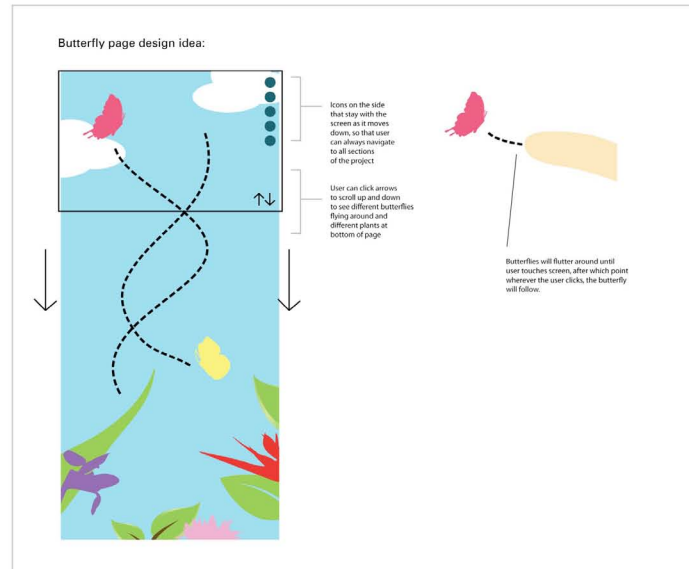




Figure 7.1.10



### Implications of the Research

By creating an interactive game to teach kids about the butterflies in the garden, the rules of the garden, and engage them in a way that would excite them about the Dancing Wings Butterfly Garden, will help to fulfill Strong Museum's mission about education and serve to keep interest in butterflies alive for future generations. The Butterfly Garden is a wonderful and unique experience, which I believe can be enhanced with an interactive educational game. Children in this digital age are comfortable with computer-based technologies and I believe they will respond positively to this interactive tool!

Factors that I will need to consider when designing the project are location, safety, height, user interaction, multiple-users, and appropriate content for a span of ages (and reading levels) and to make sure the interface itself is kid-proof.

### Budget

\$30 - Travel: to and from museum for meetings/research/installation  
 \$40 - Snacks: for committee meetings  
 \$150 - Display Materials: for external design around kiosks  
 \$100-\$125 - Entrance fee: for Communication Arts Interactive Competition  
 \$45 - Entrance fee: for Horizon Interactive Awards Competition  
 \$50 - Entrance fee: for How Interactive Awards Competition  
 \$75 - Entrance fee: for SIGGRAPH Interactive Works Competition  
 \$15 - DVDs/Paper: for submitting materials to competitions and conferences  
 \$15 - Materials for thesis show: business cards and one-page descriptions  
**\$545**

Figure 7.1.11  
See Figures 7.2.1 and  
7.2.2 for a larger view  
of the butterfly and  
plant directory from  
the Dancing Wings  
Butterfly Garden.

### Marketing Plan

- Installation at the Strong National Museum of Play
- If the construct of the project allows, it will also be available for use on the Strong National Museum of Play's website

### Competitions:

- Communication Arts Interactive Competition
- Horizon Interactive Awards Competition
- How Interactive Awards Competition
- SIGGRAPH Interactive Works Competition
- Adobe Design Achievement Awards Competition

### Conferences (to submit work to):

- SIGGRAPH Annual Conference (by way of competition)
- American Federation of Arts (AFA)
- American Association of Museums (AAM)
- Association of Children's Museums (ACM)

### Presentations:

- TedX, Rochester NY
- Strong Museum Board of Directors/Members
- Board of Cooperative Educational Services (BOCES) - related class/program

### Supporting Documents

- Notes from the 10/9/09 meeting with the Strong Museum of Play
- "Frequently Asked Questions" about the Butterfly Garden from the Strong Museum of Play
- Butterfly and plant directory from the Dancing Wings Butterfly Garden

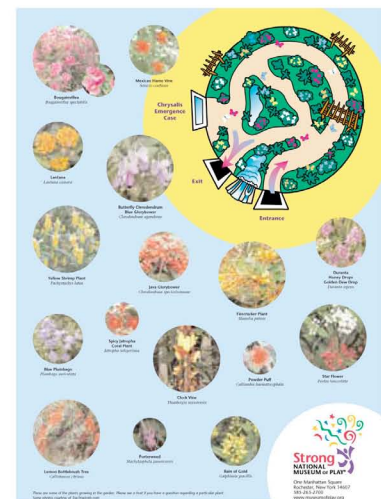


Figure 7.1.12

**Target Audience**

Cameron

Age: 4

*Educational Level:* Preschool, cannot read, can talk - some, knows how to play with computers and interactive toys.

*Motivational Level:* Wants to touch and explore everything.

*Experience:* Lives outside of city, parents have small garden, enjoys seeing "flutter-by's" in the garden.

Cloey

Age: 10

*Educational Level:* 5th grade, can read, is proficient at using computers and interactive interfaces.

*Motivational Level:* She is artistic and loves the butterflies' colors.

*Experience:* Learned a bit about them at school. She knows that a caterpillar turns into a butterfly. Lives in the city and doesn't see butterflies very often.

**Software and Hardware Requirements**

Software:

Flash CS4

ActionScript3

Illustrator CS4

Photoshop CS4

Hardware:

Macintosh

PC (Dell)

Elo 1739L 17" Rear-Mount Touchmonitor (or similar)

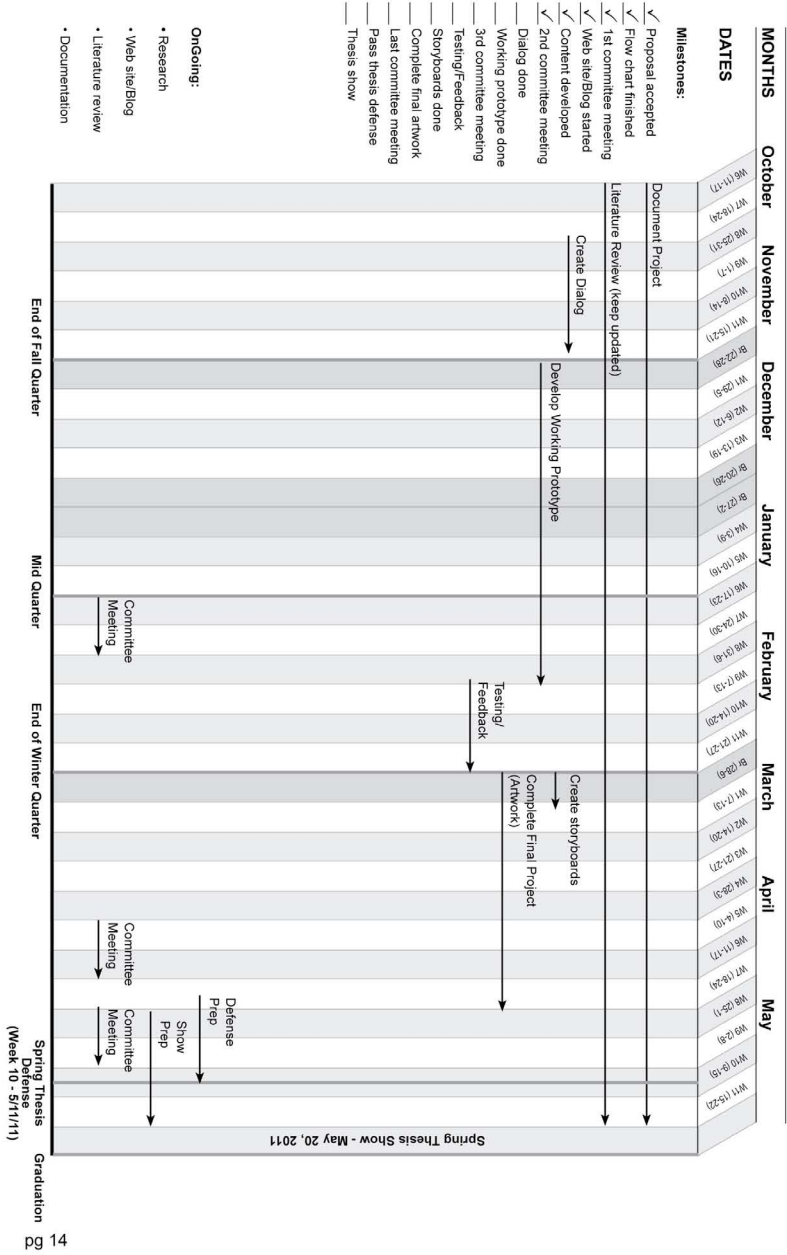
500MB free disk space and 128MB main memory

