**ReMind and CAPITAL Passages: Functional Specifications**

**Overview**

The goal of the reMind/CAPITAL Passages project, much like its end products, is twofold: to create a collaborative educational system for students and instructors to collect academic questions, and to create a module which automatically generates reading comprehension questions from passages of English text. With these components, we hope our system will not only improve existing educational structures with the convenience and accessibility of mobile applications but also improve literacy in the United States with a simpler and faster way to test reading comprehension. Since the question generation module will be an add-on to the educational system, creating questions to be fed seamlessly into the question database, it is necessary to describe both elements of the project.

ReMind, the educational tool, will provide a testing interface for instructors to evaluate their students’ performance and for students to practice their instructors’ materials. Students will answer questions for practice or for grades, and receive immediate feedback on the practice questions about the correctness of their responses. The most noteworthy feature of this system, to be implemented by an external team, will be a spaced repetition algorithm that repeats answered questions at such intervals as to promote deep learning within a deadline. The second distinctive feature will be a collaborative nature through which instructors can browse banks of questions used by other instructors for their own courses, and students can create and submit their own questions for instructor approval.

The reMind system will be crafted so that it is modular and easy to enhance: algorithms like the spaced repetition algorithm will be easily replaced, and modules that add functionality like automatic question generation will be simply inserted. As one of these add-ons, we will develop the CAPITAL Passages question generation system, which will generate comprehension questions that require students to understand connections among sentences in a passage. Once generated questions have been presented to instructors, Passages will also gather information on which question generation methods result in practically useful questions.

**User Experience**

Two major types of users can interact with these systems: students and instructors. The majority of user interactions occur within reMind, while Passages consists mostly of back-end algorithms processing text and generating questions. To begin, we will focus a student user, Rita. Rita’s school has chosen to use reMind to supplement some of its courses, and Rita mainly interacts with the mobile application to complete course materials assigned by her instructors. Rita logs in to the mobile app from her phone or browser (since it is a HTML5 app) and sees all the courses in which she is currently enrolled on a dashboard; she unenrolls from a course she doesn’t like and browses a catalog of courses at her institution. When she finds something she likes, she submits a request to enroll, and the instructor of that course reviews it later.

Rita selects one of her courses, and the app displays a screen showing her current progress through that course. She has not practiced material from this course yet today, so the app presents her with the option to complete a daily task consisting of questions selected by the spaced repetition algorithm. Once Rita finishes these questions, she is allowed to browse all the question sets (called modules) she has unlocked for that course; she practices a few of them freely, and whenever she submits a response, the app indicates whether it was correct, and which answer was correct if hers was incorrect. Eventually, Rita comes across a question she thinks is unfair, since her instructor said its material would not be tested, so she reports it to the instructor. Then, Rita checks the evaluation tab and finds her instructor has assigned a graded quiz, and when she completes it the app does not tell her which answers are correct. The survey tab presents her with a few questions her instructor has written about which day she prefers to have an exam and what material in the course is most challenging. Finally, Rita checks the announcements for her course and finds that one of her friends has requested to be her rival; she accepts and immediately checks to see how her progress compares to her friend’s. Later on, at home, Rita accesses the reMind website, logs in with the same account, creates a few questions of her own, and submits them to her instructors, who may choose to use them in their courses.

Ramon, one of Rita’s instructors, has access to a much wider set of pages on the reMind website as well as the functionality of CAPITAL Passages, and does not use the app. He signs into the website and views summary information on the information page, including notifications about student-submitted questions for a few of his courses, some pending student requests to enroll in his courses, a calendar showing that he has several modules set to release in the next week, and the statistics about how many students have completed ongoing evaluations and surveys. Ramon reviews the student-submitted questions; he likes some of them and accepts them into the pool of questions he can use to fill modules, and others he rejects. Likewise, he accepts most student requests to enroll in his courses, but there are a few students who have tried to enroll in a more advanced course than he believes they can handle, and he rejects them. From a drop-down menu, Ramon navigates to a page that shows him all of his created courses; he deletes a course he made as a test and creates a different one, giving it a start and end date for next semester. Inside the course, he creates a new module and is prompted to fill it with questions; he adds a few of his own using a form, incorporates a few of his students’ questions, and browses a bank of questions made public by other instructors for ones he likes. When Ramon is satisfied with his modules, he activates them, meaning that students will be able to see them when they release, and they can no longer be edited. Ramon follows much the same process to create some evaluations, surveys, and announcements, simply indicating in the module generation form the type of questions he wants to make, and finally browses the students in his courses to identify any students having trouble so that he can help them in class.

