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Color charm: Interactive color theory & color reflection

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COLOR CHARM
Interactive Color Theory & Color Reflection

A thesis submitted to the Faculty of the College of Imaging Arts and Sciences in candidacy for the Degree of Master of Fine Arts

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Date
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For those of us who have been blessed with the gift of sight, we are able to see various kinds of colors all around us. We are very fortunate to have this gift. However, how many people are able to recognize the value of a given color? What is the attribute that constitutes a color’s hue or its saturation? All of us who have this gift can say that we enjoy the ability to see all of these colors, but how many of us really know anything about what constitutes a color?

As a Computer Graphics Design student I was not sure if I really knew enough about color. For example, I often question whether or not I have the ability to make a good color choice for a book cover or a poster design. As such, it made me want to do more research about what these beautiful colors mean to everyone and what other people’s color preferences are.

For this application, I provide background knowledge concerning color physics and incorporate the concept of “color preference” for broken down by age group. Users are able to interact with various colors and also have the ability to share their preferences of colors to other users.

Demo Site: http://coloryen.com/colorCharm/
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Introduction
Introduction

What is the best way to open up a community that allows different ages of people to share their feelings toward the meaning of color?

Although there are many websites introducing color theory or supplying color schemes, most of them give a single function or focus more on the knowledge aspect instead of having an instructional application of color preference for teenagers.

I designed this interactive application using Adobe Flash and PHP (Hypertext Preprocessor) that encourages users to experiment with color. This project focuses on both knowledge and interactive design aspects in order to provide an instructional experience in using a website related to color for my target audience. The information design in this project is used to visually show color preferences of all active users. The goal of this project is to provide people a different way to explore more about color in order to have better sense of colors and apply this exploration to their future color choice.
There are three topics in this application, color Basics, Color & you, and Color & Me. Each topic has different objectives.

**Color Basics**
This section you will learn about the basic principles of color theory. This section contains four topics. Within each topic, there are interactive spaces that are designed to build upon your understanding of basic color theory principles. The information presented within each space will also be related to other sections you will encounter later on.

**Color & You**
In this section, there are four topics. Each topic is concerned with color as it relates to you the user. Here you will be able to gain a better understanding of the meaning of color and reflect upon the meaning of color with other users. You may share your opinions about color with your fellow users as well as vote for some of your favorite colors. Last but not least, you also have the ability to broadcast your votes!

**Color & Me**
This section you can play with color by manipulating the value, hue and saturation of color.
Research
Research

Before starting this project, PHP script was a new programming language to me, not to mention how to let Flash talk to a database system. First thing I needed to do is learn what is PHP script and how to use it to communicate with Actionscript 3.0. I did a lot of research on Actionscript 3.0 and PHP.

To keep this thesis project in the right path, I did a lot of research on color theory and interactive functionality in Flash from books and online resources. How to present the idea and information of color theory is one of the main objectives that I need to achieve. In order to incorporate some interactions with color theory, I selected the information that was important, could be represented clearly by some interactive graphics, and easier to be understandable as well. I was including another topic that talks about how colors work differently while placing them together. However, it is too broad for the topic and my project. Thus, I focused on how to make the basic color theory more interesting to people.

I also found out that there are many useful and detailed online tutorials teaching about color theory, how to connect PHP, Flash ActionScript 3.0, and MySQL database that also helped me create this thesis project as well. To see a summary of my pre-production research books and online researches please see appendix 5.1 Bibliography.
3

Process

3.1 Design
3.2 Development
3.1 Design

This section states the process of designing Color Charm, including my design ideation, target audience, interface design, and timeline.

3.1.1 Design Ideation
My intention was to create an interactive website for teenagers who might be interested in color and want to know more about other people’s color preferences. By presenting information about color and sharing users’ color preference, every user would be able to understand color better and share interests and comments across cultures, regions, ages, or genders. This project explores the possible interface design solutions in order to display a user-friendly and interactive platform to communicate with users. This website includes three main topics and ten sections.

3.1.2 Target Audience
Since the number of computer users around the world is large and is also expanding, my target audience consists of people who enjoy color, 2D graphic design, and want to learn and know more about color. The majority of the target audience is made up of teenagers whose age range is approximately 12 - 20 years old. It also consists of English speaking people (or people who can understand English).
3.1.3 Interface Design

I actually re-arranged the interface for this interactive application several times. In the previous versions of the interface design, I used too many colors in it and its main navigation buttons were designed as an interactive slide menu. I also tried several fancy hover effects and graphics, but they did not work as well as I thought. In order to provide user a joyful environment for learning and playing with colors, I designed a simple, clean, and graphic appealing style for my users.