**Timeline**

See next page.

**Flutter-by Interactive Butterfly:** Using interactivity to excite and educate children about butterflies and the Strong National Museum of Play's "Dancing Wings Butterfly Garden"

**Flutter-by Interactive Butterfly:** Using interactivity to excite and educate children about butterflies and the Strong National Museum of Play's "Dancing Wings Butterfly Garden"



## 7:2 Butterfly and Plant Directory

Figure 72.1

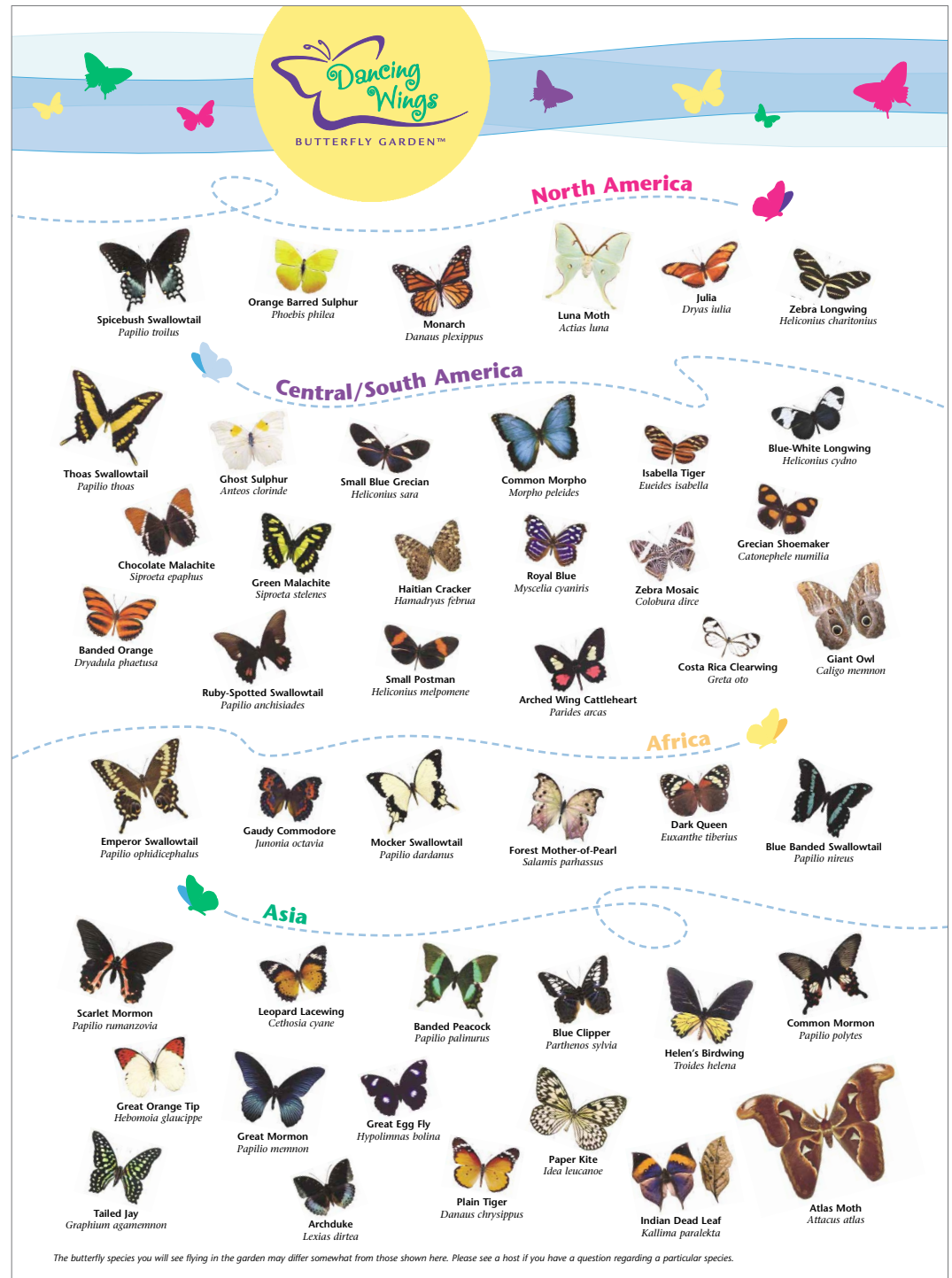
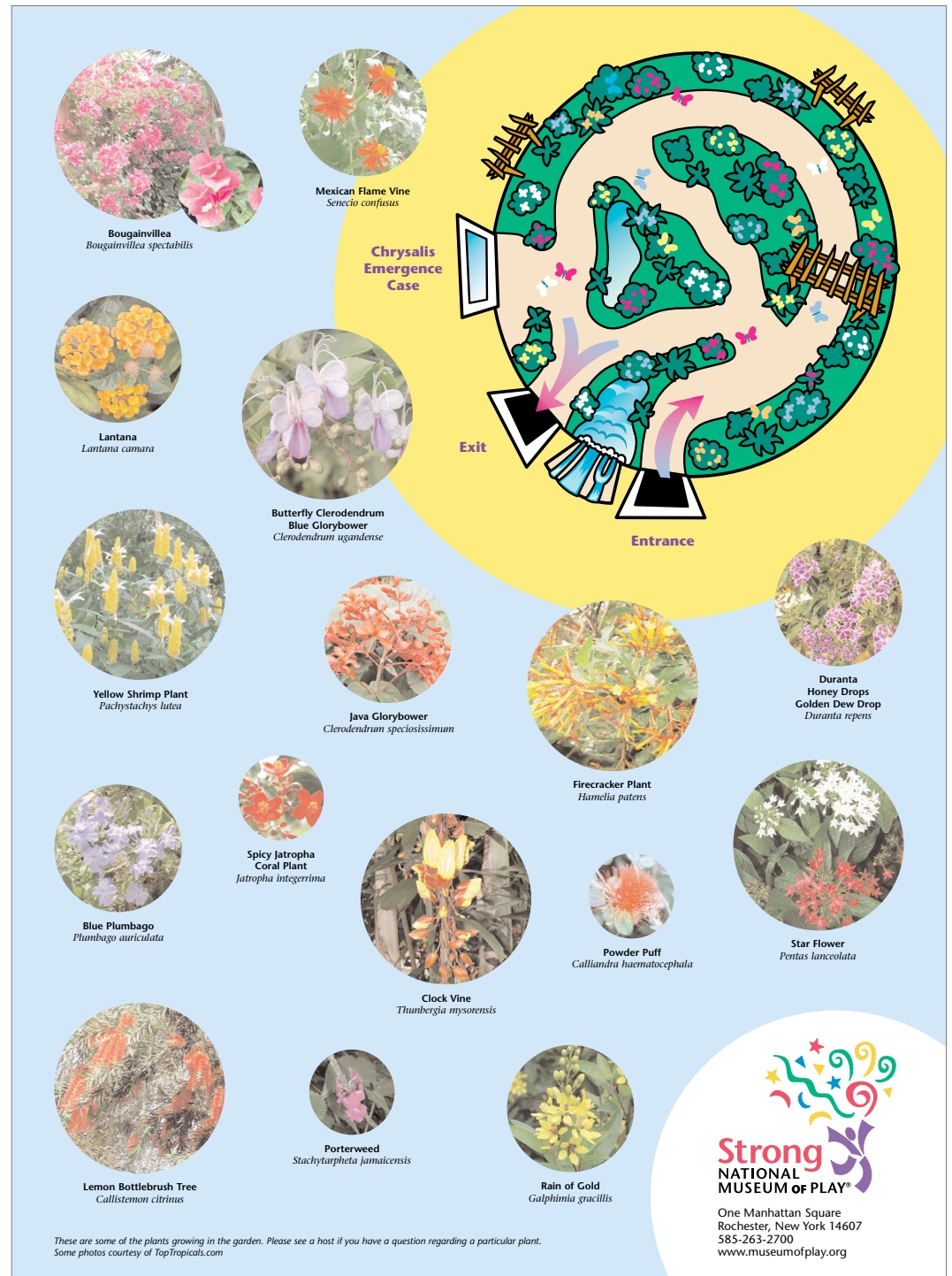


