Peer Perspective

FUNCTIONAL SPECIFICATION

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Overview

Peer Perspective is an educational system that guides students enrolled in STEM (Science, Technology, Engineering, Math) as they learn novel mathematical concepts using an eye tracker. Too often students learn concepts by repetition with no fundamental understanding of the concept. Students will plug and chug numbers into a formula hoping to get the correct solution. These students lacking a solid fundamental understanding of the concepts usually struggle as the semester progresses, have to rely on limited options for assistance in the forms of textbooks, tutoring, online resources, and meeting with faculty during office hours. Students use these resources with the intention of establishing a stronger understanding of the conceptual math topics. Peer Perspective offers students and professors a new resource that goes one step above traditional resources that are offered. A student or professor is able to write in the mathematical concept into the program. From there the student has options of a training module, testing module, and review module. The professor has the options of a testing module, student review module, and class module. Both the students and professors will have their eyes tracked when going through the testing module. Once the eye tracker sends data to PEP, it will make a comparison of the two perspectives. The results will be in the review module with a slide showing the problem and the concept, listing parts of the problem the student focused heavily on with steps of how to solve the problem using differences from two perspectives. By the time students go through the review module, students will establish to have a stronger understanding of the novel mathematical concepts.

Scenarios

**Scenario 1: Steve**

Steve is a student in Discrete Structure II who is struggling with proofs. He finds going to office hours, tutoring a hassle because he can’t explain where exactly he is struggling when applying the concept to the proof. Not being able to explain where he is getting confused is hampering his attempts at learning. Since he is starting to fall behind he decides to give Peer Perspective a try so he downloads the program and starts it up. He is presented with a simple interface that has a list of options to select from. He writes in the concept he is struggling with. Afterwards he starts the testing module, once he completes it he downloads the professor’s eye tracking data that was posted on the class webpage for the concept he is reviewing. He opens up the review module and uploads the professor’s file. Once PEP finishes the comparison, the review module presents Steve with a slide containing information of where exactly he is struggling with the concept, and guides him through the problem with the help of visual cues. Thus Steve now understands where he is struggling and what he has to do to change that.

**Scenario 2: Professor’s Millers**

Ben is a student in Professor Millers’ class. Professor Millers has instructed his students to use Peer Perspective as a way to learn the concepts covered in class so that he can tell how well his students are learning the material. The students are given three tasks for every new concept they learn, the students have to do an initial testing module before and after the training module, and submit the eye tracking data files from both testing modules. Ben logs onto the PEP and enters his provided account information. He is presented with the three options (training, testing and review) Ben does as he is told. As the semester progresses Professor Millers collects the eye tracking data files and puts them into the class module in PEP. Before the end of each week Prof. Millers checks the progression of the students in the class and see how they are improving. Furthermore he is able to see the initial patterns of where students who are excelling in the class versus students who are struggling are looking at. Being able to see this pattern enables him to help the students who are struggling even more along with the training module

**Scenario 3: Ben**

Ben is a student who studying for finals. Since finals are approaching he decides he wants to make sure he knows the material for his classes. He decides to use Peer Perspective, a program he used in a previous class. Ben decides he wants to learn actively without trying to just memorize formulas. He wants to use the training module as a way to help him actively remember mathematical concepts. The training module has its own set of tests dedicated to measure how well he understands the concepts. Testing him on whether or not he can identify the concept as formula, plain text, and graphical representation. Ben decides to track the progression of how he does on these tests in his review module. As he does the training module more Ben realizes he understands the mathematical concepts beyond just memorization and he is able to be more flexible in the application process. This allows him to get the most efficient preparation for his finals.

Initial Release

For the initial release of Peer Perspective there will be no support for multiple classes. Students will need to have a separate account for each class. Teachers will also need to have an account for each class.