After I decided which interface design I was going to follow with, I designed a logo for this thesis project.
3.1.4 Design Timeline

This was the timeline for this thesis project included in this project’s proposal. It was not accurate as I thought. The major reason that causes some progress changed is the speed of learning PHP script. After figuring out the communication between Flash and MySQL, everything went smooth. While I tried to learn PHP script, I also tested the functionality and designed my interface. I need to make progress in different aspects in order to catch up my original timeline.
3.2 Development

This section states the process of developing Color Charm, including content, back-end process, and some examples of code and scripts.

3.2.1 Information Architecture

I spent a lot of time organizing the content concerning color theory. After meeting with my professors several times, I finalized the information for the topics before I started to design graphics and animations. I organized the content into four major subjects talking about color theory in Color Basics, four subjects in Color & You, and two color games in Color & Me. The main structure of this project is listed below.

<table>
<thead>
<tr>
<th>Color Basics</th>
<th>Color &amp; You</th>
<th>Color &amp; Me</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is Color</td>
<td>Color Application</td>
<td>Match Me</td>
</tr>
<tr>
<td>Color System</td>
<td>Color &amp; Feeling</td>
<td>Color Me</td>
</tr>
<tr>
<td>Attributes of Color</td>
<td>Color Voting</td>
<td></td>
</tr>
<tr>
<td>Color Wheel</td>
<td>Color Ranking</td>
<td></td>
</tr>
</tbody>
</table>

Here are screen shots of the first topic.
Process

Because of the limitation of this application, I chose the basic and important information of color theory that people should know. After reviewing the information with my professors, I organized my research on color theory into four sections in the first topic starting with what is color to color wheel. I tried to design some different interactions for each section in this topic. At the beginning, I designed this topic as an interactive map providing the information by moving a huge graphic. But it did not work as well as I thought. Then I found out that the puzzle effect and little animations could help users learn and play at the same time. To give this project a nice interactive feeling, I incorporated the tween class in all buttons and the graphics.
Here are screen shots of the second topic, Color & You.

In the survey section of the second topic, I tried to reduce the number of question for my users in order to help them explore this project better and gain more data from them.

In the color feeling section, I actually tried to incorporate Box 2D, which is a 2D physics engine for Flash, with the color voting function, but it took me too much time to get to certain level of it. Hence, I gave up the idea of including it in this project.
Here are screen shots of the third topic, Color & Me.

I incorporated the color class in the color matching game of this topic. I was having just HVS adjustment for the game. After having some discussion with my professors, I decided to try to make a RGB adjustment and include it in this section. I tried to present the result by tracking the number of the color that users made. However, it was an other coding issue I would need some time to figure it out, so I did not include it.

Here are screen shots of additional functions, such as usability testing page, help page, and contact page.
3.2.2 Functionality Design
In this application, I designed 2D animations and graphics with words at the same time. I have tried different types of interactions. I found out this puzzle game could help me achieve the goal of “learning is play,” instead of just reading descriptions of color theory. By this action, click-drag-place, it gives users a chance to understand the knowledge in a multi-modal fashion, which increases the ease of comprehension.

User can also customize the background color by clicking on the color blocks at the bottom right corner.

In order to allow the user to explore this project more easily and remove any user interface questions, I also designed a help function that indicates the functionalities of each button and field.
In the first topic, What is Color, I designed a pre-test which has five basic questions related to color theory for user in order to give user much they have already known about color theory. There is a quiz section, which will appear after user explores all the content in “What is Color.” This quiz has eight questions based on the content provided in this topic.

In Color & You, Color Application is a survey design for collecting user’s color choices in eight situations. Users are able to see how many people have the same or different tastes in color as they do.

In the second topic, entitled Color & You, Color & Feeling is a color sensation that allows users to share they feeling about each color by rating it from 0 to 2. After sent your opinion, user can see the result.

This function was designed as a guestbook, where users could be able to enter key words to descript the feeling that the color gives to the users and see other users’ opinions at the same time. After discussed with professors, I decided to change it to what I have now for making more sense to users.
In the second topic, entitled Color & You, Color Ranking users can see the result of 12 colors’ voting ranked by age, gender, location, and total votes by mouse over the symbols or buttons.
3.2.3 Back-end Process
The first development challenge was learning how to let Flash communicate with a database. PHP script was new to me. I was struggling with it for a while. I used two PHP scripts to send and retrieve data to the database. One is for sending data, and the other is to retrieve data from the database. Moreover, it was also a big challenge for me to connect ActionScript with PHP that allows Flash to insert and get data from a database system, and then present the data into a Flash movie. By taking a database class in the New Media department and doing online research, I finally knew how to create a PHP script as the middleware to communicate with Flash and a database system. I included some codes in PHP script indicated some workflow between PHP and MySQL, please see appendix 5.2 Programming Example.

