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Computer-Aided Student Study Group Formation



Kurt O'Hearn
McNair Scholar



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Abstract

Students thrive in a variety of collaborative learning environments. Furthermore, research has shown student study groups are especially effective methods to promote learning. Our research project developed an artificially intelligent, Internet-based system that aids in formation of study groups outside the classroom setting. The system utilized a HTML/PHP/CSS web interface with a MySQL database backend for the system design. Analysis of student feedback following system demonstration revealed significant support on viability and potential usage. A formal study will be conducted during the fall 2009 semester at Grand Valley State University and analysis of results will follow.

1 Introduction

Students thrive in a variety of collaborative learning environments, especially through the use of study groups [1], [4], [6]. However, the typical means by which students form study groups remains problematic. The nature of the problems stems from randomly or pseudo-strategically selecting study-mates amongst students in a class. This approach does not typically yield top-notch study groups. Consequently, students face challenges such as arranging meeting times around busy schedules, not knowing highly-compatible study-mates, and limiting study-mate selection to one's class. To overcome these problems, we have developed an autonomous group formation system utilizing the Internet.

1.1 Background

Our system operates on the foundation that collaborative learning is an effective means of learning. In his paper, Zoltán Dörnyei [1] asserts that collaborative learning is "a highly effective classroom intervention, superior to most traditional forms of instruction in terms of producing learning gains and student achievement, higher-order thinking, positive attitudes toward learning, increased motivation, better teacher-student and student-student relationships accompanied by more developed interpersonal skills and higher self-esteem on the part of students." Study groups utilize the principles of collaborative learning, and, therefore, retain many of these benefits. Dörnyei continues on to state "group characteristics and group processes significantly contributed to success or failure in the classroom and directly affect the quality and quantity of learning within the group." While our system does not control what group processes are used in study groups, it does determine what characteristics a group is composed of in order to boost group cohesiveness and success. Phyllis C. Blumenfeld et al. [2] asserts that group composition should be of similar knowledge levels to best promote learning. Phil Kelly [3] expands the list of characteristics to include group size, gender, ability, personality, nationality, age, and experience. The focus of this research is to form effective study groups using the principles of collaborative learning. Currently, the goal of this stage in the research is to develop an artificially intelligent, Internet-based system that aids in the formation of study groups. Our system looks at the individual characteristics of age, gender, knowledge level in a subject, gender group preference, and available study times when forming groups.

1.2 Paper Outline

This paper presents our approach to developing a group formation system and analyzing viability and potential usage of our system. Section 2 outlines and describes our system operation procedures and components for facilitating their procedures. Section 3 describes our evaluation of our system prototype in terms of viability and potential usage. Analysis of the data shows that our computer system is viable, usable, and well-received by students. The final section outlines future research refinements to our prototype for a formal study and deployment.

2 System Components and Operation Procedures

The system was designed with the following components: user and administrator

interfaces (see section 3.1.1 and 3.1.2) and a MySQL database. The interfaces consist of HTML with embedded PHP web pages styled by CSS. These components operate on four procedural steps (see section 3.2).

2.1 System Components

2.1.1 User Interface

The user interface consists of three web pages: the user account login page, the user customization page, and user information processing page, accessed in this order. The user account login page facilitates user access to the system. The user must enter his or her username and password into a PHP form in order to input information into the system. The user customization page possesses the purpose of obtaining user information needed to form cohesive groups which promote learning (see section 1.1). This information also is entered into PHP forms. By inputting information, the user becomes part of the selection pool under consideration when forming study groups, and, therefore, becomes eligible to be selected to be in a study group. The user information processing page displays a message confirming the information has been correctly entered into the database and ended the user task of entering information. Finally, PHP code on this page retains the user information in a MySQL database for later processing (see section 3.2).

2.1.2 Administrator Interface

The administrator interface also consists of three web pages: administrator account login page, administrator function selection page, and administrator function output page, accessed in this order. The administrator account login is identical to the user account login page, with username and passwords required for access. The administrator function selection page allows the administrator to perform the following actions:

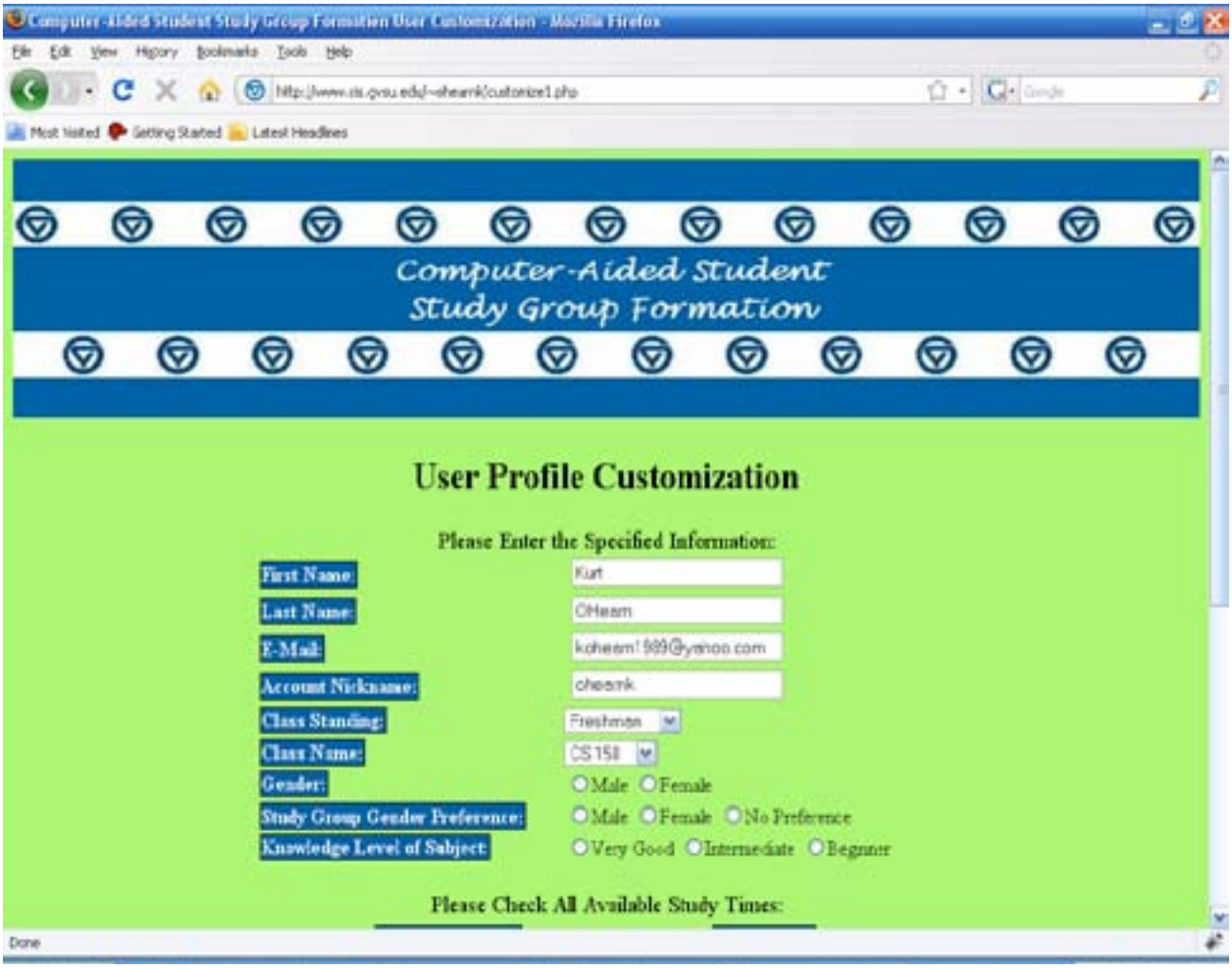
- Manually insert data into the MySQL database
- Manually delete information from the MySQL database
- Search and display information stored in the database
- Execute the group formation algorithm

Once the administrator selects and executes an option, the third page, the administrator function output page, displays the result of the action.

2.2 System Operation Procedures

The system resolved current problems in group formation by using three methods: scheduling study group meeting times and locations; expanding the number of study-

Figure 1: User Customization Page User Data Entry



mate selections, especially across sections of the same class; and selecting "best-matching" group members to maximize meaningful learning from the new possibilities. In order to accomplish these actions, we developed four cyclical operational procedures. These procedures can be summed up in the following four steps:

1. Users enter data via the user interface
2. User data are stored in a MySQL database
3. An AI program is run via the administrator interface to form groups
4. The system communicates to users that groups have been formed