Figure 72.2



## 7:3 Butterfly Key

Figure 7.3.1

*Agraulis vanillae* – Gulf Fritillary – North and South America  
*Anteos chlorinde* – Ghost Sulphur – North and South America  
*Biblis hyperia* – Red Rim – South America  
*Caligo memnon* – Giant Owl – South America  
*Catonephele numilia* – Grecian Shoemaker – South America  
*Cethosia cyane* – Leopard Lacewing – Asia  
*Colobura dirce* – Zebra Mosaic – South America  
*Danaus plexippus* – Monarch – North and South America  
*Dryas iulia* – Julia – North and South America  
*Dryadula phaetusa* – Banded Orange – North and South America  
*Eueides isabella* – Isabella Tiger – South America  
*Graphium agamemnon* – Tailed Jay - Asia  
*Greta oto* – Costa Rica Clearwing – South America  
*Hamadryas februa* – Haitian Cracker – South America  
*Hebomoia glaucippe* – Great Orange Tip – Asia  
*Heliconius charitonius* – Zebra Longwing – North and South America  
*Heliconius cydno* – Blue-White Longwing – South America  
*Heliconius melpomene* – Small Postman – South America  
*Heliconius sara* – Small Blue Grecian – South America  
*Hypolimnas bolina* – Great Egg Fly – Asia  
*Hypna clytemnestra* – Silver-studded Leafwing – South America  
*Idea leuconoe* – Paper Kite - Asia  
*Kallima paralekta* – Indian Dead Leaf - Asia  
*Lexias dirtea* – Archduke – Asia  
*Morpho peleides* – Common Morpho – South America