I used phpMyAdmin to create my database for storing and getting data. In total I created 17 tables to collect data from this project.
**3.2.4 Usability Testing**

Usability testing is a core component of my thesis. I have involved user testing all the way through the project. In order to collect users’ feedback easier I designed an online usability testing form within this application. There are five questions about how user feels about it. I got positive feedback from most users. Most of them said that they did gain some knowledge of color theory and had much fun with this application. The right side of the image on the bottom is the result of usability testing. I made some changes after receiving the result of the usability testing, such as some minor arrange of buttons and text layout.

![Usability Testing Result](image)

I also talked to some of my users and asked their comments and questions for each topic. I gained some valuable opinions concerning the interaction aspect. Some people who have never experienced any interactive applications or games did not know how to use this application. Because of that, I tried to incorporate more hover function into this application to help users use it easier. In the content aspect, I would like to add more contents of color theory and color choices to provide more information for users in the future.
**Area of Interest**

I also designed a function that keeps track of the hit number of each topic button. I connected each button to the database. Every time users click on one of the topics, the times can be collected into my database. This function allows me to visualize the information about area of interest.

<table>
<thead>
<tr>
<th>Area of Interest Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color Basics</td>
</tr>
<tr>
<td>357</td>
</tr>
</tbody>
</table>

With this function, I can easily see which topic is really interesting to most people and it could also help me in my future design.
Conclusion
Conclusion

I designed this interactive application using Adobe Flash and PHP (Hypertext Preprocessor) that encourages users to learn about colors and their preferences. This thesis project focuses on both knowledge and interactive design aspects in order to provide an instructional experience in using a website related to color for my target audience. It also focuses on user experience and creating an immersive interactive environment for users as well.

I have been interested in databases for a long time. By developing this thesis project, I have learned how to have communication between Actionscript 3.0 and PHP script, and how to insert and retrieve data from a database with Actionscript 3.0 and PHP script. I also gained more knowledge about Actionscript 3.0 and related classes, and how to design a better user interface. While developing this application, I also learned more about color theory and how to program well in Actionscript 3.0.

The biggest challenge while developing this project was the connection between Flash and a database. To make sure every progress could be on time, I spent a lot of time learning how to use Flash to connect to MySQL first by doing research online and also taking a class in New Media department. In order to make a great user interface and interaction, I re-arranging the design of the user interface many times, and also changing or adding functionalities in each section as well. It brought my professors and me more ideas and different results at the same time. To stick to my original plan for this project, I chose those changes that would help this project more engaging and could be done on time.
Conclusion

From the result of usability testing, I made some changes in this application. This also helps me visualize and realize that how much different people think about this project and how to design a better interactive project. The result of the color voting also helps me visualize the color preference in each different category, such as location, age group and gender.

I believe that this interactive application can bring people some ideas about color after they explore it. The goal of this project is to help people explore more about color in order to have better sense of colors and apply this exploration to their future color choice.
Appendix

5.1 Bibliography
5.2 Programming Example
5.3 Thesis Proposal
5.1 Bibliography

[Book]

Color Theory
José Parramon, Published by Watson-Guptill, October 1989
This guide explains how color works in nature and how it can be manipulated to make expressive paintings. After covering the more scientific aspects of color theory, the author offers information, which analyzes a subject in terms of local, tonal, reflected, and shadow color. He defines and discusses color harmonies, complements, and contrasts and shows the reader how to use cool and warm hues expressively, and how to juxtapose harmonious or discordant colors to produce different psychological and visual effects.

The Art of Color
Johannes Itten, Published by John Wiley & Sons; Revised edition, December 1997
The book presents two different approaches to understanding the art of color. The author connects the different colors with moods and feelings, religious symbols and even gives it a spiritual dimension. Subjective feelings and objective color principles are described in detail and clarified by color reproductions. Everything explained is illustrated by high quality examples and samples from different artists’ work.
Eye for Color
Olga Gutierrez De La Roza, Published by Collins Design, 11 September 2007
The book presents a unique, easy-to-follow system that the author developed to create effective color patterns, which differentiates it from the standard index-style books on the market that provide color combinations without placing those combinations in context. This book is organized into chapters by color. It helps me with how to build my own color index by “dissecting” a gorgeous selection of works used by master painters, graphic designers, fashion and furniture designers and craftsmen.

Color Choices: Making Color Sense Out of Color Theory
Stephen Quiller, Published by Watson-Guptill, 01 February 2002
The book shows readers how to discover their own personal “color sense” in Color Choices, a book that offers readers a fresh perspective on refining their own color styles. The author shows readers how they can develop their own unique color blends. This book guides me to make a good color choice for the website interface.