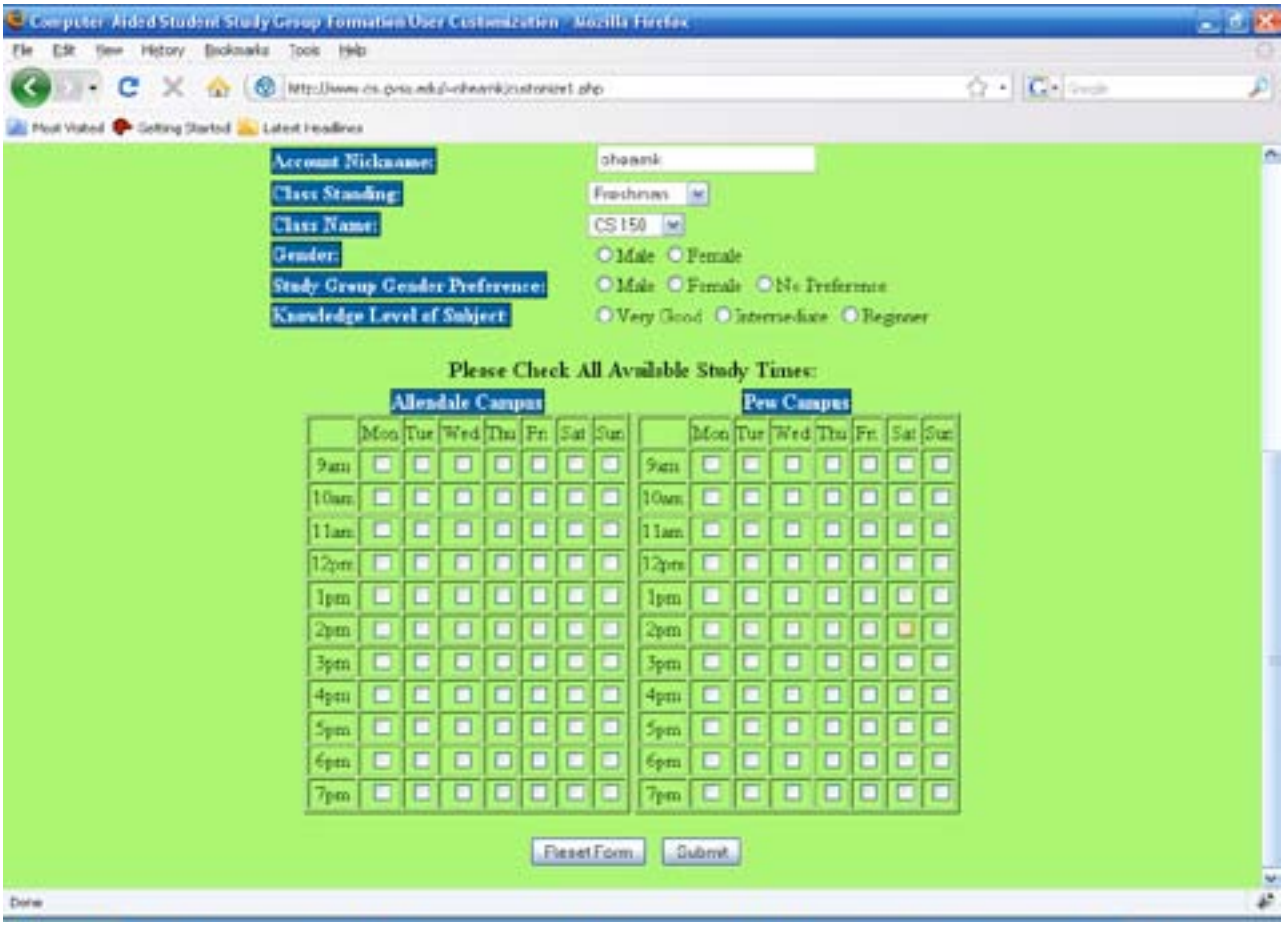
In the first step of the procedure, the user accesses our system via the user interface component (i.e., a series of web pages with PHP forms). In Figure 1 the user enters data into our system. Data entered include user identification information, user contact information, and user characteristics. One unique item contained in the user characteristics is the available study times in Figure 2. A series of check boxes collects the available study times by hour, then that information is concatenated into a string for processing. In step two, all the user data is stored in a MySQL database. PHP code in the user interface web pages accesses the MySQL database and stores all the user data in a single table. This table is sorted by user data categories (e.g., first name, last name, e-mail) so that one entry in the database corresponds to one person. A concatenation of the user e-mail and the class name abbreviation serves as the primary key for accessing information. In step three, an administrator logs onto an administrator Internet interface, which is a series of web pages similar to the user interface, and runs the group formation algorithm to form groups.

The group formation algorithm is made up of PHP code that accesses the MySQL database and temporarily copies all the data into PHP variables. These variables in conjunction with loops and conditional statements evaluate all the information and found possible groups. The current algorithm utilizes a filtering approach by time-increment and characteristics for determining groups [5], [7], [8], [9], [10]. This approach uses the following sequence: first, the system finds all students who can meet at a certain hour and have not yet been assigned a group (i.e., the system started at 9 AM for convenience and incremented until 7 PM). Next, this pool is filtered down further by other characteristics (see section 1.2). Finally, the system forms groups out of users left with matching characteristics. The system then increments to the next hour and repeats the process. In the fourth step, the system takes the output of the group formation algorithm (i.e., a list of groups) and sends e-mails to the users containing the date, time, and location of the meeting and the nicknames of the members in the group.

4 Results

We analyzed data collected through demonstrations to four summer classes in 2009 at

Figure 2: User Customization Page Available Study Times



Grand Valley State University. Following the demonstration, students were asked to complete an anonymous survey on the project viability and potential usage. A total of 76 students were surveyed.

Figure 3: Viability Responses

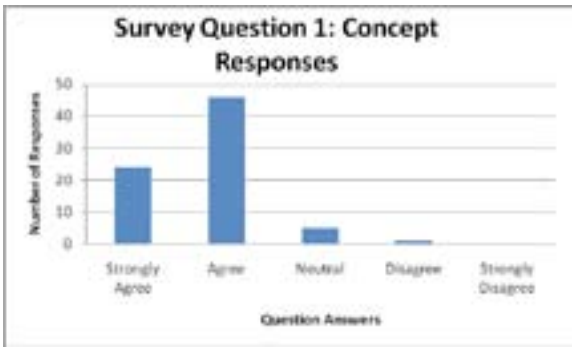


Figure 3 shows responses to the following statement: "The concept of a program that facilitates forming study groups is a 'good' idea." Statistics in Figure 3 reveal that student response was overwhelmingly positive: over ninety percent of students thought our system that formed student study groups was a feasible, worthy idea.

Figure 4: Potential Usage Responses

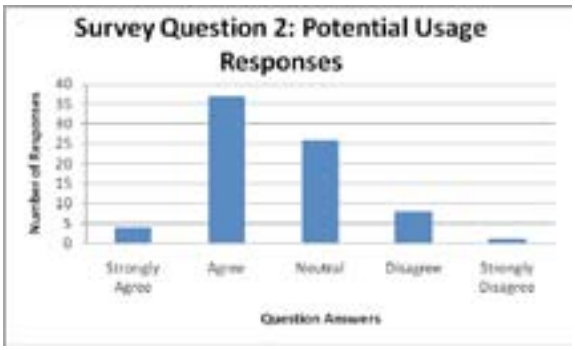


Figure 4 shows responses to the following statement: "If the program presented today was available at Grand Valley State University, I would use it." Statistics in Figure 4 on potential usage of our system are also supportive: approximately half of the students said they would use our system if it was available. Analysis confirms that our computer system is viable, usable, and well-received by students.

5 Future Research

With promising statistics on viability and usability of our current system, the direction of future research is to refine and deploy our system during the fall 2009 semester here at Grand Valley State University. Two sections of CS 162 (Computer Science I) are the intended targets for testing. Additionally, refinements to the system for future deployments include user feedback mechanisms, additional communication methods, group confirmations/cancellations, and improvement of the group formation algorithm.

The first idea for future deployment is a user feedback mechanism. This mechanism would function similarly to eBay's rating system for sales feedback. Following a study group meeting, users could log into the system and rate fellow group mates. Negative ratings would indicate little group cohesion, thus, incompatible members could not be grouped together in the future. Likewise, strong ratings would signify strong group cohesion, thus, group members with positive feedback would likely be grouped together again.

Another feature to be developed is new communication methods. Additional communication methods beyond e-mails to users may include text messages to cell phones, voice messages, and integration into existing online applications such as Facebook.

A mechanism that allows users to confirm or cancel attendance for a group meeting is another possible addition. Users could log into the system and indicate their plans on attending a group. The system could then contact other members and inform them of a group member's attendance plans. If enough people confirm or cancel, the system would confirm or cancel a group meeting. Besides the confirmation/cancelation feature, the group formation algorithm could be improved to form more cohesive groups and maximize learning. The fall 2009 deployment will provide information on system performance as well as group cohesiveness through simple surveys. This information could be used to change which characteristics the group formation algorithm uses to form groups.