Figure 7.3.2

*Myscelia cyaniris* – Royal Blue – South America

*Papilio anchisiades* – Ruby-Spotted Swallowtail – North and South America

*Papilio dardanus* – Mocker Swallowtail - Africa

*Papilio memnon* – Great Mormon - Asia

*Papilio nireus* – Blue Banded Swallowtail – Africa

*Papilio ophidicephalus* - Emperor Swallowtail - Africa

*Papilio palinurus* – Banded Peacock – Asia

*Papilio polytes* – Common Mormon – Asia

*Papilio polyxenes* – Black Swallowtail – North and South America

*Papilio rumanzovia* – Scarlet Mormon – Asia

*Papilio thoas* – Thoas Swallowtail – North and South America

*Parides arcas* – Arched Wing Cattleheart – South America

*Parthenos sylvia* – Blue Clipper – Asia

*Phoebis philea* – Orange Barred Sulphur – North and South America

*Siproeta epaphus* – Chocolate Malachite – North and South America

*Siproeta stelenes* – Green Malachite – North and South America

*Troides rhadamantus* – Yellow Birdwing - Asia

## 7:4 Plant Key

Figure 7.4.1

*Plants in the garden*

Botanical Name	Common	Family
<i>Aglaonema nitidum</i>	Chinese Evergreen	Araceae
<i>Allamanda cathartica</i>	Buttercup flower	Apocynaceae
<i>Alpinia zerumbet</i> 'Variegata'	Variegated Shell Ginger	Zingiberaceae
<i>Anthurium</i>	Flamingo Flower	Araceae
<i>Aphelandra squarrosa</i>	Zebra Plant	Acanthaceae
<i>Araucaria heterophylla</i>	Norfolk Pine	Araucariaceae
<i>Asparagus densiflorus</i>	Asparagus Fern	Liliaceae
<i>Aspidistra elatior</i>	Cast Iron Plant	Ruscaceae
<i>Begonia Bonfire</i>	Bonfire Begonia	Begoniaceae
<i>Begonia coccinea</i>	Silver-spotted Begonia	Begoniaceae
<i>Begonia</i> 'Dragon Wing Red'	Dragon Wing Begonia	Begoniaceae
<i>Begonia x hiemalis</i>	Reiger Begonia	Begoniaceae
<i>Begonia x semperflorens-cultorum</i>	Wax Begonia	Begoniaceae
<del><i>Bougainvillea</i></del>	Paper Flower	Nyctaginaceae
<i>Bromeliad spp.</i>	Bromeliads	Bromeliaceae
<i>Caladium spp.</i> *	Caladium	Araceae
<i>Calathea bella</i>	Silver Belle	Marantaceae
<i>Calathea calathea</i> 'Dottie'	Calathea 'Dottie'	Marantaceae
<i>Callistemon acuminatus</i>	Rigid Bottlebrush	Myrtaceae
<i>Callistemon citrinus</i>	Lemon Bottlebrush	Myrtaceae
<i>Canna spp.</i>	Canna Lily	Cannaceae
<i>Chamaedorea seifrizii</i>	Bamboo Palm	Arecaceae/Palmae
<i>Cissus tetrastigma</i>	Lizard Vine	Vitaceae
<i>Clerodendrum speciosissimum</i>	Pagoda Flower	Verbenaceae
<i>Clerodendrum ugandense</i>	Butterfly Clerodendrum	Verbenaceae
<i>Codiaeum variegatum</i>	Croton	Euphorbiaceae
<i>Cordyline fruticosa</i>	Ty plant	Agavaceae
<i>Crossandra infundibuliformis</i>	Crossandra	Acanthaceae
<i>Davallia</i>	Rabbit's Foot Fern	Davalliaceae
<i>Dieffenbachia</i> *	Dumb plant	Araceae
<i>Dracaena deremensis</i> 'Limelight'	Limelight Dracaena	Ruscaceae
<i>Duranta erecta</i> *	Golden Dewdrop	Verbenaceae
<i>Dyopsis lutescens</i>	Areca Palm	Arecaceae
<i>Epiphyllum spp.</i>	Orchid Cactus	Cactaceae
<i>Epipremnum aureum</i>	Pothos	Araceae
<i>Ficus elastica</i>	Rubber Plant	Moraceae
<i>Ficus elastica</i>	Rubber Plant	Moraceae
<i>Fittonia verschaffeltii</i>	Nerve Plant	Acanthaceae
<i>Galphimia glauca</i>	Thrallis	Malpigiaceae
<i>Hamelia patens</i> -	Scarlet Bush	Rubiaceae
<i>Hedera spp.</i>	Ivy*	Araliaceae
<i>Hibiscus rosa-sinensis</i>	Hibiscus	Malvaceae
<i>Impatiens spp.</i>	Impatiens	Balsaminaceae
<i>Ixora coccinea</i> -	Jungle Flame	Rubiaceae
<i>Jasminum sambac</i>	Arabian Jasmine	Oleaceae

Figure 74.2

<i>Jatropha integerrima</i> *	Spicy Jatropha	Euphorbiaceae
<i>Justicia carnea</i>	Brazilian Plume Flower	Acanthaceae
<i>Justicia scheidweileri</i>	Brazilian Fireworks	Acanthaceae
<i>Lantana camara</i> *	Lantana	Verbenaceae
<i>Maranta leuconeura</i>	Prayer Plant	Marantaceae
<i>Medinilla magnifica</i>	Showy Medinilla	Melastomataceae
<i>Neoregelia 'Fireball'</i>	Neoregelia 'Fireball'	Bromeliaceae
<i>Nepenthes spp.</i>	Pitcher Plant	Nepenthaceae
<i>Nephrolepis exaltata</i>	Boston Fern	Lomariopsidaceae
<i>Orchid spp.</i>	Orchid	Orchidaceae
<i>Pachystachys lutea</i>	Golden Shrimp Plant	Acanthaceae
<i>Pentas lanceolata</i>	Pentas	Rubiaceae
<i>Philodendron 'Limelight'</i>	Limelight Philodendron	Araceae
<i>Philodendron spp.</i>	Philodendron	Araceae
<i>Philodendron 'Xanadu'</i>	Philodendron 'Xanadu'	Araceae
<i>Platynerium bifurcatum</i>	Staghorn Fern	Polypodiaceae
<i>Plumbago auriculata</i>	Plumbago	Plumbaginaceae
<i>Pteris ensiformis</i>	Silver Lace Fern	Pteridaceae
<i>Russelia equisetiformis</i>	Firecracker Plant	Scrophulariaceae
<i>Sansevieria trifasciata</i>	Mother-in-Law's Tongue	Ruscaceae
<i>Schefflera elegantissima</i>	False Aralia	Araliaceae
<i>Schefflera spp.</i>	Schefflera	Araliaceae
<i>Selaginella uncinata</i>	Peacock Spikemoss	Selaginellaceae
<i>Senecio confusus</i>	Mexican Flame vine	Asteraceae
<i>Solanum rantonnetii</i>	Potato bush	Solanaceae
<i>Senecio confusus</i>	Mexican Flame Vine	Asteraceae
<i>Solenostemon spp.</i>	Coleus	Lamiaceae
<i>Spathiphyllum cochlearispathum</i>	Peace Lily	Araceae
<i>Stachytarpheta frantzii</i>	Purple porterweed	Verbenaceae
<i>Stachytarpheta jamaicensis</i>	Porterweed	Verbenaceae
<i>Stachytarpheta mutabilis</i>	Red Porterweed	Verbenaceae
<i>Stephanotis floribunda</i>	Hawaiian Wedding flower	Asclepiadaceae
<i>Strelitzia alba</i>	White Bird of Paradise	Strelitziaceae
<i>Streptocarpus</i>	Cape Primrose	Gesneriaceae
<i>Syagrus romanzoffiana</i>	Queen Palm	Arecaceae
<i>Syngonium podophyllum</i>	Arrowhead Vine	Araceae
<i>Thunbergia mysorensis</i>	Clock Vine	Acanthaceae
<i>Tillandsea usneoides</i>	Spanish Moss	Bromeliaceae
<i>Tillandsea species</i>	Air plant	Bromeliaceae
<i>Zantedeschia spp.</i>	Calla Lily*	Araceae

## 7:5 Customer Surveys

Figure 7.5.1

---

**Strong Museum Customer Survey for MFA Thesis Project**

Lydia Powers  
Rochester Institute of Technology  
College of Imaging Arts and Sciences  
School of Design  
Computer Graphics Design

**Flutter-by Interactive Butterfly:** Using interactivity to excite and educate children about butterflies and the Strong National Museum of Play's "Dancing Wings Butterfly Garden"

---

Date: \_\_\_\_\_ Time: \_\_\_\_\_ (Group #s) Adults: \_\_\_\_\_ Kids: \_\_\_\_\_

---

**1) Is this your first visit to the Museum?**    **yes**    **no**  
(if no) How often do you come to the Museum?

**2) Is this your first visit to the Butterfly Garden?**    **yes**    **no**  
(if no) How often have you been?

**3) How did you first find out about the Butterfly Garden?**  
Word of Mouth      Advertisement      Website      Other (explain)

(If answered website) Did it help you to plan your day here?

(If did not answer website) Did you visit the website before coming to the museum?