Harry Waldman, Published by Graphic Arts Technical Fndtn, 01 July 2000
This book guides readers to the fundamental concepts and applications of computer graphics programs that are specifically intended for the newcomer but is also an excellent source of clarification for users who want to extend their comprehension. It introduces the concepts and programs used to create color graphics for a number of everyday uses: brochures, ads, websites, presentations, etc. This introductory-level reference helps me use graphics programs or simply help me communicate more effectively with users.
Appendix

**ActionScript 3.0 Bible**  
Roger Braunstein, Published by Wiley; Revised & enlarged 2nd edition, 2010  
The book aims to be an ultimate guide to ActionScript 3.0, the common language of the Flash Platform. This book contains comprehensive information about Flash scripting language with several examples for readers. It is a good reference book that guides me to how to design my application and organize my code, and also helps me solve some coding problems as well.

**Building Database Driven Flash Applications**  
Tom Fraser, Adam Banks, Published by Jones & Bartlett, 1997  
The authors demonstrate techniques for utilizing Flash presentation capabilities with the power of back-end databases, step by step. This book also includes examples that incorporate multiple technology platforms. It provides me the background of how a database functions with programs.

**Foundation PHP 5 for Flash**  
There are some chapters in the book that cover things such as getting data from PHP to Flash and back again, variables, arrays, string manipulation, validating user input, and feedback forms. This book helps me establish a database system in order to record users information.

**Head First PHP & MySQL**  
Lynn Beighley and Michael Morrison, Published by O’Reilly Media, 1st edition, 2008  
This book is the ultimate learning guide to building dynamic, database-driven websites using PHP and MySQL. The author teaches readers all the essentials of server-side programming, from the fundamentals coding to advanced topics. There are also many useful examples within this book.
[Online Resources]


This website provides me some basic information about color theory. It also inspires me in designing the graphics showing next to the contents in the first topic.

*Information is Beautiful, [http://www.informationisbeautiful.net/](http://www.informationisbeautiful.net/)*

This website provides many visual and functional information designs. It inspires me in the way to present my data in the second topic entitled “Color Ranking”.


This website is dedicated to the growth and improvement of the information and experience industries through the provision of a centralized online resource.


This website is all about PHP development. It provides web developers with a full suite of tools for building dynamic websites with many examples.


This website provides many online video tutorials on web application programming, including HTML, PHP, CSS, ActionScript 3, XML, and MySQL.
Appendix

5.2 Programming Examples
I used phpMyAdmin to create my database for storing and getting data. I totally created 17 tables to collect data from this project.

The first development challenge was learning how to let Flash communicate with a database. I used two PHP scripts to send and retrieve data to the database. One is for sending data, the other is to retrieve data from the database. Moreover, it was also a big challenge to know how to connect ActionScript with PHP that allows Flash to insert and get data from the database, then present the data into Flash movie. The following codes in PHP script indicates some workflow between PHP and MySQL.

```
4  $name = $_POST['name'];
5  $feel = $_POST['feeling'];
6  
7  $query = "INSERT INTO myfeeling (id, name, feeling) VALUES ('','$name', '$feel');"
8  
9  //send Query to SQL, adds new entry to database
10  mysql_query($query) or die("Error querying database.");
11  mysql_close($db);
```
The following codes in PHP script indicated the workflow of retrieving the data from MySQL by PHP script.

```php
$sqli = new mysqli($hostname, $username, $password);
sqli.select_db($database);
$login = mysqli_query($sqli, "SELECT * FROM myfeeling");
$login = mysqli_query($sqli, "SELECT * FROM myfeeling");
while(mysqli_fetch_object($login))
{
    $login = mysqli_query($sqli, "SELECT * FROM myfeeling");
    "$login = mysqli_query($sqli, "SELECT * FROM myfeeling");
    $login = mysqli_query($sqli, "SELECT * FROM myfeeling");
}```

The following codes, function "ColorLocation" in ActionScript 3 was used to connect a PHP script for getting the data of user's location from the database system.

```actionscript
public function ColorLocation()
{
    // create myrequest - needed to load xml
    var myRequest:URLRequest = new URLRequest("http://crown.com/colortheory/PHP-getData.php");
    // create loader
    myLoader = new URLRequestLoader();
    // load loader
    myLoader.load(myRequest);
    // add event listener for COMPLETE
    myLoader.addEventListener(FlexEvent.COMPLETE, loadCompleted);
}
```

The following codes, function "sendUsed1" in ActionScript 3 was used to call a PHP script for inserting the data of user's information to the database system.