Appendix A: Source Code

```
<!--Project: Computer-Aided Student Study Group Formation
    Author: Kurt O'Hearn
    Date: 6/30/2009
    Description: This page is the user login
    to the user interface.

    The Ronald E. McNair Post-Baccalaureate Achievement Program
    at Grand Valley State University provided funding and
    support to perform this project. Dr. Roger Ferguson mentored
    this project.
-->

<!DOCTYPE html PUBLIC "-//W3C/DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/html4/loose.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">

<head>
<meta http-equiv="content-type"
content="text/html; charset=utf-8" />
<title>Computer-Aided Student Study Group Formation Login</title>
<link rel="stylesheet" type="text/css"
href="style1.css" />
</head>

<body>

<!--header-->

<img src="Computer-Aided_Student_Study_Group_Formation_Webpage_Logo2.JPG"
   width=100% height=200px />

<!--end header-->

<!--main content-->

<h2>This Program is for Demonstration Purposes ONLY<br />
This program is not yet fully operational</h2>
<h2>Welcome to Our Website!</h2>

<div align="center">

<big>Please log in below to edit information on your account</big><br />
<form method="post" action="customize1.php">
<table><tbody>
<tr><td id="loginlabel"><label align="left">Username: </label></td>
<td id="pdata"><input type="text" name="username" value=""
   size="25" maxlength="50" /></td></tr>
<tr><td id="loginlabel"><label>Password: </label></td>
<td id="pdata"><input type="password" name="password" value=""
   size="25" maxlength="50" /></td></tr></tbody></table>
<input type="submit" value="Confirm" />
</form>

</div>

<br /><br /><br /><br />
<p class="group" align="center">We Form Groups to Promote Learning</p>

<!--end main content-->

</body>

</html>
```

```
<!--Project: Computer-Aided Student Study Group Formation
    Author: Kurt O'Hearn
    Date: 6/30/2009
    Description: This page is the user data entry page.
    All characteristics used in the group formation
    algorithm are entered in by the user in forms
    and then stored in the database in process.php.

    The Ronald E. McNair Post-Baccalaureate Achievement Program
    at Grand Valley State University provided funding and
    support to perform this project. Dr. Roger Ferguson mentored
    this project.
-->

<!DOCTYPE html PUBLIC "-//W3C/DTD XHTML 1.0 Transitional//EN"

"http://www.w3.org/TR/html4/loose.dtd">

<html xmlns="http://www.w3.org/1999/xhtml">

<head>
<meta http-equiv="content-type"
content="text/html; charset=utf-8" />
<title>Computer-Aided Student Study Group Formation User Customization</title>
<link rel="stylesheet" type="text/css"
href="style1.css" />
</head>

<body>

<!--header-->

<img src="Computer-Aided_Student_Study_Group_Formation_Webpage_Logo2.JPG"
   width=100% height=200px />

<!--end header-->

<!--main content-->

<?php

   //Process information from username/password form
   if(array_key_exists("username", $_POST))
      $username = $_POST['username'];
   if(array_key_exists("password", $_POST))
      $password = $_POST['password'];
   //Error checking for username/password combination
   if ($password != "admin" || !$username) {
      print "<error>Error: Incorrect Username/" .
        "Password Combination</error><BR>";
      exit(0);
   }
?>
<h2 align="center">User Profile Customization</h2>

<div align="center">

<form method="post" action="process1.php">
<big>Please Enter the Specified Information:</big>
<table><tbody>
<tr><td id="label"><label>First Name:</label></td>
<td id="data"><input type="text" value="Kurt" name="fname" size="25"
   maxlength="50" /></td></tr>
```

```
<tr><td id="label"><label>Last Name:</label></td>
<td id="data"><input type="text" value="OHearn" name="lname" size="25"
   maxlength="50" /></td></tr>
<tr><td id="label"><label>E-Mail:</label></td>
<td id="data"><input type="text" value="kohearn1989@yahoo.com" name="email"
size="25"
   maxlength="50" /></td></tr>
<tr><td id="label"><label>Account Nickname:</label></td>
<td id="data"><input type="text" value="ohearnk" name="nickname" size="25"
   maxlength="50" /></td></tr>
<tr><td id="label"><label>Class Standing:</label></td>
<td id="data"><select name="classstanding">
<option value="freshman">Freshman</option>
<option value="sophomore">Sophomore</option>
<option value="junior">Junior</option>
<option value="senior">Senior</option></select></td></tr>
<tr><td id="label"><label>Class Name:</label></td>
<td id="data"><select name="classname">
<option value="cs150">CS 150</option>
<option value="sta215">STA 215</option></select></td></tr>
<tr><td id="label"><label>Gender:</label></td>
<td id="data"><input type="radio" name="gender"
   value="M" />Male
<input type="radio" name="gender" value="F" />Female</td></tr>
<tr><td id="label"><label>Study Group Gender Preference:</label></td>
<td id="data"><input type="radio" name="genderpref" value="M" />Male
<input type="radio" name="genderpref" value="F" />Female
<input type="radio" name="genderpref" value="N" />No Preference</td></tr>
<tr><td id="label"><label>Knowledge Level of Subject:</label></td>
<td id="data"><input type="radio" name="level" value="E" />Very Good
<input type="radio" name="level" value="I" />Intermediate
<input type="radio" name="level" value="B" />Beginner</td></tr>
</tbody></table>
<br />

<table>
<thead><big>Please Check All Available Study Times:</big></thead>
<tbody><tr><td>
<label>Allendale Campus</label>
<table id="times" border="1"><tbody>
<tr><td> </td><td>Mon</td><td>Tue</td><td>Wed</td>
   <td>Thu</td><td>Fri</td><td>Sat</td><td>Sun</td></tr>
<tr><td>9am</td>
<td><input type="checkbox" name="ma9" value="t" /></td>
<td><input type="checkbox" name="ta9" value="t" /></td>
<td><input type="checkbox" name="wa9" value="t" /></td>
<td><input type="checkbox" name="tha9" value="t" /></td>
<td><input type="checkbox" name="fa9" value="t" /></td>
<td><input type="checkbox" name="saa9" value="t" /></td>
<td><input type="checkbox" name="sua9" value="t" /></td></tr>
<tr><td>10am</td>
<td><input type="checkbox" name="ma10" value="t" /></td>
<td><input type="checkbox" name="ta10" value="t" /></td>
<td><input type="checkbox" name="wa10" value="t" /></td>
<td><input type="checkbox" name="tha10" value="t" /></td>
<td><input type="checkbox" name="fa10" value="t" /></td>
<td><input type="checkbox" name="saa10" value="t" /></td>
<td><input type="checkbox" name="sua10" value="t" /></td></tr>
<tr><td>11am</td>
<td><input type="checkbox" name="ma11" value="t" /></td>
<td><input type="checkbox" name="ta11" value="t" /></td>
<td><input type="checkbox" name="wa11" value="t" /></td>
```

```
<td><input type="checkbox" name="tha11" value="t" /></td>
<td><input type="checkbox" name="fa11" value="t" /></td>
<td><input type="checkbox" name="saa11" value="t" /></td>
<td><input type="checkbox" name="sua11" value="t" /></td></tr>
<tr><td>12pm</td>
<td><input type="checkbox" name="ma12" value="t" /></td>
<td><input type="checkbox" name="ta12" value="t" /></td>
<td><input type="checkbox" name="wa12" value="t" /></td>
<td><input type="checkbox" name="tha12" value="t" /></td>
<td><input type="checkbox" name="fa12" value="t" /></td>
<td><input type="checkbox" name="saa12" value="t" /></td>
<td><input type="checkbox" name="sua12" value="t" /></td></tr>
<tr><td>1pm</td>
<td><input type="checkbox" name="ma13" value="t" /></td>
<td><input type="checkbox" name="ta13" value="t" /></td>
<td><input type="checkbox" name="wa13" value="t" /></td>
<td><input type="checkbox" name="tha13" value="t" /></td>
<td><input type="checkbox" name="fa13" value="t" /></td>
<td><input type="checkbox" name="saa13" value="t" /></td>
<td><input type="checkbox" name="sua13" value="t" /></td></tr>
<tr><td>2pm</td>
<td><input type="checkbox" name="ma14" value="t" /></td>
<td><input type="checkbox" name="ta14" value="t" /></td>
<td><input type="checkbox" name="wa14" value="t" /></td>
<td><input type="checkbox" name="tha14" value="t" /></td>
<td><input type="checkbox" name="fa14" value="t" /></td>
<td><input type="checkbox" name="saa14" value="t" /></td>
<td><input type="checkbox" name="sua14" value="t" /></td></tr>
<tr><td>3pm</td>
<td><input type="checkbox" name="ma15" value="t" /></td>
<td><input type="checkbox" name="ta15" value="t" /></td>
<td><input type="checkbox" name="wa15" value="t" /></td>
<td><input type="checkbox" name="tha15" value="t" /></td>
<td><input type="checkbox" name="fa15" value="t" /></td>
<td><input type="checkbox" name="saa15" value="t" /></td>
<td><input type="checkbox" name="sua15" value="t" /></td></tr>
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<td><input type="checkbox" name="ma16" value="t" /></td>
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<td><input type="checkbox" name="wa16" value="t" /></td>
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<td><input type="checkbox" name="sua16" value="t" /></td></tr>
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<td><input type="checkbox" name="ma17" value="t" /></td>
<td><input type="checkbox" name="ta17" value="t" /></td>
<td><input type="checkbox" name="wa17" value="t" /></td>
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<td><input type="checkbox" name="fa17" value="t" /></td>
<td><input type="checkbox" name="saa17" value="t" /></td>