**4) Who made the decision to go to the Butterfly Garden?**

**5) What did you like best about the Butterfly Garden?**

Figure 7.5.2

**Strong Museum Customer Survey for MFA Thesis Project**

Lydia Powers  
Rochester Institute of Technology  
College of Imaging Arts and Sciences  
School of Design  
Computer Graphics Design

Flutter-by Interactive Butterfly: Using interactivity to excite and educate children about butterflies and the Strong National Museum of Play's "Dancing Wings Butterfly Garden"

---

Date: \_\_\_\_\_ Time: \_\_\_\_\_ (Group #s) Adults: **1** Kids: **2**

---

1) Is this your first visit to the Museum? ☒ yes ☐ no  
(if no) How often do you come to the Museum? **1 or 2 a year**

2) Is this your first visit to the Butterfly Garden? yes ☐ no ☐  
(if no) How often have you been? **girls have been (w/ Dad)  
Mom's first time**

3) How did you first find out about the Butterfly Garden?  
Word of Mouth \_\_\_\_\_ Advertisement \_\_\_\_\_ Website \_\_\_\_\_ Other (explain) **Friend**

(If answered website) Did it help you to plan you day here?  
**This morning  
to get Directions/  
Hours**

(If did not answer website) Did you visit the website before coming to the museum?

4) Who made the decision to go to the Butterfly Garden?  
**girls really excited**

5) What did you like best about the Butterfly Garden?  
**girls: Butterflies  
whole thing**

Figure 75.3

**Strong Museum Customer Survey for MFA Thesis Project**

Lydia Powers  
Rochester Institute of Technology  
College of Imaging Arts and Sciences  
School of Design  
Computer Graphics Design

**Flutter-by Interactive Butterfly:** Using interactivity to excite and educate children about butterflies and the Strong National Museum of Play's "Dancing Wings Butterfly Garden"

---

Date: \_\_\_\_\_ Time: \_\_\_\_\_ (Group #s) Adults: 2 Kids: 2

---

1) Is this your first visit to the Museum? ☒ yes ☐ no  
(if no) How often do you come to the Museum? *from Albany*

2) Is this your first visit to the Butterfly Garden? ☒ yes ☐ no  
(if no) How often have you been?

3) How did you first find out about the Butterfly Garden?  
Word of Mouth      Advertisement      Website      Other (explain) *in town for Baby shower*

(If answered website) Did it help you to plan your day here? *internet* *looked up things to do*  
*yes*

(If did not answer website) Did you visit the website before coming to the museum?

4) Who made the decision to go to the Butterfly Garden?  
*parents*

5) What did you like best about the Butterfly Garden?  
*Beautiful*  
*unique*



Figure 75.4

**Strong Museum Customer Survey for MFA Thesis Project**

Lydia Powers  
Rochester Institute of Technology  
College of Imaging Arts and Sciences  
School of Design  
Computer Graphics Design

Flutter-by Interactive Butterfly: Using interactivity to excite and educate children about butterflies and the Strong National Museum of Play's "Dancing Wings Butterfly Garden"

---

Date: \_\_\_\_\_ Time: \_\_\_\_\_ (Group #s) Adults: 2 Kids: 4 (6 mo-6 yrs)

---

1) Is this your first visit to the Museum? yes ☐ no ☒

(if no) How often do you come to the Museum? *from Buffalo 3<sup>rd</sup> year - members times a*

2) Is this your first visit to the Butterfly Garden? yes ☒ no ☐

(if no) How often have you been? *2nd time*

3) How did you first find out about the Butterfly Garden?

Word of Mouth ☐ Advertisement ☒ Valley Website ☐ Other (explain) *Magazine maybe*

(If answered website) Did it help you to plan your day here? *really like emails - about Lego - pulled kids out of school*

(If did not answer website) Did you visit the website before coming to the museum?

4) Who made the decision to go to the Butterfly Garden? *they asked kids - tickets w/ membership if wanted to go*

5) What did you like best about the Butterfly Garden? *6 mo old really liked 6 yrs old wanted butterflies then to land on them 3 year old wanted to stomp on them - left early*

Figure 75.5

**Strong Museum Customer Survey for MFA Thesis Project**

Lydia Powers  
Rochester Institute of Technology  
College of Imaging Arts and Sciences  
School of Design  
Computer Graphics Design

**Flutter-by Interactive Butterfly:** Using interactivity to excite and educate children about butterflies and the Strong National Museum of Play's "Dancing Wings Butterfly Garden"

---

Date: \_\_\_\_\_ Time: \_\_\_\_\_ (Group #s) Adults: 1 (mom) Kids: 2 ~~girls~~ girl + boy?

---

1) Is this your first visit to the Museum? ☒ yes no  
(if no) How often do you come to the Museum? *from Toronto*

2) Is this your first visit to the Butterfly Garden? ☒ yes no  
(if no) How often have you been?

3) How did you first find out about the Butterfly Garden?  
Word of Mouth Advertisement Website Other (explain)

(If answered website) Did it help you to plan your day here?  
*maps info*

(If did not answer website) Did you visit the website before coming to the museum?  
*Internet research → Husband at conference at RIT  
#1 to do for kids in Rochester  
Strong museum*

4) Who made the decision to go to the Butterfly Garden?  
*Been to Niagara Falls one  
Kids wanted to go  
to that one - mom  
on way down*

5) What did you like best about the Butterfly Garden?  
*small  
Hubber Nursery  
north of Toronto  
Zoo at Toronto*  
*It was great!  
More intimate than NF ones  
Liked having  
Hosts - to answer questions*

Figure 75.6

**Strong Museum Customer Survey for MFA Thesis Project**

Lydia Powers  
Rochester Institute of Technology  
College of Imaging Arts and Sciences  
School of Design  
Computer Graphics Design

**Flutter-by Interactive Butterfly:** Using interactivity to excite and educate children about butterflies and the Strong National Museum of Play's "Dancing Wings Butterfly Garden"

---

Date: \_\_\_\_\_ Time: \_\_\_\_\_ (Group #s) Adults: 2 Kids: 2

---

1) Is this your first visit to the Museum? yes ☐ no ☒

(if no) How often do you come to the Museum? from Buffalo once a year

2) Is this your first visit to the Butterfly Garden? yes ☐ no ☒

(if no) How often have you been? 2nd time to - Strong & to - Butterfly garden

3) How did you first find out about the Butterfly Garden?