```actionscript
function sendUsed1()
{
    var myRequest:URLRequest;
    var myLoader:URLRequestLoader;
    var myVars = new URLVariables();
    myVars.user = user;
    myRequest = new URLRequest();
    myRequest.url = "php/used1.php";
    myRequest.method = URLRequestMethod.POST;
    myRequest.data = myVars;
    myLoader = new URLRequestLoader();
    myLoader.dataFormat = URLRequestDataFormat.TEXT;
    myLoader.addEventListener(FlexEvent.URLError, showErrorEvent);
    myLoader.load(myRequest);
}
```

function showErrorEvent(e:ErrorEvent)
{
    trace("There was an error!");
}
The following code, class “rank” in ActionScript 3 indicates how I connect a PHP script for inserting and retrieving the data of user’s voting rank from the database system.

```actionscript
package rank
{
    import flash.display.MovieClip;
    import flash.events.*;
    import flash.net.*;
    import flash.text.*;
    import flash.utils.*;
    import com.mindshare.fishing.;
    import com.mindshare.fishing.social.*;
    import flash.display.Sound;

    public class ColorLocation extends MovieClip
    {
        private var myLoader:URLLoader;
        private var myColorLAN:
        private var userColor1: MultiList;
        private var userColor2: MultiList;
        private var userColor3: MultiList;
        private var userColor4: MultiList;
        private var userColor5: MultiList;
        private var userColor6: MultiList;
        private var userColor7: MultiList;
        private var userColor8: MultiList;
        private var userColor9: MultiList; // Add more variables as needed
        private var numClicks = 0;
        private var numVotes = 0;

        public function ColorLocation()
        {
            // Create myRequest, needed to load xml
            var myRequest:URLRequest = new URLRequest("http://colorer.com/colorCharX.php?id=1030");
            // Create load
            myLoader = new URLLoader();
            // Load loader
            myLoader.load(myRequest);
            // Add event listener for complete
            myLoader.addEventListener(Event.COMPLETE, loadCompleted);
        }

        private function loadCompleted(e:Event):void
        {
            loc_a_btn.addEventListener(MouseEvent.MOUSE_OVER, loadOver);
            loc_b_btn.addEventListener(MouseEvent.MOUSE_OVER, loadOver);
            loc_c_btn.addEventListener(MouseEvent.MOUSE_OVER, loadOver);
            loc_d_btn.addEventListener(MouseEvent.MOUSE_OVER, loadOver);
            loc_e_btn.addEventListener(MouseEvent.MOUSE_OVER, loadOver);
            loc_f_btn.addEventListener(MouseEvent.MOUSE_OVER, loadOver);
            loc_g_btn.addEventListener(MouseEvent.MOUSE_OVER, loadOver);

            var locBtnArray = new Array(loc_a_btn, loc_b_btn, loc_c_btn, loc_d_btn, loc_e_btn, loc_f_btn, loc_g_btn);
            for (var i=0; i < locBtnArray.length; i++)
            {
                locBtnArray[i].addEventListener(MouseEvent.MOUSE_OVER, loadOver);
                locBtnArray[i].addEventListener(MouseEvent.MOUSE_OUT, loadOut);
            }

            // Set selected proper button
            function setLocation(id:uint):void
            {
                var locBtnArray = new Array(loc_a_btn, loc_b_btn, loc_c_btn, loc_d_btn, loc_e_btn, loc_f_btn, loc_g_btn);
                for (var i=0; i < locBtnArray.length; i++)
                {
                    if (id == i)
                    {
                        locBtnArray[i].gotoAndPlay("over");
                        locBtnArray[i].removeEventListener(MouseEvent.MOUSE_OVER, loadOver);
                        locBtnArray[i].removeEventListener(MouseEvent.MOUSE_OUT, loadOut);
                    }
                    else
                    {
                        if (id == 1)
                        {
                            locBtnArray[i].gotoAndPlay("on");
                            locBtnArray[i].removeEventListener(MouseEvent.MOUSE_OVER, loadOver);
                        }
                        else
                        {
                            locBtnArray[i].gotoAndPlay("off");
                        }
                    }
                    locBtnArray[i].addEventListener(MouseEvent.MOUSE_OVER, loadOver);
                    locBtnArray[i].addEventListener(MouseEvent.MOUSE_OUT, loadOut);
                }
            }
        }
    }
}
```

Color Charm | Interactive Color Theory & Color Reflection
Appendix