Initial Login

When a user opens Peer Perspective they are presented on the left with a brief overview of what the project is and some of its features. On the right hand side is a login box with ability to login, create an account. The login box takes in an email as well as a password. When a user clicks the submit button their account information goes against several checks. The system first validates the information is a valid input. If the email is not recognized then an error is displayed alerting the user to try again or to create an account. If the email is correct, then system checks their account email against the database and if it is found, the password is checked. If the password matches the stored value, they are directed to either the student or professor window. If the password is incorrect, the user is alerted and they are instructed to try again. If a user clicks on the account creation button they are directed to the Account Creation Page. When a user clicks on the create class button they are directed to the Class Creation Page.

Account Creation

When the user clicks on the account creation button, they are presented with this page. The account creation page presents a form that asks for several pieces of identifying information. The user is asked to present a valid email, a valid password, a first and last name, and a course identification number. When the user clicks the submit button the data is then validated. The email is checked against the system to see if it matches and existing entry. If the email is found in the database, the user is alerted and told to use a different email. The password is checked against its second entry to make sure they match and have not been mistyped. The course identification number is checked to make sure it matches an existing class. If the course number is not valid the user is then alerted to check and renter the value.

Once the data has been successfully validated, it is then entered into the database as a user entry. The user is then added to the class and sent an email confirming their account creation. The email provides a confirmation message that presents the user name of the user as well as the name of the course they have enrolled in. The user’s password is not contained in the email. The system then directs the user to the window so the user can start working.

Class Creation

Once a user has clicked on the create class button they are presented with this page. The class creation page presents a form that allows a professor to enter account details and to fill in information about their class. The form contains the following information: First name, Last name, Email, Password, Course name and Expected number of students. When the instructor hits submit the data is validated. The instructors email is checked against the system to see if the email is already taken. If the email is already present the user is alerted to choose a different email. The two passwords are checked against each other to make sure that the user typed their desired password in correctly. If they do not match the user is instructed to please type in their password again.

When the data has been successfully validated, the account information is saved as a user record in the database and the course information is added as a course record. The system then sends a confirmation email to the instructor. The email contains a confirmation message as well as the username and class information including a generated course code to be used for student registration. The system then directs the user to the professor window.

Student Window

Once a student has successfully logged in, they are presented with the student window. It is on this window that the student will spend all their time. Students will be given access to a training, testing, and review module. Each of the modules has different functionalities. The training module revolves around the idea of incorporating active learning with the mathematical concepts by presenting the concept in three different formats (plain text, formula, graphical). Afterwards they are tested to see how well they can go between the different formats with multiple choice questions where the student has to select the answer from four possible solutions. The idea being if a student is able to identity a concept from one format to another it shows a level of understanding. While each time the student takes the test it is being recorded and tracked to be view later on in the review module.

If a student is seeking help and will involve a professor then the testing module will be used. With the testing module students will have their eyes tracked by an eye tracker. Students will be presented an application of the mathematical concept on a slide which they will be asked to go through, to be used later in comparison to the professor’s perspective in the review module. Following the application component, there is a smaller set of tests where the students are given the different steps of the mathematical concept at the top of the window, followed by a problem and statement asking the student to click if the statement is true or false according to the concept. The eye tracker will be used to identify whether student looks at the conceptual steps listed above the problem and where they focus primarily along with the true or false answer that was given by the student. This will be used to identity patterns for students in the class for the professor’s class module.

If a student completed the training and testing module they will be able to use the review module which provides all the necessary components to ensure that the student fully understands the mathematical concept. With the review module the student can track their progression through the course. Learn where they are making mistakes based on the comparison of eye tracking data. Furthermore will be provided problems where a visual cue that uses data from the comparison is displayed on the window to help guide them through the problem in areas where they previously struggled.

Professor Window

Once a professor has logged in or created a course they are directed to the professor window. The window has the following three modules: testing, student review, and class. In clicking testing module, they will be presented with a new window showing the application of mathematical concept and asked to go through the steps of solving it while having their eyes tracked. Student review module brings up a separate window allowing the professor to have access in on individual student’s data and see their progression as the semester progresses.

The class module is the component that will present a slide that shows what common patterns among students are. Given a table of student information it will check if students who are struggling at understanding the concept look at the same areas or if students who are excelling look at certain areas more so than others. From here it is up to the professor to decide how to they want to proceed if they want to focus on certain areas more than others in class based on the results shown in the professor window.