<td><input type="checkbox" name="sua17" value="t" /></td></tr>
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<td><input type="checkbox" name="saa18" value="t" /></td>
<td><input type="checkbox" name="sua18" value="t" /></td></tr>
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<td><input type="checkbox" name="ma19" value="t" /></td>
```

```
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<td><input type="checkbox" name="fa19" value="t" /></td>
<td><input type="checkbox" name="saa19" value="t" /></td>
<td><input type="checkbox" name="sua19" value="t" /></td></tr>
</tbody>
</table>
</td>

<td>
<label>Pew Campus</label>
<table id="times" border="1"><tbody>
<tr><td> </td><td>Mon</td><td>Tue</td><td>Wed</td>
   <td>Thu</td><td>Fri</td><td>Sat</td><td>Sun</td></tr>
<tr><td>9am</td>
<td><input type="checkbox" name="mp9" value="t" /></td>
<td><input type="checkbox" name="tp9" value="t" /></td>
<td><input type="checkbox" name="wp9" value="t" /></td>
<td><input type="checkbox" name="thp9" value="t" /></td>
<td><input type="checkbox" name="fp9" value="t" /></td>
<td><input type="checkbox" name="sap9" value="t" /></td>
<td><input type="checkbox" name="sup9" value="t" /></td></tr>
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<td><input type="checkbox" name="tp10" value="t" /></td>
<td><input type="checkbox" name="wp10" value="t" /></td>
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<td><input type="checkbox" name="sap10" value="t" /></td>
<td><input type="checkbox" name="sup10" value="t" /></td></tr>
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<td><input type="checkbox" name="tp13" value="t" /></td>
<td><input type="checkbox" name="wp13" value="t" /></td>
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<td><input type="checkbox" name="sup13" value="t" /></td></tr>
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<td><input type="checkbox" name="thp14" value="t" /></td>
<td><input type="checkbox" name="fp14" value="t" /></td>
<td><input type="checkbox" name="sap14" value="t" /></td>
<td><input type="checkbox" name="sup14" value="t" /></td></tr>
```

```
<tr><td>3pm</td>
<td><input type="checkbox" name="mp15" value="t" /></td>
<td><input type="checkbox" name="tp15" value="t" /></td>
<td><input type="checkbox" name="wp15" value="t" /></td>
<td><input type="checkbox" name="thp15" value="t" /></td>
<td><input type="checkbox" name="fp15" value="t" /></td>
<td><input type="checkbox" name="sap15" value="t" /></td>
<td><input type="checkbox" name="sup15" value="t" /></td></tr>
<tr><td>4pm</td>
<td><input type="checkbox" name="mp16" value="t" /></td>
<td><input type="checkbox" name="tp16" value="t" /></td>
<td><input type="checkbox" name="wp16" value="t" /></td>
<td><input type="checkbox" name="thp16" value="t" /></td>
<td><input type="checkbox" name="fp16" value="t" /></td>
<td><input type="checkbox" name="sap16" value="t" /></td>
<td><input type="checkbox" name="sup16" value="t" /></td></tr>
<tr><td>5pm</td>
<td><input type="checkbox" name="mp17" value="t" /></td>
<td><input type="checkbox" name="tp17" value="t" /></td>
<td><input type="checkbox" name="wp17" value="t" /></td>
<td><input type="checkbox" name="thp17" value="t" /></td>
<td><input type="checkbox" name="fp17" value="t" /></td>
<td><input type="checkbox" name="sap17" value="t" /></td>
<td><input type="checkbox" name="sup17" value="t" /></td></tr>
<tr><td>6pm</td>
<td><input type="checkbox" name="mp18" value="t" /></td>
<td><input type="checkbox" name="tp18" value="t" /></td>
<td><input type="checkbox" name="wp18" value="t" /></td>
<td><input type="checkbox" name="thp18" value="t" /></td>
<td><input type="checkbox" name="fp18" value="t" /></td>
<td><input type="checkbox" name="sap18" value="t" /></td>
<td><input type="checkbox" name="sup18" value="t" /></td></tr>
<tr><td>7pm</td>
<td><input type="checkbox" name="mp19" value="t" /></td>
<td><input type="checkbox" name="tp19" value="t" /></td>
<td><input type="checkbox" name="wp19" value="t" /></td>
<td><input type="checkbox" name="thp19" value="t" /></td>
<td><input type="checkbox" name="fp19" value="t" /></td>
<td><input type="checkbox" name="sap19" value="t" /></td>
<td><input type="checkbox" name="sup19" value="t" /></td></tr>
</tbody></table>
</td></tr></tbody></table>

<p><input type="reset" value="Reset Form" />
<input type="submit" value="Submit" /></p>
</form>

</div>

<!--end main content-->

</body>

</html>
```

```
<!--Project: Computer-Aided Student Study Group Formation
    Author: Kurt O'Hearn
    Date: 6/30/2009
    Description: This page takes the user data entered
    into forms on the customize.php page and inserts
    that information into the database for later
    processing by the group formation algorithm.

    The Ronald E. McNair Post-Baccalaureate Achievement Program
    at Grand Valley State University provided funding and
    support to perform this project. Dr. Roger Ferguson mentored
    this project.
-->

<!DOCTYPE html PUBLIC "-//W3C/DTD XHTML 1.0 Transitional//EN"

"http://www.w3.org/TR/html4/loose.dtd">

<html xmlns="http://www.w3.org/1999/xhtml">

<head>
<meta http-equiv="content-type"
content="text/html; charset=utf-8" />
<title>Processor</title>
<link rel="stylesheet" type="text/css"
href="style1.css" />
</head>

<body>

<!--header-->

<img src="Computer-Aided_Student_Study_Group_Formation_Webpage_Logo2.JPG"
   width=100% height=200px />

<!--end header-->

<!--main content-->

<?php

   //Process infromation from data entry form
   if(array_key_exists("fname", $_POST))
      $fname = $_POST['fname'];
   if(array_key_exists("lname", $_POST))
      $lname = $_POST['lname'];
   if(array_key_exists("email", $_POST))
      $email = $_POST['email'];
   if(array_key_exists("nickname", $_POST))
      $nickname = $_POST['nickname'];
   if(array_key_exists("gender", $_POST))
      $gender = $_POST['gender'];
   if(array_key_exists("genderpref", $_POST))
      $genderpref = $_POST['genderpref'];
   if(array_key_exists("classstanding", $_POST))
      $classstanding = $_POST['classstanding'];
   if(array_key_exists("classname", $_POST))
      $classname = $_POST['classname'];
   if(array_key_exists("level", $_POST))
      $level = $_POST['level'];

   $atime = "";
   $ptime = "";
```

```
   //Allendale Campus Times
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("ma$i", $_POST) ? $atime .= '1' : $atime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("ta$i", $_POST) ? $atime .= '1' : $atime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("wa$i", $_POST) ? $atime .= '1' : $atime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("tha$i", $_POST) ? $atime .= '1' : $atime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("fa$i", $_POST) ? $atime .= '1' : $atime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("saa$i", $_POST) ? $atime .= '1' : $atime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("sua$i", $_POST) ? $atime .= '1' : $atime .= '0');
   //Pew Campus Times
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("mp$i", $_POST) ? $ptime .= '1' : $ptime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("tp$i", $_POST) ? $ptime .= '1' : $ptime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("wp$i", $_POST) ? $ptime .= '1' : $ptime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("thp$i", $_POST) ? $ptime .= '1' : $ptime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("fp$i", $_POST) ? $ptime .= '1' : $ptime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("sap$i", $_POST) ? $ptime .= '1' : $ptime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("sup$i", $_POST) ? $ptime .= '1' : $ptime .= '0');
   $time = $atime.$ptime;

   if (!$fname || !$lname || !$email || !$nickname || !$gender || !$genderpref
   || !$classstanding || !$classname || !$level ) {
      print "<error>Error: Incorrect Data Entry</error><BR>";
      print "<error>Please Fill In All Areas Before Submitting</error><BR>";
      exit(0);
   }

   if ($ptime == "000000000000000000000000000000000000" .
   "000000000000000000000000000000000000000000"
   && $atime == "000000000000000000000000000000000000" .
   "000000000000000000000000000000000000000000") {
        print "<error>Error: Incorrect Data Entry</error><BR>";
        print "<error>Please Fill In At Least 1 Available Study</error>”;
        print "<error> Time Before Submitting</error><BR>";
      exit(0);
}

   //1st Database Testing Code
   mysql_connect("localhost", "mcnairdb", "mcnairdb1579") or die ("<error>" .
   "No Connection. Please Try Again Later.</error><BR>");

//   mysql_query ("CREATE TABLE mcnairdb.table1(email CHAR(40) PRIMARY KEY, " .
//   "fname CHAR(30), lname CHAR (30), nickname CHAR (30), gender CHAR (1), " .
//   "genderpref CHAR (1), classstanding CHAR (9), classname CHAR (6), level" .
//   " CHAR (1), time CHAR (154))");

   //Delete similar entries before inserting to prevent duplicate entries
   $temp = "DELETE FROM mcnairdb.table1 WHERE email = '$email' && classname =
'$classname'";
   mysql_query ($temp) or die (mysql_error());
   //Insert form data
```

```
   $temp = "INSERT INTO mcnairdb.table1(email, fname, lname, nickname, gender,
   genderpref, classstanding, classname, level, time) VALUES ('$email', '$fname',
  '$lname', '$nickname', '$gender', '$genderpref', '$classstanding', '$classname',