```javascript
function loadEvent(e, mouseEvent) {  
  // Code implementation...
}
```
5.3 Thesis Proposal

Thesis Proposal for the Master of Fine Arts Degree

*Color Charm - Interactive Color Preference and Fun*

**Situation Analysis**

“Choosing colors should not be a gamble. It should be a conscious decision. Colors have meaning and function.”

~ Verner Panton

For those of us who have been blessed with the gift of sight, we are able to see various kinds of colors all around us. We are very fortunate to have this gift. However, how many people are able to recognize the value of a given color? What is the attribute that constitutes a color’s hue or its saturation? All of us who have this gift can say that we enjoy the ability to see all of these colors, but how many of us really know anything about what constitutes a color? As a Computer Graphics Design student, even I do not know if I really know so much about color myself. For example, I often question whether or not I have the ability to make a good color choice for a book cover or a poster design. As such, it makes me want to do more research about what these beautiful colors mean to everyone and what other people’s color preferences are. For this application, I wish to provide background knowledge concerning color physics and incorporate the concept of “color preference” for teenagers. Users will be able to interact with various colors and also have the ability to share their preferences of colors to other users.
Problem Statement

*How it is important for teenagers to know other people’s color preferences?*

In my opinion, it is an awkward situation for teenagers when they start to mature and build up their personality. During this period, they tend to have “special taste of color.” Also, they like to see other people’s preferences and tastes as well. As a result, I think that this project could bring teenagers some ideas about color. It can help them explore more about color in order to have better sense of colors and apply this exploration to their future color choice. Although there are many websites introducing color theory or supplying color schemes, most of them give a single function or focus more on the knowledge aspect instead of having an instructional application of color preference for teenagers. I plan to build an interactive application using Adobe Flash and PHP (Hypertex Preprocessor) that encourages users to experiment with color. This project will focus on both knowledge and interactive design aspects in order to provide an instructional experience in using a website related to color for my target audience. Information design will be used to visually show color preferences of all users.
Survey of Literature

In the literature review, I selected books related to color theory, web design, and PHP database design aspects. I also reviewed many online articles and websites about color to shape and support my point of view toward this application.

Color Theory
Jose Parramon, Published by Watson-Guptill, October 1989
This guide explains how color works in nature and how it can be manipulated to make expressive paintings. After covering the more scientific aspects of color theory, the author offers information, which analyzes a subject in terms of local, tonal, reflected, and shadow color. He defines and discusses color harmonies, complements, and contrasts and shows the reader how to use cool and warm hues expressively, and how to juxtapose harmonious or discordant colors to produce different psychological and visual effects.

Interaction of Color
In this book, the author, Josef Albers, presents his unique ideas of color experimentation in a way that is valuable to specialists as well as to a larger audience. It is a significantly expanded selection of more than thirty color studies alongside Albers’ original unabridged text, demonstrating such principles as color relativity, intensity, and temperature; vibrating and vanishing boundaries; and the illusions of transparency and reversed grounds.
Appendix

The Art of Color
Johannes Itten, Published by John Wiley & Sons; Revised edition, December 1997

The book presents two different approaches to understanding the art of color. The author connects the different colors with moods and feelings, religious symbols and even gives it a spiritual dimension. Subjective feelings and objective color principles are described in detail and clarified by color reproductions. Everything explained is illustrated by high quality examples and samples from different artists’ work.

Eye for Color
Olga Gutierrez De La Roza, Published by Collins Design, 11 September 2007

The book presents a unique, easy-to-follow system that the author developed to create effective color patterns, which differentiates it from the standard index-style books on the market that provide color combinations without placing those combinations in context. This book is organized into chapters by color. It could help me with how to build my own color index by “dissecting” a gorgeous selection of works used by master painters, graphic designers, fashion and furniture designers and craftsmen.

Color Choices: Making Color Sense Out of Color Theory
Stephen Quiller, Published by Watson-Guptill, 01 February 2002

The book shows readers how to discover their own personal “color sense” in Color Choices, a book that offers readers a fresh perspective on refining their own color styles. The author shows readers how they can develop their own unique color blends. I think this book could guide me to make a good color choice for the website interface.
Appendix

**Computer Color Graphics: Understanding Today's Visual Communication**
*Harry Waldman, Published by Graphic Arts Technical Fndtn, 01 July 2000*

This book guides readers to the fundamental concepts and applications of computer graphics programs that are specifically intended for the newcomer but is also an excellent source of clarification for users who want to extend their comprehension. It introduces the concepts and programs used to create color graphics for a number of everyday uses: brochures, ads, websites, presentations, etc. This introductory-level reference will help me use graphics programs or simply help me communicate more effectively with users.