Word of Mouth      Advertisement      Website      Other (explain)

(If answered website) Did it help you to plan your day here? Coming here

(If did not answer website) Did you visit the website before coming to the museum? 1st time came - looking at hours exhibits (the other day)

4) Who made the decision to go to the Butterfly Garden? Mom (of dad) 4 year old also

5) What did you like best about the Butterfly Garden? Butter-flies watching them eat

## 7:6 Usability Testing

Figure 76.1

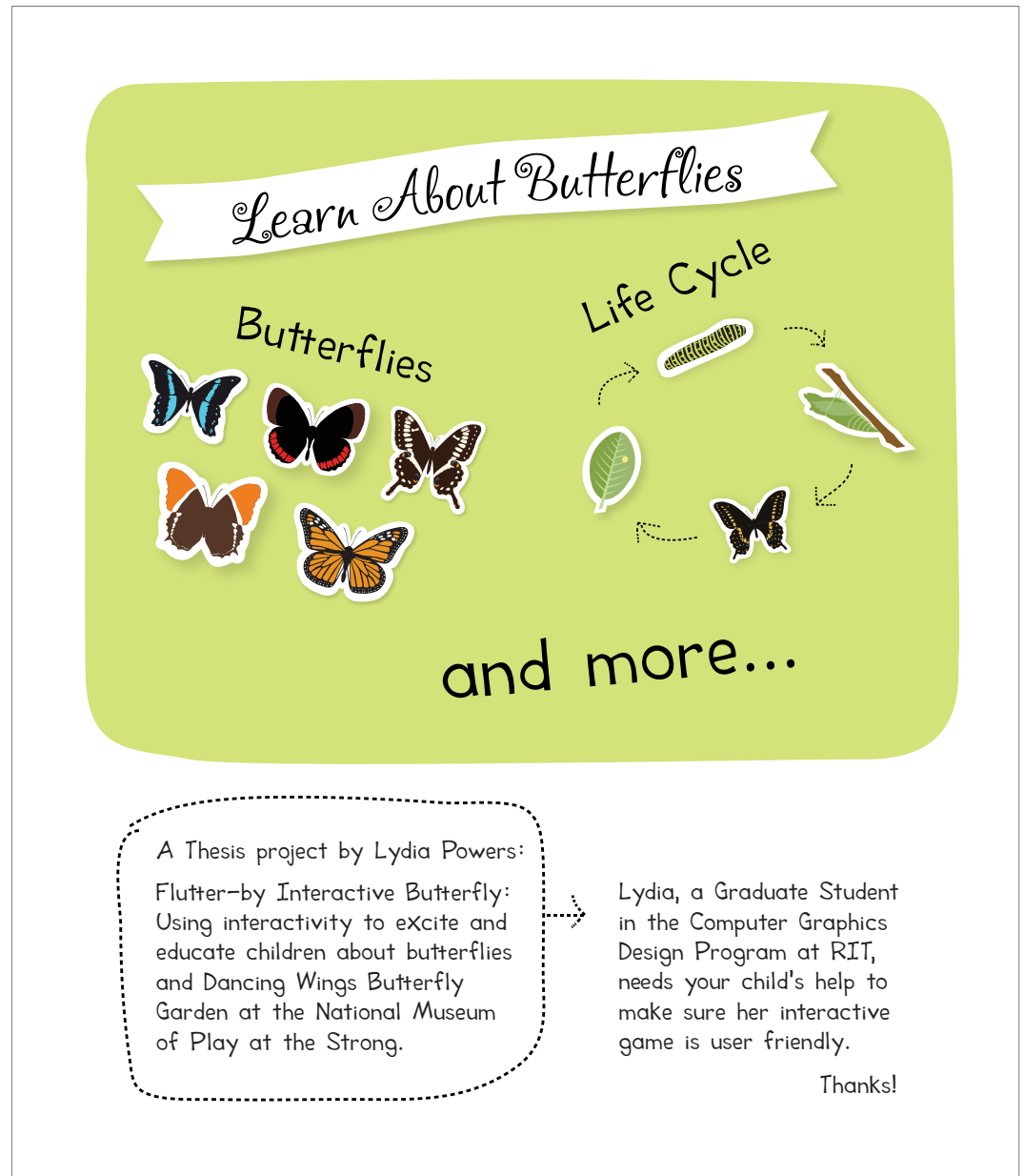


Figure 7.6.2

---

### The Strong User Participation Survey for MFA Thesis Project

Lydia Powers  
Rochester Institute of Technology  
College of Imaging Arts and Sciences  
School of Design  
Computer Graphics Design

**Flutter-by Interactive Butterfly:** Using interactivity to excite and educate children about butterflies and the National Museum of Play at the Strong's "Dancing Wings Butterfly Garden"

---

Hi! My name is Lydia Powers.

I am a graduate student at RIT in the Computer Graphics Design program.

My thesis project is to create an set of interactive games about Butterflies and the Dancing Wings Butterfly Garden!

The project is still in progress, but I could use your child's help to make sure it is user-friendly.

I will be observing your child's interaction with the game, so that I may improve the usability.  
I would also like to know your child's age, to see if there are trends of ease of use or difficulty of use in each age bracket.

I would also like to ask them a few questions after they have finished playing the game if that is alright?  
The results of this survey will only be appearing in my thesis documentation.

Thank you so much for your time.  
You have been a huge help!

~Lydia Powers

Lydia Powers  
Rochester Institute of Technology  
College of Imaging Arts and Sciences  
School of Design  
Computer Graphics Design

**Flutter-by Interactive Butterfly:** Using interactivity to excite and educate children about butterflies and the National Museum of Play at the Strong's "Dancing Wings Butterfly Garden"

Negative:

## Positive:

Parent read text to them? Y

Is there anything you did not like?



## 7:7 Coding Examples

### Preloaders

```
function preloader(e:Event):void
{
    var toLoad:Number = loaderInfo.bytesTotal;
    var loaded:Number = loaderInfo.bytesLoaded;
    var total:Number = loaded/toLoad;
    if(loaded == toLoad)
    {
        removeEventListener(Event.ENTER_FRAME, preloader);
        gotoAndStop(2);
    }
    else
    {
        preload_txt.text = String(Math.floor(total*100)) + "%";
    }
}

function showProgress(e:ProgressEvent)
{
    preload2_mc.visible = true;
    var percent:int = (e.target.bytesLoaded / e.target.bytesTotal) * 100;
    preload2_mc.contentLoader_txt.text = String(percent + "%");
    if (percent == 100)
    {
        preload2_mc.visible = false;
    }
}
```

### Custom Cursor

```
// hide the cursor
Mouse.hide();

// disable the cursor from receiving any MouseEvents
arrow_mc.mouseEnabled = false;
state_mc.mouseEnabled = false;

function moveCursor(event:Event):void
{
    arrow_mc.x = mouseX;

    arrow_mc.y = mouseY;
}
```

### Load SWF Files

```
// create event handler to respond to the loaded SWF file
function loadedSWF(e:Event):void
{
    // create a movie clip that hold the loader data as a movie clip
    // this will allow you to access frames inside the loaded SWF file
    swfTimeline = myLoader.content as MovieClip;

    // add the SWF file to the stage
    container_mc.addChild(myLoader);

    preload2_mc.visible = false;
    container_mc.addChild(myLoader);
    TweenMax.to(myLoader, 0, {alpha: 0, colorMatrixFilter:{saturation:0}});
    TweenMax.to(myLoader, 1.5, {alpha: 1, colorMatrixFilter:{saturation:1}});
}
```