  '$level', '$time')";
   mysql_query ($temp) or die (mysql_error());

   mysql_close();

?>
<h2>Thank you!<br />You are now signed out<br />
   <br />You will receive e-mail notification(s) of groups forming soon.</h2>
<h3><a href="http://www.cis.gvsu.edu/~ohearnk/index1.html">Return to
Homepage</a></h3>

<!--end main content-->

</body>

</html>
```

```
<!--Project: Computer-Aided Student Study Group Formation
    Author: Kurt O'Hearn
    Date: 6/30/2009
    Description: This page is the administrator login
    to the debugger/testing system.

    The Ronald E. McNair Post-Baccalaureate Achievement Program
    at Grand Valley State University provided funding and
    support to perform this project. Dr. Roger Ferguson mentored
    this project.
-->

<!DOCTYPE html PUBLIC "-//W3C/DTD XHTML 1.0 Transitional//EN"

"http://www.w3.org/TR/html4/loose.dtd">

<html xmlns="http://www.w3.org/1999/xhtml">

<head>
<meta http-equiv="content-type"
content="text/html; charset=utf-8" />
<title>Computer-Aided Student Study Group Formation Login</title>
<link rel="stylesheet" type="text/css"
href="style.css" />
</head>

<body>

<!--header-->

<img src="Computer-Aided_Student_Study_Group_Formation_Webpage_Logo2.JPG"
   width=100% height=200px />

<!--end header-->

<!--main content-->

<h2>Welcome to Our Website!<br />This is the Administrator Login Page</h2>

<div align="center">

<big>Please log in below</big><br />
<form method="post" action="option.php">
<table><tbody><tr><td id="loginlabel"><label align="left">Username: </label></td>
<td id="pdata"><input type="text" name="username" value=""
   size="25" maxlength="50" /></td></tr>
<tr><td id="loginlabel"><label>Password: </label></td>
<td id="pdata"><input type="password" name="password" value=""
   size="25" maxlength="50" /></td></tr></tbody></table>
<input type="submit" value="Confirm" />
</form>

</div>

<br /><br /><br /><br />
<p class="group" align="center">We Form Groups to Promote Learning</p>

<!--end main content-->

</body>

</html>
```

```
<!--Project: Computer-Aided Student Study Group Formation
    Author: Kurt O'Hearn
    Date: 6/30/2009
    Description: This debugger/testing page contains four forms
    pertaining to four different functions to execute:
    search database entries and display, insert new entry into the
    database and display, delete existing entries from the database
    and display, and run the study group formation algorith to form
    a listing of study groups.

    The Ronald E. McNair Post-Baccalaureate Achievement Program
    at Grand Valley State University provided funding and
    support to perform this project. Dr. Roger Ferguson mentored
    this project.
-->

<!DOCTYPE html PUBLIC "-//W3C/DTD XHTML 1.0 Transitional//EN"

"http://www.w3.org/TR/html4/loose.dtd">

<html xmlns="http://www.w3.org/1999/xhtml">

<head>
<meta http-equiv="content-type"
content="text/html; charset=utf-8" />
<title>Search</title>
<link rel="stylesheet" type="text/css"
href="style1.css" />
</head>

<body>

<!--header-->

<img src="Computer-Aided_Student_Study_Group_Formation_Webpage_Logo2.JPG"
   width=100% height=200px />

<!--end header-->

<!--main content-->

<div align = "center">

<?php

   if(array_key_exists("username", $_POST))
      $username = $_POST['username'];
   if(array_key_exists("password", $_POST))
      $password = $_POST['password'];

   if ($password != "admin" || $username != "administrator") {
      print "<error>Error: Incorrect Username/" .
        "Password Combination</error><BR>";
      exit(0);
   }

?>
</div><br />

<div align="center">
<p><big><big>Choose One of the Four Options Below</big></big></p>
<form method="post" action="data.php">
<p><big>Specify Category and Keyword to Search the Database For:</big></p>
```

```
<table><tbody>
<tr><td id="searchlabel"><label>Category:</label></td>
<td id="searchlabel"><label>Keyword:</label></td></tr>
<tr><td id="search"><select name="category">
<option value="all">Display All</option>
<option value="email">E-Mail</option>
<option value="fname">First Name</option>
<option value="lname">Last Name</option>
<option value="nickname">Nickname</option>
<option value="gender">Gender</option>
<option value="genderpref">Gender Preference</option>
<option value="classstanding">Class Standing</option>
<option value="classname">Class Name</option>
<option value="level">Knowledge Level</option></select></td>
<td id="search"><input type="text" name="keyword"
   size="15" maxlength="50" /></td></tr>
</tbody></table>
<p><input type="submit" value="Search" /></p>
</form></div><br />

<div align="center">
<form method="post" action="data.php">
<p><big>Enter Data to Insert into the Database:</big></p>
<table><tbody>
<tr><td id="label"><label>First Name:</label></td>
<td id="data"><input type="text" name="fname"
   size="25" maxlength="50" /></td></tr>
<tr><td id="label"><label>Last Name:</label></td>
<td id="data"><input type="text" name="lname"
   size="25" maxlength="50" /></td></tr>
<tr><td id="label"><label>E-Mail:</label></td>
<td id="data"><input type="text" name="email"
   size="25" maxlength="50" /></td></tr>
<tr><td id="label"><label>Account Nickname:</label></td>
<td id="data"><input type="text" name="nickname"
   size="25" maxlength="50" /></td></tr>
<tr><td id="label"><label>Class Standing:</label></td>
<td id="data"><select name="classstanding">
<option value="freshman">Freshman</option>
<option value="sophomore">Sophomore</option>
<option value="junior">Junior</option>
<option value="senior">Senior</option></select></td></tr>
<tr><td id="label"><label>Class Name:</label></td>
<td id="data"><select name="classname">
<option value="cs150">CS 150</option>
<option value="sta215">STA 215</option></select></td></tr>
<tr><td id="label"><label>Gender:</label></td>
<td id="data"><input type="radio" name="gender" value="M" />Male
<input type="radio" name="gender" value="F" />Female</td></tr>
<tr><td id="label"><label>Study Group Gender Preference:</label></td>
<td id="data"><input type="radio" name="genderpref" value="M" />Male
<input type="radio" name="genderpref" value="F" />Female
<input type="radio" name="genderpref" value="N" />No Preference</td></tr>
<tr><td id="label"><label>Knowledge Level of Subject:</label></td>
<td id="data"><input type="radio" name="level" value="E" />Very Good
<input type="radio" name="level" value="I" />Intermediate
<input type="radio" name="level" value="B" />Beginner</td></tr>
<input type="hidden" name="category" value="all" />
<input type="hidden" name="insert" value="yes" />
<input type="hidden" name="delete" value="yes" />
</tbody></table>
<table><thead><big>Please Check All Available Study Times:</big></thead>
<tbody><tr><td>
```

```
<label>Allendale Campus</label>
<table id="times" border="1"><tbody>
<tr><td> </td><td>Mon</td><td>Tue</td><td>Wed</td>
   <td>Thu</td><td>Fri</td><td>Sat</td><td>Sun</td></tr>
<tr><td>9am</td>
<td><input type="checkbox" name="ma9" value="t" /></td>
<td><input type="checkbox" name="ta9" value="t" /></td>
<td><input type="checkbox" name="wa9" value="t" /></td>
<td><input type="checkbox" name="tha9" value="t" /></td>
<td><input type="checkbox" name="fa9" value="t" /></td>
<td><input type="checkbox" name="saa9" value="t" /></td>
<td><input type="checkbox" name="sua9" value="t" /></td></tr>
<tr><td>10am</td>
<td><input type="checkbox" name="ma10" value="t" /></td>
<td><input type="checkbox" name="ta10" value="t" /></td>
<td><input type="checkbox" name="wa10" value="t" /></td>
<td><input type="checkbox" name="tha10" value="t" /></td>
<td><input type="checkbox" name="fa10" value="t" /></td>
<td><input type="checkbox" name="saa10" value="t" /></td>
<td><input type="checkbox" name="sua10" value="t" /></td></tr>
<tr><td>11am</td>
<td><input type="checkbox" name="ma11" value="t" /></td>
<td><input type="checkbox" name="ta11" value="t" /></td>
<td><input type="checkbox" name="wa11" value="t" /></td>
<td><input type="checkbox" name="tha11" value="t" /></td>
<td><input type="checkbox" name="fa11" value="t" /></td>
<td><input type="checkbox" name="saa11" value="t" /></td>
<td><input type="checkbox" name="sua11" value="t" /></td></tr>
<tr><td>12pm</td>
<td><input type="checkbox" name="ma12" value="t" /></td>
<td><input type="checkbox" name="ta12" value="t" /></td>
<td><input type="checkbox" name="wa12" value="t" /></td>
<td><input type="checkbox" name="tha12" value="t" /></td>
<td><input type="checkbox" name="fa12" value="t" /></td>
<td><input type="checkbox" name="saa12" value="t" /></td>
<td><input type="checkbox" name="sua12" value="t" /></td></tr>
<tr><td>1pm</td>
<td><input type="checkbox" name="ma13" value="t" /></td>
<td><input type="checkbox" name="ta13" value="t" /></td>
<td><input type="checkbox" name="wa13" value="t" /></td>
<td><input type="checkbox" name="tha13" value="t" /></td>
<td><input type="checkbox" name="fa13" value="t" /></td>
<td><input type="checkbox" name="saa13" value="t" /></td>
<td><input type="checkbox" name="sua13" value="t" /></td></tr>
<tr><td>2pm</td>
<td><input type="checkbox" name="ma14" value="t" /></td>
<td><input type="checkbox" name="ta14" value="t" /></td>
<td><input type="checkbox" name="wa14" value="t" /></td>
<td><input type="checkbox" name="tha14" value="t" /></td>
<td><input type="checkbox" name="fa14" value="t" /></td>