**Color Right from the Start: Progressive Lessons in Seeing and Understanding Color**
*Hilary Page, Published by Addison-Wesley Professional, 05 August 2004*

Beyond step-by-step techniques for managing color in modern graphic design practice, Designer’s Color Manual also addresses topics which help designers understand color in a variety of disciplines, looking at historical color systems, color in art, and the psychology of color, among dozens of other topics.

**ActionScript 3.0 Bible**
*Roger Braunstein, Published by Wiley; Revised & enlarged 2nd edition, 12 April 2010*

The book aims to be an ultimate guide to ActionScript 3.0, the common language of the Flash Platform. This book contains comprehensive information about Flash scripting language with several examples for readers. I think it is a good reference book that can guide me to how to design my application and organize my code, and also could help me solve some coding problems.
Building Database Driven Flash Applications
Tom Fraser, Adam Banks, Published by Jones & Bartlett Publishers 1997
The authors demonstrate techniques for utilizing Flash presentation capabilities with the power of back-end databases, step by step. This book also includes examples that incorporate multiple technology platforms. It could provide me the background of how a database functions with programs and guide me with useful examples.

Foundation PHP 5 for Flash
There are some chapters in the book that cover things such as getting data from PHP to Flash and back again, variables, arrays, string manipulation, validating user input, and feedback forms. This book could help me establish a database system in order to record users information.

AdvancED Flash Interface Design
Brian Monnone, Guido Rosso, Michael Kemper, Published by Friends of ED, 08 May 2006
The authors discuss general background theory, such as site planning, color theory, and information architecture. It will help me establish an interactive Flash interface step by step.

The Art and Science of Digital Compositing
Ron Brinkmann, Published Morgan Kaufmann; 2nd edition, 4 June 2008
This book covers a wide range of topics from basic image creation, representation and manipulation, to a look at the visual cues that are necessary to create a believable composite. Designed as an introduction to the field, as well as an authoritative technical reference, this book provides essential information for novices and professionals alike.
Appendix

**Generator/Flash Web Development**  
David Powers, Published by New Riders Publishing, 13 April 2001

The main theme of this book is the workflow process from initial creative inspiration to the production of an entire site. This book shows every process of the off-line dynamic site development workflow. Each step of development is explained and accompanied by example code and illustrations, including site flowcharts, database creation, Flash template design, and final production. The ideas covered and lessons learned will give designers and developers new tools to produce large, content-heavy sites in a quick turn-around fashion.

**Information Visualization**  
Colin Ware, Published by Morgan Kaufmann; 2nd edition, 21 April 2004

This book’s emphasis is on real-world examples and applications of computer-generated/interactive information visualization and also takes a dynamic approach to the subject using software examples on an associated website. I can learn how to display information to: pick out key information from large data streams; present ideas clearly and effectively; and increase the usability and efficiency of computer systems. This book is appropriate for readers interested in information visualization, human-computer interaction, business information technology, and computer graphics.
Design Ideation

I wish to create an interactive website for teenagers who might be interested in color and want to know more about other people’s color preferences. By presenting information about color and sharing users’ color preference, every user would be able to understand color better and share interests and comments across cultures, regions, ages, or genders. This thesis will explore the possible interface design solutions in order to display a user-friendly and interactive platform to communicate with users. This website will include three main topics.

I wish to have a section entitled Color Physics that could allow users to learn, experience, and have fun with colors. Users can have the ability to drag and drop the colors on the stage and also can vote for three of them as their favorite colors. Users not only can receive information about color, but also can be entertained while playing with colors at the same time.

The use of interactive visual representations of 2D animations and graphics allows users to see, experience, and grasp key concepts more easily in this project. Also, this application will include visualization of information and data from users. Visualizing the information and data collection can help users obtain information from other users all over the world. The main goal of this thesis is to gain a better understanding of different people’s perception of color and help users learn color physics more easily by offering a rich visual experience.
Design Flowchart
The contents will have three directions including information of color physics, interactive experience, and survey of color.

Mind Map
After the splash page, the first page will be an introduction to this application.
Before users enter this application, they need to fill out their basic information, such as age, gender, and region. I will have three menu selections for each category.

![User Information Diagram]

The first section entitled “About Color” provides a foundational concepts of color. There will be several movie clips to help users grab the information easily.

![Color Physics Diagram]
The second section entitled “Color Physics” of the website has 12 colors that the user can drag and interactive with, obtain information about, and also cast a vote on (the user will be able to vote on his/her three favorite colors out of the 12 colors displayed on the page).
This page is an information design.

In this section, it also contains three categories in which users can see the top three colors ranked by age, gender, and region.