## Welcome Section scrolling

```
// create a boolean variable to activate the movement of the slider
var canMove:Boolean = true;

function moveBackground(e:Event):void
{
    // check to see if the value of canMove is true
    // left/right

    if(canMove == false)
    {
        speed = 0;
    }
    else if (canMove == true)
    {

        // move the garden movieclip left or right depending on cursor's position
        // accerate speed as cursor moves away from the center of Stage
        // divide by 50 to keep maximum speed value small
        speed = (mouseX - 950/2)/50;

        if(mouseX >= 150 && mouseX <=800)
        {
            speed = 0;
        }

        garden_mc.x -= speed;

        //stop movieclip at edge of left and right side
        if(garden_mc.x>=0)
        {
            garden_mc.x=0;
        }
        else if(garden_mc.x<=950 - garden_mc.width)
        {
            garden_mc.x=950 - garden_mc.width;
        }

        // top/bottom

        // move the garden movieclip up/down depending on cursor's position
        // accerate speed as cursor moves away from the center of Stage
        // divide by 40 to keep maximum speed value small so user can click
        speed = (mouseY - 540/2)/50;

        if(mouseY >= 150 && mouseY <= 390)
        {
            speed = 0;
        }

        garden_mc.y -= speed;

        //stop movieclip at top and bottom edges
        if(garden_mc.y>=0)
        {
            garden_mc.y=0;
        }
        else if(garden_mc.y<=540 - garden_mc.height)
        {
            garden_mc.y=540 - garden_mc.height;
        }
    }
}
```

## Welcome Section dialog

```
//popup function on roll over
function popup0Over(e:MouseEvent):void
{
    //make background stop moving while popup visible
    canMove = false;
    speed = 0;

    garden_mc.popup0_mc.visible = false;
    garden_mc.popup0_mc.alpha = 0;

    if(mouseX >= stage.stageWidth/2)
    {
        TweenMax.to(garden_mc.popup0_mc, 0.3, {autoAlpha:1});
        garden_mc.popup0_mc.x = garden_mc.butterfly0_mc.x - garden_mc.popup0_mc.width+100;
        garden_mc.popup0_mc.pointerRight.visible = true;
        garden_mc.popup0_mc.pointerLeft.visible = false;
    }
    else
    {
        TweenMax.to(garden_mc.popup0_mc, 0.3, {autoAlpha:1});
        garden_mc.popup0_mc.x = garden_mc.butterfly0_mc.x + 400;
        garden_mc.popup0_mc.pointerRight.visible = false;
        garden_mc.popup0_mc.pointerLeft.visible = true;
    }
    sclnstr.stop();
    sclnstr = bea1.play();

    MovieClip(parent.parent.parent).magnifyCursor(null);
}
```

## Save Trading Card to Desktop

```
// import the JPEG Encoder from external "com" folder
import com.adobe.images.JPEGEncoder;

// create a new FileReference object to save the file
var file:FileReference = new FileReference();

// add event handler
function snapPic(e:MouseEvent):void{

    // first create an new Bitmap Data object that is the height and width of image movie clip
    var bitmapData:BitmapData = new BitmapData(winScreen_mc.tradingCard_mc.width, winScreen_
    mc.tradingCard_mc.height);

    // capture the movie clips image and match its scale properties (new Matrix)
    bitmapData.draw(winScreen_mc.tradingCard_mc, new Matrix());

    // store the captured pixels in a bitmap object
    var bitmap:Bitmap = new Bitmap(bitmapData);

    // create a new JPEG Encoder to save the file to. 80 is the compression setting
    var jpg:JPEGEncoder = new JPEGEncoder(80);

    // create a byte array object to keep track of the pixel information
    var ba:ByteArray = jpg.encode(bitmapData);

    // use the FileReference to save the byteArray with a name for the JPEG file
    if(winScreen_mc.urlText_txt.text == null || winScreen_mc.urlText_txt.text == ""){
        file.save(ba, "TradingCard.jpg");
    }else{
        file.save(ba, winScreen_mc.urlText_txt.text + ".jpg");
    }
}
```

## Life Cycle Animations Back, Pause, Play and Next for FLV

```

var fl_NC:NetConnection = new NetConnection();
fl_NC.connect(null); // starts a connection; null is used unless using Flash Media Server

var fl_NS:NetStream = new NetStream(fl_NC);
fl_NS.client = {};

var fl_Vid:Video = new Video(950,540);
fl_Vid.attachNetStream(fl_NS);

//addChild(swfPlayerBt);
container_mc.addChild(fl_Vid);
fl_NS.play("Stage1.flv");

function onClickVideoPause(e:MouseEvent):void
{
    fl_NS.pause();
}

function onClickVideoPlay(e:MouseEvent):void
{
    fl_NS.resume();
}

function onClickVideoBack(e:MouseEvent):void
{
    fl_NS.pause();
    fl_NS.seek(0);
    fl_NS.resume();
}

function nextSection(e:Event):void
{
    MovieClip(parent.parent.parent).goLifeCycle2(null);
}

//loop video
fl_NS.addEventListener(NetStatusEvent.NET_STATUS, statusHandler); //to detect end of flash video

function statusHandler(event:NetStatusEvent):void
{
    if(event.info.code == "NetStream.Play.Stop")
    {
        fl_Vid.attachNetStream(null);
        fl_Vid.clear();
        fl_Vid.attachNetStream(fl_NS);
        MovieClip(parent.parent.parent).goLifeCycle2(null);
    }
}

```

## Life Cycle Stage 2 and 4 game enemy

```

function addbirdToStage():void
{
    var randomSide = Math.floor((Math.random()*4 + 1));
    createBird(randomSide);
}

function createBird(whichSide)
{
    //right side
    if (whichSide == 1)
    {
        var mybird1:Bird = new Bird();
        mybird1.x = 1150;
        mybird1.y = randomY;
        addChild(mybird1);
        currentScreen = mybird1;

        TweenLite.to(mybird1, .25, {x:"-200", ease:Cubic.easeInOut, onComplete:playBird1});
        //goes from 300px away to where is it located on the stage

        function playBird1():void
        {
            mybird1.gotoAndPlay(2);
            TweenLite.delayedCall(0.25, reverseBird1);
            sclnstr = bird1.play();
        }

        function reverseBird1():void
        {
            TweenLite.to(mybird1, .25, {x:"200", ease:Cubic.easeInOut});
        }
    }

    //bottom
    else if(whichSide == 2)
    {
        var mybird2:Bird = new Bird();
        mybird2.rotation = 90;
        mybird2.x = randomX;
        mybird2.y = 840;
        addChild(mybird2);
        currentScreen = mybird2;

        TweenLite.to(mybird2, .25, {y:"-200", ease:Cubic.easeInOut, onComplete:playBird2});
        //goes from 300px away to where is it located on the stage

        function playBird2():void
        {
            mybird2.gotoAndPlay(2);
            TweenLite.delayedCall(0.25, reverseBird2);
            sclnstr = bird1.play();
        }

        function reverseBird2():void
        {
            TweenLite.to(mybird2, .25, {y:"200", ease:Cubic.easeInOut});
        }
    }

    //left side
    else if(whichSide == 3)
    {
        var mybird3:Bird = new Bird();
        mybird3.scaleX *= -1;
        mybird3.x = -200;
        mybird3.y = randomY;
        addChild(mybird3);
        currentScreen = mybird3;
    }
}