<td><input type="checkbox" name="saa14" value="t" /></td>
<td><input type="checkbox" name="sua14" value="t" /></td></tr>
<tr><td>3pm</td>
<td><input type="checkbox" name="ma15" value="t" /></td>
<td><input type="checkbox" name="ta15" value="t" /></td>
<td><input type="checkbox" name="wa15" value="t" /></td>
<td><input type="checkbox" name="tha15" value="t" /></td>
<td><input type="checkbox" name="fa15" value="t" /></td>
<td><input type="checkbox" name="saa15" value="t" /></td>
<td><input type="checkbox" name="sua15" value="t" /></td></tr>
<tr><td>4pm</td>
<td><input type="checkbox" name="ma16" value="t" /></td>
<td><input type="checkbox" name="ta16" value="t" /></td>
```

```
<td><input type="checkbox" name="wa16" value="t" /></td>
<td><input type="checkbox" name="tha16" value="t" /></td>
<td><input type="checkbox" name="fa16" value="t" /></td>
<td><input type="checkbox" name="saa16" value="t" /></td>
<td><input type="checkbox" name="sua16" value="t" /></td></tr>
<tr><td>5pm</td>
<td><input type="checkbox" name="ma17" value="t" /></td>
<td><input type="checkbox" name="ta17" value="t" /></td>
<td><input type="checkbox" name="wa17" value="t" /></td>
<td><input type="checkbox" name="tha17" value="t" /></td>
<td><input type="checkbox" name="fa17" value="t" /></td>
<td><input type="checkbox" name="saa17" value="t" /></td>
<td><input type="checkbox" name="sua17" value="t" /></td></tr>
<tr><td>6pm</td>
<td><input type="checkbox" name="ma18" value="t" /></td>
<td><input type="checkbox" name="ta18" value="t" /></td>
<td><input type="checkbox" name="wa18" value="t" /></td>
<td><input type="checkbox" name="tha18" value="t" /></td>
<td><input type="checkbox" name="fa18" value="t" /></td>
<td><input type="checkbox" name="saa18" value="t" /></td>
<td><input type="checkbox" name="sua18" value="t" /></td></tr>
<tr><td>7pm</td>
<td><input type="checkbox" name="ma19" value="t" /></td>
<td><input type="checkbox" name="ta19" value="t" /></td>
<td><input type="checkbox" name="wa19" value="t" /></td>
<td><input type="checkbox" name="tha19" value="t" /></td>
<td><input type="checkbox" name="fa19" value="t" /></td>
<td><input type="checkbox" name="saa19" value="t" /></td>
<td><input type="checkbox" name="sua19" value="t" /></td></tr>
</tbody>
</table>
</td>

<td>
<label>Pew Campus</label>
<table id="times" border="1"><tbody>
<tr><td>&amp;nbsp;</td><td>Mon</td><td>Tue</td><td>Wed</td>
   <td>Thu</td><td>Fri</td><td>Sat</td><td>Sun</td></tr>
<tr><td>9am</td>
<td><input type="checkbox" name="mp9" value="t" /></td>
<td><input type="checkbox" name="tp9" value="t" /></td>
<td><input type="checkbox" name="wp9" value="t" /></td>
<td><input type="checkbox" name="thp9" value="t" /></td>
<td><input type="checkbox" name="fp9" value="t" /></td>
<td><input type="checkbox" name="sap9" value="t" /></td>
<td><input type="checkbox" name="sup9" value="t" /></td></tr>
<tr><td>10am</td>
<td><input type="checkbox" name="mp10" value="t" /></td>
<td><input type="checkbox" name="tp10" value="t" /></td>
<td><input type="checkbox" name="wp10" value="t" /></td>
<td><input type="checkbox" name="thp10" value="t" /></td>
<td><input type="checkbox" name="fp10" value="t" /></td>
<td><input type="checkbox" name="sap10" value="t" /></td>
<td><input type="checkbox" name="sup10" value="t" /></td></tr>
<tr><td>11am</td>
<td><input type="checkbox" name="mp11" value="t" /></td>
<td><input type="checkbox" name="tp11" value="t" /></td>
<td><input type="checkbox" name="wp11" value="t" /></td>
<td><input type="checkbox" name="thp11" value="t" /></td>
<td><input type="checkbox" name="fp11" value="t" /></td>
<td><input type="checkbox" name="sap11" value="t" /></td>
<td><input type="checkbox" name="sup11" value="t" /></td></tr>
<tr><td>12pm</td>
```

```
<td><input type="checkbox" name="mp12" value="t" /></td>
<td><input type="checkbox" name="tp12" value="t" /></td>
<td><input type="checkbox" name="wp12" value="t" /></td>
<td><input type="checkbox" name="thp12" value="t" /></td>
<td><input type="checkbox" name="fp12" value="t" /></td>
<td><input type="checkbox" name="sap12" value="t" /></td>
<td><input type="checkbox" name="sup12" value="t" /></td></tr>
<tr><td>1pm</td>
<td><input type="checkbox" name="mp13" value="t" /></td>
<td><input type="checkbox" name="tp13" value="t" /></td>
<td><input type="checkbox" name="wp13" value="t" /></td>
<td><input type="checkbox" name="thp13" value="t" /></td>
<td><input type="checkbox" name="fp13" value="t" /></td>
<td><input type="checkbox" name="sap13" value="t" /></td>
<td><input type="checkbox" name="sup13" value="t" /></td></tr>
<tr><td>2pm</td>
<td><input type="checkbox" name="mp14" value="t" /></td>
<td><input type="checkbox" name="tp14" value="t" /></td>
<td><input type="checkbox" name="wp14" value="t" /></td>
<td><input type="checkbox" name="thp14" value="t" /></td>
<td><input type="checkbox" name="fp14" value="t" /></td>
<td><input type="checkbox" name="sap14" value="t" /></td>
<td><input type="checkbox" name="sup14" value="t" /></td></tr>
<tr><td>3pm</td>
<td><input type="checkbox" name="mp15" value="t" /></td>
<td><input type="checkbox" name="tp15" value="t" /></td>
<td><input type="checkbox" name="wp15" value="t" /></td>
<td><input type="checkbox" name="thp15" value="t" /></td>
<td><input type="checkbox" name="fp15" value="t" /></td>
<td><input type="checkbox" name="sap15" value="t" /></td>
<td><input type="checkbox" name="sup15" value="t" /></td></tr>
<tr><td>4pm</td>
<td><input type="checkbox" name="mp16" value="t" /></td>
<td><input type="checkbox" name="tp16" value="t" /></td>
<td><input type="checkbox" name="wp16" value="t" /></td>
<td><input type="checkbox" name="thp16" value="t" /></td>
<td><input type="checkbox" name="fp16" value="t" /></td>
<td><input type="checkbox" name="sap16" value="t" /></td>
<td><input type="checkbox" name="sup16" value="t" /></td></tr>
<tr><td>5pm</td>
<td><input type="checkbox" name="mp17" value="t" /></td>
<td><input type="checkbox" name="tp17" value="t" /></td>
<td><input type="checkbox" name="wp17" value="t" /></td>
<td><input type="checkbox" name="thp17" value="t" /></td>
<td><input type="checkbox" name="fp17" value="t" /></td>
<td><input type="checkbox" name="sap17" value="t" /></td>
<td><input type="checkbox" name="sup17" value="t" /></td></tr>
<tr><td>6pm</td>
<td><input type="checkbox" name="mp18" value="t" /></td>
<td><input type="checkbox" name="tp18" value="t" /></td>
<td><input type="checkbox" name="wp18" value="t" /></td>
<td><input type="checkbox" name="thp18" value="t" /></td>
<td><input type="checkbox" name="fp18" value="t" /></td>
<td><input type="checkbox" name="sap18" value="t" /></td>
<td><input type="checkbox" name="sup18" value="t" /></td></tr>
<tr><td>7pm</td>
<td><input type="checkbox" name="mp19" value="t" /></td>
<td><input type="checkbox" name="tp19" value="t" /></td>
<td><input type="checkbox" name="wp19" value="t" /></td>
<td><input type="checkbox" name="thp19" value="t" /></td>
<td><input type="checkbox" name="fp19" value="t" /></td>
<td><input type="checkbox" name="sap19" value="t" /></td>
<td><input type="checkbox" name="sup19" value="t" /></td></tr>
```

```
</tbody></table>
</td></tr><tbody></table>
<p><input type="submit" value="Insert" /></p>
</form></div><br />

<div align="center">
<form method="post" action="data.php">
<p><big>Specify E-mail and Class Name to Delete Entry:</big></p>
<table><tbody>
<tr><td id="searchlabel"><label>E-mail:</label></td>
<td id="searchlabel"><label>Class Name:</label></td></tr>
<tr><td id="search"><input type="text" name="email"
   size="15" maxlength="50" /></td>
<td id="search"><input type="text" name="classname"
   size="15" maxlength="50" /></td></tr>
<input type="hidden" name="category" value="all" />
<input type="hidden" name="delete" value="yes" />
</tbody></table>
<p><input type="submit" value="Delete" /></p>
</form></div><br />

<div align="center">
<form method="post" action="data.php">
<p><big>Group Formation Algorithm:</big></p>
<input type="hidden" name="algorithm" value="yes" />
<p><input type="submit" value="Run" /></p>
</form></div><br />

<h3><a href="http://www.cis.gvsu.edu/~ohearnk/adminlogin.html">Log Out</a></h3>

<!--end main content-->

</body>

</html>
```

```
<!--Project: Computer-Aided Student Study Group Formation
    Author: Kurt O'Hearn
    Date: 6/30/2009
    Description: This page displays the result of the selection
    from the option.php page (search, insert, delete, run algorithm).
    The search option queries the database for all or specific
    information and displays that information. The delete and insert
    options change entries in the database and then display the
    newly changed database. The run algorithm option forms study groups
    by copying all entries from the database into temporary arrays
    and manipulating the data.

    The Ronald E. McNair Post-Baccalaureate Achievement Program
    at Grand Valley State University provided funding and
    support to perform this project. Dr. Roger Ferguson mentored
    this project.
-->

<!DOCTYPE html PUBLIC "-//W3C/DTD XHTML 1.0 Transitional//EN"

"http://www.w3.org/TR/html4/loose.dtd">

<html xmlns="http://www.w3.org/1999/xhtml">

<head>
<meta http-equiv="content-type"
content="text/html; charset=utf-8" />
<title>Data</title>