Although all user interfaces will be accessed through reMind, Ramon may still access the CAPITAL Passages question generation tool. When he is browsing questions to add to his modules, Ramon chooses a few that were generated with Passages, but he also opts to generate questions himself. He selects the Passages tool while creating questions and peruses a few of the stored passages other instructors have used in the past, but ultimately he pastes a passage he likes into the Passages tool. Ramon selects the number of questions he would like to generate and chooses their types (he can choose one or more of categories such as true/false, factual short-answer, and multiple choice), and Passages generates questions and displays them to him. Ramon then selects some questions; he doesn’t think several of them are appropriate for his purposes, so he rejects them and chooses to generate new questions until he has a selection of reading comprehension questions that he likes. Satisfied, he chooses the option to submit, and Passages dumps the questions into his current module as usual, including the passage, the question, and its correct answers.

**Components and User Interactions**

From a user’s perspective, the visible components of reMind and CAPITAL Passages will be the pages of the website and the mobile application. All pages are designed for and correspond tightly to a specific user interaction. For example, the student’s reMind website will consist only of a login/create account page, a dashboard view collecting her courses, and a question creation form used to create and submit questions. For instructors, the website’s functionality will be significantly expanded, with pages for each function described in the previous section: a page for the dashboard view, for viewing, editing, or deleting courses, for creating a new course, for viewing question modules in a course, for adding questions to a module, and so on. The mobile application’s pages will comprise a login/account creation screen, a course selection screen showing all active courses, a dashboard view for each course indicating the student’s daily task, a practice view showing all currently available modules, an evaluation view showing any unanswered evaluations, a survey view showing any unanswered surveys, and an announcement view showing any unread announcements or rivalry requests. Naturally, the app will also include a specific screen for viewing and answering a question, which consists of a text prompt (e.g., “Which of the following people was not a U.S. President?”), any supplementary material (such as an image), and zero or more choices (zero choices for a fill-in-the-blank question, for example); if the question is for practice it will also indicate the correct answer once the student has submitted a response. CAPITAL Passages will consist mainly of back-end components and display to the user only an interface which allows him to select or input a passage and choose from questions generated from that passage.

Aside from students and instructors, two secondary types of users exist, called administrators and super administrators. These users’ interactions with the system will consist mainly of managerial duties, such as adding batches of students to the system. In particular, the super administrator will have the ability to create institutions, create administrators for institutions, and add batches of students to an institution at once. Meanwhile, administrators will be able to view and add instructors for their institution, view and add courses and assign instructors to them, view and add individual students, and issue announcements and survey questions to their institution’s students.

The user interactions performed by instructors and students parallel those discussed in their user stories. The instructor will have the ability to edit his own user information (such as his password), create courses, copy his own courses into a new instance (if for example he wishes to use the same course material for two years in a row), manage (add, edit, or remove) his own courses, manage question modules in his own courses, activate modules in his courses, manage questions in his inactive question modules, accept or reject students’ requests to enroll in his courses, manage students in his own courses, accept or reject student-generated questions for his courses, create announcements, evaluations, or surveys for his courses, view the progress of students in his courses, and customize the parameters of certain algorithms (such as the spaced repetition algorithm). In the Passages system, instructors will input a new passage, view stored passages previously used for question generation, provide parameters for question generation such as number of questions desired, and select or reject generated questions.

Student interactions on the website, on the other hand, will be limited to creating accounts and creating new questions to be submitted to their instructors. On the app, a student will be able to create an account, view courses in which she is enrolled, unenroll from courses, submit requests to enroll in new courses, view and answer the questions selected by the spaced repetition algorithm, view and answer any practice questions in any unlocked module, receive immediate feedback about the correctness of responses to practice questions, report any question to her instructor as incorrect or inappropriate, view and answer evaluation questions, view and answer survey questions, view announcements, accept or reject rivalry requests, view her own and other students’ progress, and request other students as rivals.