In this part will provide culture information concerning each color. Users can also vote on three of their favorite colors.

This part will be a visual display that shown how many different people like a given color (vote system).

This part is a visualization of data information that shows the top three colors ranked by region.

This part for describing the concepts in words.
The third section entitled “Color & You” will be a “Survey of Color” that has three sections in which users can answer questions. Should users choose to answer each question in each section (it is not necessary to answer them all), they will be able to see how many people have the same or different tastes in color as they do. The three sections are entitled, “Color & Your Eyes”, “Color & Culture”, “Color & You”, and “Color Me.”
The section entitled “Color Me” allows users to manipulate color patterns and save them to their local machine or print them out.

### Methodological Design

For this web-based application, it has three main topics and three directions of design: user interface design, information design, and survey and quiz design.

**Interactive Interface Design**

This section will be the main interface for users to interact with. By presenting 2D animations and graphics with words at the same time, users can comprehend the knowledge more easily. The main section of this website is Color Physics that will allow users to vote for their favorite colors and play with colors on the stage. The number of color choices for users to participate with will limited to twelve. Users can also click on each color to see more information about its different culture meanings and voting situation.
Information Design
The content for this part will mainly consist of a series of personal questions, including where they come from, what their gender is, how old they are, and different people have different color preferences that could be inscribed by PHP and MySQL. The data will be visualized through a series of color maps.

Survey and Quiz Design
In the game section, there will be a series of questions based on color theory and color choice. After users select their answers, they can see the answers or the results of what other people have chosen. There is also a part to test users about the color physics covered in the first section of this application by asking them ten questions and providing answers.

Software
• Adobe Flash
• Adobe Flash Player
• Adobe Illustrator
• Adobe Photoshop
• Adobe Dreamweaver

Hardware
• Personal Computer both Mac & Windows

Supporting Programs
• PHP
• MySQL
Target Audience

Since the number of computer users around the world is large and is also expanding, my target audience consists of people who enjoy color, 2D graphic design, and want to learn and know more about color. The majority of the target audience is made up of teenagers whose age range is approximately 12 - 20 years old. It also consists of English speaking people (or people who can understand English).

Persona A
Name: Ching-Ting Huang
Age: 14 years old
Educational Level: High School Freshman
Hobbies/Interests: Likes to read and takes pictures. Would like to learn how to make a more eye-catching 2D graphic design composition.
Experience with Thesis Subject Matter: Has known about the color and wants to learn how to choose color to make her blog look more elegant.

Persona B
Name: Joanna Kirilow
Age: 17 years old
Educational Level: High School Senior
Hobbies/Interests: Likes to listen to pop music and reads a lot of comic books.
Experience with Thesis Subject Matter: Does not know the basics of color physics and would like to see other people’s color preferences.
Implementation Strategies

I intend to design a user-friendly interactive interface that will be pleasing both visually as well as conceptually. The visual elements of this project include illustrated 2D graphics and bit map images. In order to complete this project, I must learn how to use a PHP database to communicate with a Flash ActionScript 3.0 class. By integrating Flash and PHP, I will have the ability to store the user's color preference and answers from the color survey for every other user to see.

Dissemination

This project will be a web-based application that will rely heavily on the user’s involvement. I will publish this application on a web space. I also intend to post the link to my web space on various blogs in order to obtain higher level of user participation and feedback.

As to possible competitions, I will submit my finished project to major computer graphics design competitions, such as HOW Interactive Design Awards, Computer Arts Interactive Competition, American Design Award, and Adobe Design Achievement Awards.
Evaluation Plan

As color plays an important role in the field of design that has many intricacies involved, I will create and send out a questionnaire to teenagers who may or may not deal with color a lot in their daily life by asking them about their opinions on colors that should be covered and feedback after using this application. As the application mainly aims at teenagers around the world about colors, the feedback from this survey will help me to create multidimensional contents in this project.

Also, the results of each question in the survey section and the ranking of colors could also help users and me to know about user color preferences. By computing the average between the user number and the result, I can understand the ratio of most people’s color preferences.
Appendix

Pragmatic Considerations

Budget

$50  Web space cost  
$50  Printing costs for questionnaire and thesis show 

$100  Total

Timeline

10/2010  ___Thesis proposal draft
10/2010  ___Concept sketches
10/2010  ___Flowchart finished
11/2010  ___Thesis proposal
11/2010  ___Website started
12/2010  ___1st committee meeting
12/2010  ___Content finalized
01/2011  ___1st prototype done
01/2011  ___Website development
01/2011  ___2nd committee meeting
02/2011  ___Thesis report online
02/2011  ___Database development
03/2011  ___3rd committee meeting
03/2011  ___Create the questionnaire
04/2011  ___4th committee meeting
04/2011  ___Final project complete
04/2011  ___Last committee meeting
05/2011  ___Pass thesis defense
05/2011  ___Thesis show
05/2011  ___Graduation