```

```

TweenLite.to(mybird3, .25, {x:"200", ease:Cubic.easeInOut, onComplete:playBird3});
//goes from 300px away to where is it located on the stage

function playBird3():void
{
    mybird3.gotoAndPlay(2);
    TweenLite.delayedCall(0.25, reverseBird3);
    sclnstr = bird1.play();
}

function reverseBird3():void
{
    TweenLite.to(mybird3, .25, {x:"-200", ease:Cubic.easeInOut});
}

}

//top
else if(whichSide == 4)
{
    var mybird4:Bird = new Bird();
    mybird4.rotation = -90;
    mybird4.x = randomX;
    mybird4.y = -300;
    addChild(mybird4);
    currentScreen = mybird4;

    TweenLite.to(mybird4, .25, {y:"200", ease:Cubic.easeInOut, onComplete:playBird4});
    //goes from 300px away to where is it located on the stage

    function playBird4():void
    {
        mybird4.gotoAndPlay(2);
        TweenLite.delayedCall(0.25, reverseBird4);
        sclnstr = bird1.play();
    }

    function reverseBird4():void
    {
        TweenLite.to(mybird4, .25, {y:"-200", ease:Cubic.easeInOut});
    }

}
}

```



## Create Your Own Butterfly: Switch between parts

```
//_____
//body

var bodyArray:Array = [butterfly.body_mc.b1, butterfly.body_mc.b2, butterfly.body_mc.b3, butterfly.body_
mc.b4, butterfly.body_mc.b5,butterfly.body_mc.b6,butterfly.body_mc.b7,butterfly.body_mc.b8,butterfly.body_
mc.b9,butterfly.body_mc.b10,butterfly.body_mc.b11,butterfly.body_mc.b12,butterfly.body_mc.b13,butterfly.
body_mc.b14,butterfly.body_mc.b15];
var currentState:uint = 0;

// set up bodies
for (var a = 0; a < bodyArray.length; a++){
    bodyArray[a].visible = false;
}
bodyArray[currentState].visible = true;

// add clicks to each body part
function addClicktoBodyParts(){
    for (var a = 0; a < bodyArray.length; a++){
        bodyArray[a].addEventListener(MouseEvent.CLICK, onBClick);
    }
}

//_____
//body functions

// determine which one to turn on
function onBClick(e:MouseEvent):void {
    if(currentState < bodyArray.length - 1){
        currentState++;
    } else {
        currentState = 0;
    }
    changeBody();
}

//_____
// turn on the right body

function changeBody() {
    for (var a = 0; a < bodyArray.length; a++){
        bodyArray[a].visible = false;
    }
    bodyArray[currentState].visible = true;

    //turn on glow
    bodyArray[currentState].filters = [myGlow];

    //make rollovers appear
    changeRolloversToFalse();
    panel1_mc.part4_btn.arrowClick3_mc.visible = true;
}
```

## Create Your Own Butterfly: Coloring

```
//_____
//body

//remove event listeners so that you cannot click on butterfly
for (var a = 0; a < bodyArray.length; a++){
    bodyArray[a].removeEventListener(MouseEvent.CLICK, onBClick);
}

//add event listener for coloring
for (var aa = 0; aa < bodyArray.length; aa++){
    bodyArray[aa].addEventListener(MouseEvent.CLICK, on_pattern3_click)
}

//setup variables for coloring
var paletteOutline:paletteOutline_mc;
var palette:palette_mc;
var pal_color:ColorTransform;
var colors:Array=new Array(0xFFFFFFFF, 0xFFCCFF, 0xFF99CC, 0xFF66CC, 0xFF0099,
    0xCC0066, 0x990066, 0xFF0033, 0xCC0000, 0x990000,
    0xFFCC00, 0xFF9933, 0xFF6600, 0xCC9900, 0x996633,
    0xFFFF99, 0xFFFF00, 0xCCFF00, 0x99FF33, 0x99CC00,
    0x66FF33, 0x66CC00, 0x009900, 0x66CC99, 0x009966,
    0x99FFFF, 0x66CCCC, 0x66CCFF, 0x0066FF, 0x000099,
    0CCCCFF, 0x9999FF, 0x9966CC, 0x660099, 0x000000);

var current_color:int=0;

var colorContainer_mc:Sprite = new Sprite();
addChild(colorContainer_mc);

// function for colors to dynamically load
function coloring():void
{
    for (var i:int=0; i<=35; i++)
    {
        palette = new palette_mc();
        pal_color=palette.transform.colorTransform;
        pal_color.color=colors[i];
        palette.transform.colorTransform=pal_color;

        //making the color palettes show up rows
        if (i >=0 && i <=4)
        {
            palette.y=120;
            palette.x=615+i*50;
        }
        else if (i >=5 && i <=9)
        {
            palette.y=165;
            palette.x=615+(i-5)*50;
        }
        else if (i >=10 && i <=14)
        {
            palette.y=210;
            palette.x=615+(i-10)*50;
        }
        else if (i >=15 && i <=19)
        {
            palette.y=255;
            palette.x=615+(i-15)*50;
        }
        else if (i >=20 && i <=24)
        {
            palette.y=300;
            palette.x=615+(i-20)*50;
        }
        else if (i >=25 && i <=29)
        {
            palette.y=345;
            palette.x=615+(i-25)*50;
        }
    }
}
```

```

        palette.ind=i;
        colorContainer_mc.addChild(palette);
        palette.buttonMode = true;
        palette.addEventListener(MouseEvent.CLICK,on_palette_click);
    }

    //add outlines
    paletteOutline = new paletteOutline_mc();
    paletteOutline.y=120;
    paletteOutline.x=615;
    colorContainer_mc.addChild(paletteOutline);
}

//create changeColor function
function on_palette_click(e:MouseEvent):void
{
    var palette_clicked:palette_mc=e.currentTarget as palette_mc;
    current_color=palette_clicked.ind;
    trace("color" + current_color);

    if(current_color == 0)
    {
        MovieClip(parent.parent.parent.parent).paintbrushCursor0(null);
    }
    if(current_color == 1)
    {
        MovieClip(parent.parent.parent.parent).paintbrushCursor1(null);
    }
}

function on_pattern3_click(e:MouseEvent):void
{
    //body 1
    for (var ka:int = 0; ka < butterfly.body_mc.b1.numChildren; ka++)
    {
        if (butterfly.body_mc.b1.getChildAt(ka).hitTestPoint(stage.mouseX, stage.mouseY,true))
        {
            trace("color body1");
            pal_color=butterfly.body_mc.b1.getChildAt(ka).transform.colorTransform;
            pal_color.color=colors[current_color];
            butterfly.body_mc.b1.getChildAt(ka).transform.colorTransform=pal_color;
        }
    }
}

```

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