<link rel="stylesheet" type="text/css"
href="style1.css" />
</head>

<body>

<!--header-->

<img src="Computer-Aided_Student_Study_Group_Formation_Webpage_Logo2.JPG"
   width=100% height=200px />

<!--end header-->

<!--main content-->

<div align = "center">

<?php

//This function copies all selected data stored in the database and displays it
function display ($q) {
   print "<table border = '1'> <tbody>";
   print "<tr><td>E-mail</td><td>First Name</td><td>Last
Name</td><td>Nickname</td>" .
   "<td>Gender</td><td>Gender Preference</td><td>Class Standing</td><td>Class
Name</td>" .
   "<td>Knowledge Level</td><td>Study Times</td></tr>";
   while ($r = mysql_fetch_row($q)) {
       print "<tr>";
       foreach ($r as $column)
           print "<td>".$column."</td>";
       print "</tr>";
   }
   print "</tbody> </table>";
}
```

```
//This function copies all data stored in the database to temporary arrays for
manipulation
//to run the group formation algorithm
function transfer () {
   //Copy information from database
   $q = mysql_query ("SELECT email, fname, lname, nickname, gender, genderpref,
classstanding," .
   " classname, level, time FROM mcnairdb.table1") or die (mysql_error());
   $i = 0;
   while ($r = mysql_fetch_row($q)) {
       $emails[$i] = $r[0];
       $fnames[$i] = $r[1];
       $lnames[$i] = $r[2];
       $nicknames[$i] = $r[3];
       $genders[$i] = $r[4];
       $genderprefs[$i] = $r[5];
       $classstanding[$i] = $r[6];
       $classnames[$i] = $r[7];
       $levels[$i] = $r[8];
       $times[$i] = $r[9];
       $i++;
   }

   //Assigned group number. By default, each person is assigned a "0"
   //which means no group is assigned
   for($j = 0; $j <= $i; $j++)
      $gassign[$j] = 0;

   //Temporary time match number used to create a pool of group candidates
   for($j = 0; $j <= $i; $j++)
      $ttemp[$j] = 0;

   //Day of group meeting
   for($j = 0; $j <= $i; $j++)
      $gday[$j] = "";

   //Time of group meeting
   for($j = 0; $j <= $i; $j++)
      $gtime[$j] = "";

   //Storage of all the arrays into another array for easy access to all data
   $data = array(0 => $emails, 1 => $fnames, 2 => $lnames, 3 => $nicknames, 4 =>
$genders,
   5 => $genderprefs, 6 => $classstandings, 7 => $classnames, 8 => $levels, 9 =>
$times,
   10 => $gassign, 11 => $ttemp, 12 => $gday, 13 => $gtime);

   return $data;
}

//This function counts the number of entries in the database
function dbSize () {
   $size = 0;
   $q = mysql_query ("SELECT email FROM mcnairdb.table1") or die (mysql_error());
   while ($r = mysql_fetch_row($q))
       foreach ($r as $column)
           $size++;

   return $size;
}

//This function determines the meeting day of a group
//in the group formation algorithm
```

```
function assignGroupDay ($k) {
   if(((int)($k / 11)) == 0 || ((int)($k / 11)) == 7)
      return "Monday";
   else if(((int)($k / 11)) == 1 || ((int)($k / 11)) == 8)
      return "Tuesday";
   else if(((int)($k / 11)) == 2 || ((int)($k / 11)) == 9)
      return "Wednesday";
   else if(((int)($k / 11)) == 3 || ((int)($k / 11)) == 10)
      return "Thursday";
   else if(((int)($k / 11)) == 4 || ((int)($k / 11)) == 11)
      return "Friday";
   else if(((int)($k / 11)) == 5 || ((int)($k / 11)) == 12)
      return "Saturday";
   else
      return "Sunday";
}

//This function determines the meeting time of a group
//in the group formation algorithm
function assignGroupTime ($k) {
   if($k % 11 == 0)
      return "9AM";
   else if($k % 11 == 1)
      return "10AM";
   else if($k % 11 == 2)
      return "11AM";
   else if($k % 11 == 3)
      return "12PM";
   else if($k % 11 == 4)
      return "1PM";
   else if($k % 11 == 5)
      return "2PM";
   else if($k % 11 == 6)
      return "3PM";
   else if($k % 11 == 7)
      return "4PM";
   else if($k % 11 == 8)
      return "5PM";
   else if($k % 11 == 9)
      return "6PM";
   else
      return "7PM";
}

//This function displays the output of the group
//formation algorithm (i.e. groups)
function displayGroups ($gnumber, $size, $data) {
      for ($j = 1; $j < $gnumber; $j++) {
         print "<BR><table><tbody>";
         print "<tr><td><ins>Group#$j</ins></td></tr>";
         print "</tbody></table>";
         for ($i = 0; $i < $size; $i++)
            if($data[10][$i] == $j) {
               print "<table><tbody>";
               print "<tr>";
               print "<td id='algorithm'>".$data[0][$i]."</td>";
               print "<td id='algorithm'>".$data[1][$i]."</td>";
               print "<td id='algorithm'>".$data[2][$i]."</td>";
               print "<td id='algorithm'>".$data[3][$i]."</td>";
               print "<td id='algorithm'>".$data[7][$i]."</td>";
               print "<td id='algorithm' >".$data[12][$i]."</td>";
               print "<td id='algorithm'>".$data[13][$i]."</td>";
               print "</tr>";
```

```
               print "</tbody></table>";
            }
      }
}

//This function generates an array containing one entry for
//each unique class name to use in the group formation algorithm
function getClasses () {
   //Copy class names
   $q = mysql_query ("SELECT classname FROM mcnairdb.table1") or die
(mysql_error());
   $i = 0;
   while ($r = mysql_fetch_row($q)) {
       foreach ($r as $column)
          if($i == 0) {
             $cnames[$i] = $column;
             $i++;
          }
          else {
             $flag = 0;
             for($j = 0; $j < $i; $j++)
                if($cnames[$j] == $column)
                   $flag = 1;
             if($flag == 0) {
                $cnames[$i] = $column;
                $i++;
             }
          }
   }

   return $cnames;
}

//This function works identically to the function above
//except it returns the number of unique classes instead
function getNumberOfClasses () {
   //Copy class names
   $q = mysql_query ("SELECT classname FROM mcnairdb.table1") or die
(mysql_error());
   $i = 0;
   while ($r = mysql_fetch_row($q)) {
       foreach ($r as $column)
          if($i == 0) {
             $cnames[$i] = $column;
             $i++;
          }
          else {
             $flag = 0;
             for($j = 0; $j < $i; $j++)
                if($cnames[$j] == $column)
                   $flag = 1;
             if($flag == 0) {
                $cnames[$i] = $column;
                $i++;
             }
          }
   }

   return $i;
}

   //Process data needed to discern option
   if(array_key_exists("category", $_POST))
```

```
      $category = $_POST['category'];
   if(array_key_exists("keyword", $_POST))
      $keyword = $_POST['keyword'];
   if(array_key_exists("insert", $_POST))
      $insert = $_POST['insert'];
   if(array_key_exists("delete", $_POST))
      $delete = $_POST['delete'];
   if(array_key_exists("algorithm", $_POST))
      $algorithm = $_POST['algorithm'];

   //Create time string for manipulation
   $atime = "";
   $ptime = "";
   //Allendale Campus Times
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("ma$i", $_POST) ? $atime .= '1' : $atime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("ta$i", $_POST) ? $atime .= '1' : $atime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("wa$i", $_POST) ? $atime .= '1' : $atime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("tha$i", $_POST) ? $atime .= '1' : $atime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("fa$i", $_POST) ? $atime .= '1' : $atime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("saa$i", $_POST) ? $atime .= '1' : $atime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("sua$i", $_POST) ? $atime .= '1' : $atime .= '0');
   //Pew Campus Times
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("mp$i", $_POST) ? $ptime .= '1' : $ptime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("tp$i", $_POST) ? $ptime .= '1' : $ptime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("wp$i", $_POST) ? $ptime .= '1' : $ptime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("thp$i", $_POST) ? $ptime .= '1' : $ptime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("fp$i", $_POST) ? $ptime .= '1' : $ptime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("sap$i", $_POST) ? $ptime .= '1' : $ptime .= '0');
   for($i = 9; $i <= 19; $i++)
      (array_key_exists("sup$i", $_POST) ? $ptime .= '1' : $ptime .= '0');
   $time = $atime.$ptime;

   //Search input error checking
   if ($category != "all" && !$keyword && !$algorithm) {
        print "<error>Error: No Search Term</error><BR>";
        exit(0);
   }

   //Database connection and manipulationnn
   mysql_connect("localhost", "mcnairdb", "mcnairdb1579") or die ("<error>No Connection." .
   " Please Try Again Later.</error><BR>");

   //Create table
//   mysql_query ("CREATE TABLE mcnairdb.table1(email CHAR(40) PRIMARY KEY, fname " .
//   "CHAR(30), lname CHAR (30), nickname CHAR (30), gender CHAR (1), genderpref " .
//   "CHAR (1), classstanding CHAR (9), classname CHAR (6), level CHAR (1), time " .
//   "CHAR (154))");

   //Delete entry
   //Before inserting new entry, all similar entries
```

```
//to new entry are deleted to prevent duplications
if ($delete == "yes") {
   $temp = "DELETE FROM mcnairdb.table1 WHERE email = '$email' && " .
   "classname = '$classname'";
   mysql_query ($temp) or die (mysql_error());
}

//Insert new entry
