Lab 1 – Study Buddy Description

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CS 411

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1. Introduction

Study Buddy will be a web application developed for students who wish to be matched with like-minded students for the purpose of forming study groups. Study Buddy will apply an Intelligent Buddy Matching algorithm, discussed in section 2.1, used to match potential study buddies.

A study group is a small group of students who meet with the goal of reviewing coursework and preparing for exams. According to the article Benefits of Joining a Study Group, many students, especially those in college resist joining study groups even though they have proven benefits, such as improved notes, building a support system, covering more material and making topics more interesting. Study Buddy is directed toward students who tend to be too shy to reach out to other students or who may feel alienated because they are enrolled in an online class.

Figure 1 shows the limited options for students who wish to form a study group. If they are shy or an online learning student, there are no tools to help them find or form groups, if they are not shy or enrolled in online classes, their options are limited to asking classmates or posting on a discussion board, this can lead to several attempts as there will likely be some negative responses.
With the current process flow, students who do make a connection to form a study group may join or form a group that is not conducive to their own study habits or their own learning style. Visual, auditory, kinesthetic and reading/writing are the four most common types of learners (Erickson, 2016). Joining those with similar learning styles can allow the group to make better use of time by having more strategic study sessions.

The proposed process flow, shown in Figure 2, shows that with Study Buddy, any student can more easily find a study group. Students who want to form a study group will access the web application, if they are a new user, they will then create a profile, complete with learning preferences. Users will then select their topic of study and the application will match them to potential study partners or groups.
According to Southern Cross University, 23% more students passed courses by having a “study buddy support (SBS).” Study Buddy will be an effective and invaluable tool for students who want the benefits of study groups such as improved grades, increased motivation and focus, as well as a more comfortable setting to learn, as described by Southern Cross University.

2. Study Buddy Product Description

Study Buddy will use a server infrastructure to manage and process data. Users will access Study Buddy via any internet accessible device. A database will store user profile information that is accessed to match buddies using calculations from the Intelligent Buddy Matching algorithm, shown in Figure 3. The server will then forward that information to the end-user’s computer or device and display it via the application.
2.1 Key Product Features and Capabilities

As shown in Figure 2, end-users will create a profile with their study and learning preferences, then select “Find a Buddy”. Here the user will input their class or subject, from this data, a list will be created of users looking for buddies in the same subject or class. From this list, buddies are filtered out that have different availability and remark buddies who the end-user has blocked. The Study Buddy Intelligent Buddy Matching algorithm is applied as follows: the end-user’s study preferences for the subject are stored in vectors, the cosine of an angle between 2 vectors is calculated to provide a score, as shown in Figure 3.

<table>
<thead>
<tr>
<th>Learning Style</th>
<th>User: Jamal Williams</th>
<th>User: John Grotzer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual</td>
<td><img src="image" alt="Visual vector" /></td>
<td><img src="image" alt="Visual vector" /></td>
</tr>
<tr>
<td>Auditory</td>
<td><img src="image" alt="Auditory vector" /></td>
<td><img src="image" alt="Auditory vector" /></td>
</tr>
<tr>
<td>Kinesthetic</td>
<td><img src="image" alt="Kinesthetic vector" /></td>
<td><img src="image" alt="Kinesthetic vector" /></td>
</tr>
<tr>
<td>Reading/Writing</td>
<td><img src="image" alt="Reading/Writing vector" /></td>
<td><img src="image" alt="Reading/Writing vector" /></td>
</tr>
</tbody>
</table>

\[
\cos \theta = \frac{W \cdot C}{\|W\| \|C\|} = \frac{2}{\sqrt{2} \times \sqrt{3}} = \frac{2}{\sqrt{6}} \approx 0.8165
\]

Figure 3: Intelligent Buddy Matching Algorithm

The similarity score will be used to match potential buddies in list sorted in descending order. The closer to 1 the score the more compatible the users’ learning styles.
Numerous external application programming interfaces will be used to allow for a central study application. Google Hangouts will permit users to meet online when in-person meetings are not feasible. Google Drive will allow for file sharing and joint project collaboration. Other applications that will assist in file and data sharing for various topics include Codeshare for real-time programming and coding assignments and Jupyter Notebook for sharing mathematical equations and visual data. Slack, a real-time messaging application will be embedded to the web application to allow users to chat via web or smartphone and receive notifications and alerts for conversations, this permits users to ensure they do not miss opportunities to set up new meeting times and locations. Git is another feature, Study Buddy users will be able to create repositories using Project name, owner and members.

2.2 Major Components (Hardware/Software)

Study Buddy will consist of three major elements: the web application, which is the user interface accessible by any internet capable device; the server infrastructure, which will collect and process data; and a database of user accounts which will be comprised of the user’s personal information, availability, study preferences and blocked list. The exchanges are shown in Figure 4.
3. Identification of Case Study

Current college and high school students are the target audience, with an emphasis on students who are enrolled online, shy or have trouble finding study groups or partners who have similar study and learning preferences. These are potential users who would benefit most as well as provide a large enough user base to provide any benefit over current methods of seeking study groups and partners.
The Study Buddy web application can integrate with school portals such as myODU and replace virtual message boards such as those in Figure 5. Study Buddy would allow students to prepare for college entrance exams such as the SAT or ACT, as well as graduate school entrance exams such as MCAT and LSAT. The application would also allow anyone with a desire to learn new topics or just refresh their knowledge of previously studied subjects, to form study groups and enhance their own knowledge.