if ($insert == "yes") {
   //Process data needed to insert new entry
   if(array_key_exists("fname", $_POST))
      $fname = $_POST['fname'];
   if(array_key_exists("lname", $_POST))
      $lname = $_POST['lname'];
   if(array_key_exists("email", $_POST))
      $email = $_POST['email'];
   if(array_key_exists("nickname", $_POST))
      $nickname = $_POST['nickname'];
   if(array_key_exists("gender", $_POST))
      $gender = $_POST['gender'];
   if(array_key_exists("genderpref", $_POST))
      $genderpref = $_POST['genderpref'];
   if(array_key_exists("classstanding", $_POST))
      $classstanding = $_POST['classstanding'];
   if(array_key_exists("classname", $_POST))
      $classname = $_POST['classname'];
   if(array_key_exists("level", $_POST))
      $level = $_POST['level'];

   //Insert entry general error checking
   if ((!$fname || !$lname || !$email || !$nickname || !$gender || !$genderpref
   || !$classstanding || !$classname || !$level) ) {
        print "<error>Error: Incorrect Data Entry</error><BR>";
      print "<error>Please Fill In All Areas Before Inserting</error><BR>";
        exit(0);
   }

   //Insert entry study times error checking
   if ($ptime == "000000000000000000000000000000000000000000000000" .
   "00000000000000000000000000" && $atime == "0000000000000000000" .
   "000000000000000000000000000000000000000000000000000000000000000") {
      print "<error>Error: Incorrect Data Entry</error><BR>";
      print "<error>Please Fill In At Least 1 Available Study Time" .
      " Before Submitting</error><BR>";
        exit(0);
   }

   $temp = "INSERT INTO mcnairdb.table1(email, fname, lname, nickname, " .
   "gender, genderpref, classstanding, classname, level, time) VALUES " .
   "('$email', '$fname', '$lname', '$nickname', '$gender', '$genderpref'," .
   " '$classstanding', '$classname', '$level', '$time')";
   mysql_query ($temp) or die (mysql_error());
}

//Query options by category
//Query db for all data
if ($category == "all")
   $q = mysql_query ("SELECT email, fname, lname, nickname, gender," .
   " genderpref, classstanding, classname, level, time" .
   " FROM mcnairdb.table1") or die (mysql_error());

//Query db for matching email entries only
else if ($category == "email")
```

```
      $q = mysql_query ("SELECT email, fname, lname, nickname, gender," .
      " genderpref, classstanding, classname, level, time" .
      " FROM mcnairdb.table1 WHERE email = '$keyword'") or die (mysql_error());

   //Query db for matching first name entries only
   else if ($category == "fname")
      $q = mysql_query ("SELECT email, fname, lname, nickname, gender," .
      " genderpref, classstanding, classname, level, time" .
      " FROM mcnairdb.table1 WHERE fname = '$keyword'") or die (mysql_error());

   //Query db for matching last name entries only
   else if ($category == "lname")
      $q = mysql_query ("SELECT email, fname, lname, nickname, gender," .
      " genderpref, classstanding, classname, level, time" .
      " FROM mcnairdb.table1 WHERE lname = '$keyword'") or die (mysql_error());

   //Query db for matching nickname entries only
   else if ($category == "nickname")
      $q = mysql_query ("SELECT email, fname, lname, nickname, gender," .
      " genderpref, classstanding, classname, level, time" .
      " FROM mcnairdb.table1 WHERE nickname = '$keyword'") or die (mysql_error());

   //Query db for matching gender entries only
   else if ($category == "gender")
      $q = mysql_query ("SELECT email, fname, lname, nickname," .
      "gender, genderpref, classstanding, classname, level, time " .
      "FROM mcnairdb.table1 WHERE gender = '$keyword'") or die (mysql_error());

   //Query db for matching gender preferences entries only
   else if ($category == "genderpref")
      $q = mysql_query ("SELECT email, fname, lname, nickname, gender," .
      " genderpref, classstanding, classname, level, time" .
      " FROM mcnairdb.table1 WHERE genderpref = '$keyword'") or die
(mysql_error());

   //Query db for matching class standing entries only
   else if ($category == "classstanding")
      $q = mysql_query ("SELECT email, fname, lname, nickname, gender," .
      " genderpref, classstanding, classname, level, time" .
      " FROM mcnairdb.table1 WHERE classstanding = '$keyword'") or die
(mysql_error());

   //Query db for matching class name entries only
   else if ($category == "classname")
      $q = mysql_query ("SELECT email, fname, lname, nickname, gender," .
      " genderpref, classstanding, classname, level, time" .
      " FROM mcnairdb.table1 WHERE classname = '$keyword'") or die
(mysql_error());

   //Query db for matching knowledge level entries only
   else if ($category == "level")
      $q = mysql_query ("SELECT email, fname, lname, nickname, gender," .
      " genderpref, classstanding, classname, level, time" .
      " FROM mcnairdb.table1 WHERE level = '$keyword'") or die (mysql_error());

   if (!$algorithm) {
      //Display query option
      print "<BR>";
      display($q);
      print "<BR>";
   }

   //Group formation algorithm execution
```

```
if ($algorithm == "yes") {
   //Copy All Data from the Database and Store Temporarily for Algorithm Execution
   $data = transfer();
   //Copy array of class names
   $cnames = getClasses();
   //Determine the number of unique class entries
   $numberofclasses = getNumberOfClasses();
   //Study group formation algorithm
   $size = dbSize(); //Number of entries in db
   $gnumber = 1; //Group assignment number. Increments with each new group.

   //Cycle through study times
   for($m = 0; $m < $numberofclasses; $m++)
      for($k = 0; $k <= 153; $k++) {
         $pool = 0;
         //Cycle through db entries
         for($i = 0; $i < $size; $i++)
            if($k <= 152)
               //Check entry if possible match for pool, then add
               if(strcmp(substr($data[9][$i], $k, -153 + $k), 1) == 0
               && $data[10][$i] == 0 && $data[7][$i] == $cnames[$m]) {
                  $data[11][$i] = 1;
                  $pool++;
               }
               //Remove entry from pool if not possible match
               else
                  $data[11][$i] = 0;

            //To Compare the Last Piece of the String;
            //Couldn't Use strcmp for last element with zero for reverse number
            else
               //Check entry if possible match for pool, then add
               if(strcmp(substr($data[9][$i], -1), 1) == 0
               && $data[10][$i] == 0 && $data[7][$i] == $cnames[$m]) {
                  $data[11][$i] = 1;
                  $pool++;
               }
               //Remove entry from pool if not possible match
               else {
                  $data[11][$i] = 0;
               }

         //Check for large enough pool to form group
         $j = 0;
         if($pool >= 2)
            //Able to form another group
            while($pool != 0) {
               $thisgroup = $pool % 6;
               if($pool == 0)
                  $thisgroup == 6;
               while($thisgroup > 0) {
                  //Add member to group
                  if($data[11][$j] == 1) {
                     $data[10][$j] = $gnumber;
                     //Assign group day
                     $data[12][$j] = assignGroupDay($k);
                     //Assign group time
                     $data[13][$j] = assignGroupTime($k);
                     $thisgroup--;
                     $pool--;
                  }

                  //Next group
```

```
                    if($thisgroup == 0)
                       $gnumber++;
                    $j++;
                 }
              }
         }
      //Display groups
      displayGroups($gnumber, $size, $data);
   }

   //Delete Table
//   mysql_query("DROP TABLE mcnairdb.table1") or print "Failure to drop table" .
//   " -> Table does not exist6<BR>";
   mysql_close();
?>

<br /><form method="post" action="option.php">
<input type="hidden" name="username" value="administrator" />
<input type="hidden" name="password" value="admin" />
<input type="submit" value="Previous Page" />
</form>

</div>

<h3><a href="http://www.cis.gvsu.edu/~ohearnk/adminlogin.html">Log Out</a></h3>

<!--end main content-->

</body>

</html>
```

```
<!--CSS-->

body
   {background: #AEFA73}
h2
   {font-size: 28px;
    text-align: center;}
h3
   {text-align: center;}
error
   {font-size: 28px;
    color:red;
    width: 100%;
    text-align: center;}
label
   {color: white;
    background: #0561A5;
    font-weight: bold;
    border: 1px solid black;}
input
   {margin-left: .5em;
    margin-bottom: .2em;
    line-height: 1.4em;}
p.group
   {font-family: "Freestyle Script", sans-serif;
    font-size: 24px;}
td
   {text-align: center;
    width: 25px;}
#loginlabel
   {text-align:left;
    width: 50px;}
#label
   {text-align:left;
    width: 250px;}
#searchlabel
   {text-align:left;
    width: 55px;}
#data
   {text-align:left;
    width: 325px;}
#dpata
   {text-align:left;
    width: 50px;}
#search
   {text-align: left;
    width: 55px;}
#algorithm
   {text-align: center;
    width: 175px;}
a:link
   {font-weight: bold;
    color:red;}
a:visited
   {color:orange;}
a:focus
   {color:purple;}
a:hover
   {color:green;}
a:active
   {color:blue;}
```

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