4. Study Buddy Product Prototype Description

The Study Buddy prototype will perform the algorithms required to match users with other buddies. The application will be limited to a web application, with only a select few accessing it for testing purposes. The prototype will permit identification of design and implementation weaknesses as well as verify algorithms.

4.1 Prototype Architecture (Hardware/Software)

The prototype architecture will include a virtual server, a database and a set of internet accessible devices shown in Figure 4. The configuration of the database will be that of the final product and shall include tuples of simulated user data.

Functional components of the internet accessible devices will be identical to those of the final product. Only a small sampling of devices will be used for the prototype development.

A virtual machine will be utilized for the prototype server infrastructure. The database, web server and the server software will be run from the virtual server. For testing purposes all features of the application will be implemented and the virtual server will allow any performance tests to take place.
4.2 Prototype Features and Capabilities

Features of the prototype will be more limited than those of the finished product due to the limited development time and need to acquire necessary permission or registrations. Other features will be unavailable due to the small scope of the prototype. A full list of available features for both the prototype and the final product can be found in Table 1.
### Table 1: Prototype Features

<table>
<thead>
<tr>
<th>Features</th>
<th>Study Buddy Final Product</th>
<th>Study Buddy Prototype</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GUI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Login</td>
<td>Allows user entry of authentication credentials</td>
<td>Will be implemented</td>
</tr>
<tr>
<td>New User</td>
<td>Allows a user to create an account</td>
<td>Will be implemented</td>
</tr>
<tr>
<td>Study Preference Setting</td>
<td>Allows users to set study preferences for intelligent buddy matching algorithm</td>
<td>Will be implemented with limited study preference fields</td>
</tr>
<tr>
<td>Search for buddies</td>
<td>Allows user to search for study buddies</td>
<td>Will be implemented</td>
</tr>
<tr>
<td>Create a study group</td>
<td>Allows user to create a study group</td>
<td>Will be implemented</td>
</tr>
<tr>
<td>Set wait time</td>
<td>Allows user to set wait time in case of no matched buddies found</td>
<td>Will not be implemented</td>
</tr>
<tr>
<td><strong>Features</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Web Application</td>
<td>The way in which the user will interact with the Study Buddy application using a web browser</td>
<td>Will be implemented</td>
</tr>
<tr>
<td>Mobile Application</td>
<td>The way in which the user will interact with the Study Buddy application using their smartphone device</td>
<td>Will not be implemented</td>
</tr>
<tr>
<td>Private Message</td>
<td>Allows users to send and receive private messages within the Study Buddy App</td>
<td>Will not be implemented</td>
</tr>
<tr>
<td>Block buddies</td>
<td>Allows users to block buddies with different goals</td>
<td>Will not be implemented</td>
</tr>
<tr>
<td>Partner match by subject of interest</td>
<td>Matching Study Buddies by their own subject interest</td>
<td>Will be implemented</td>
</tr>
<tr>
<td>Intelligent Buddy Matching</td>
<td>Matching Study Buddies with the proprietary algorithm</td>
<td>Will be implemented</td>
</tr>
<tr>
<td>Google Hangout Integration</td>
<td>Allows users to integrate their Google Hangouts accounts for setting meeting times and web conferencing</td>
<td>Will be implemented</td>
</tr>
<tr>
<td>Slack Integration</td>
<td>Allows users to integrate their Slack accounts, allowing channels to be made to aid in communication between Study Buddies</td>
<td>Will not be implemented</td>
</tr>
<tr>
<td>Codelshare integration</td>
<td>Allows users to share their code real time with their Study Buddies</td>
<td>Will not be implemented</td>
</tr>
<tr>
<td>Schedule syncing with Buddy</td>
<td>Allows users to make matches with Study Buddies based on the availability they input</td>
<td>Will not be implemented</td>
</tr>
<tr>
<td>Rate your buddy</td>
<td>Allows users to provide feedback on their Study Buddies</td>
<td>Will not be implemented</td>
</tr>
</tbody>
</table>

4.3 Prototype Development Challenges

The challenges faced during prototype development are unfamiliarity of language and framework, as well as use of a new development platform. Inexperience of the developers is at the basis of these challenges.
5. Glossary

**Auditory Learner** - best comprehend information by listening to information rather than reading it or seeing it visually.

**Business Logic** - The programming that manages communication between an end user interface and a database.

**CRUD** - Stands for Create, Read, Update, and Delete. Basic database/application operations.

**Entity Class** - A simple Java Class with member variables and getter and setter methods defined.

**JPA** - Java Persistence Application Programming Interface is an API for handling all database operations such as storing or retrieve entities from the database.

**JSF** - Java server faces is a java framework that couples the view and servlet into one managed component.

**Kinesthetic Learner** - best comprehend information by participating in activities or solving problems in a hands-on manner.

**ORM** - Object-relational mapping. Technique for persisting objects into a database table. Tables are modeled after Entity classes.

**Procrastination** - delaying or postponing a task, which needs to be completed, often to the detriment of the procrastinator.

**Prototype** - the prototype of Study Buddy will be a reduced scale version of the final product, and will demonstrate the functionality of the completed product in a simulated environment.
**Reading/Writing Learner** - best comprehend information by reading texts to further absorb information by condensing and rephrasing it in traditional lecture and note-taking environments.

**Study Group** - a small group of students with similar goals who meet regularly to review course material and prepare for exams.

**Visual Learner** - best comprehend information by visualizing relationships and ideas through maps, charts, diagrams and even essays.

**Web Application** - an application that uses a website as the interface

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Student Success Center, Eastern Illinois University. Study Skills: Study Groups,