

Requirements Specification

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Team IQ

Project Sponsor: Erika Konrad

Faculty Mentor: Igor Steinmacher

Team Members:

Logan Samstag (Team Lead)

Nicholas Persley

Kristiana Kirk

Elian Zamora

Robin Pace

Acceptance Statement:

For the team: Logan Samstag Date: 12/9/23
For the client: Erika J. Konrad Date: 12/9/23

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Introduction

Courses on college campuses commonly have completing quizzes that do not help them learn the course content. For the product we are creating, we aim to solve this issue with courses that teach English skills in the field of professional journalism.

Our client for this product is a professor at NAU, and her name is Dr. Konrad. She currently uses another product in a similar field, the New York Times CopyEditThis quizzes, to teach her students. The current way that these quizzes are being used is just as a measure of how well the student understands the course materials, with the client having a way to see how the students in the course are doing as a whole. Additionally, these quizzes that are offered by the New York Times have many problems, such as being locked behind a paywall, so Dr. Konrad has very limited ways to allow her students to actually take quizzes that would help them learn about technical writing. Additionally, as the quizzes are made by an outside entity, the content of the quizzes could not be in line with the course content, making some parts of the quizzes redundant if the part of the quiz is not necessary for a concept in the course.

However, how will our product, RedPen, help with the problems that our client is having? The important points to our team during our development will be that RedPen should be free to all students and quizzes should be able to be designed by our client and made accessible to the students. With these two features, RedPen will improve the education of technological writing students greatly, as the client will be able to tailor quizzes to the problems that the students currently have. Additionally, we plan on making our product much easier for the client to use when compared to the New York Times quizzes, as we plan on allowing the client to search through all of the quiz results from a quiz that she has made so that she can tailor the course content to what the students are having difficulty understanding.

Problem Statement

Our sponsor, Dr. Konrad, teaches professional technical writing, which includes grammar, punctuation, and professional editing. As a result, she currently uses an application that The New York Times provides, which are interactive quizzes for students to take. Dr. Konrad assigns these quizzes to her students allowing them to practice real-world editing. Once a student is done with a quiz, they report back to Dr. Konrad with any concerns they have about the material.

However, the resources are not as accessible or customizable as Dr. Konrad prefers. The main deficiencies in her current work flow are

- **Quiz Availability** - The New York Times quizzes are in limited supply. The professor/students have limited access to quizzes. Some quizzes may cover content discussed in class but there is also the chance that the quiz does not cover 100% of the in-class content.
- **Irrelevant Information** - Despite the fact of The New York Times being able to supply the content relevant to discussion in class or not, quizzes that are provided may give the student irrelevant information. Dr. Konrad structures her class so that they have knowledge from the real world. But may not be able to find a good match and leave the students confused, or without practice. The most undesired action would be to have Dr. Konrad has to conform her lesson plans to their application instead of having full control over the lesson plan.
- **Cost** - When a quiz is found that covers the desired content, The New York Times requires the students to pay. While there is a free version of the quizzes, it is extremely limited. Furthermore, while the first six months of paying is \$4/month, after that it goes up to \$24/month, which, to a college student and Dr. Konrad, is not desired.

Solution Vision

Now that the problems, forced by the client Dr. Konrad, are laid out, a solution can be determined and expanded upon. We propose to build an educational quiz application that addresses the specific needs of our client. This application will serve as a platform for creating, managing, and delivering quizzes to students while providing the statistics/detailed insights to Dr. Konrad (the administrator). In order to do this, the key highlights of this are:

- **Administrator Panel:**

- **Quiz Creation:** The system allows administrators to create and edit quizzes, adding questions, correct answers, and editing advice.
- **User Management:** Administrators can manage user accounts, by grouping them into which semester they took the course.
- **Data Access:** Admins have access to students' quiz results and performance metrics, including completion status and the number of attempts made.
- **Tagging System:** The application includes a tagging system for categorizing quiz items, aiding in research and analysis of student performance trends.
- **Customization of Quiz Content:** The system ensures that Dr. Konrad can customize quiz content according to the specific needs and focus areas of her course.

- **Student Features:**

- **Registration:** We are hoping with the ITS Server, that we are able to use their NAU UID and password sign in. If this does not work, our back up plan is that students can create an account with an email and password.
- **Immediate Results:** Students can view their quiz results immediately after completing a quiz.
- **Semester-long Access:** Students have access to their results throughout the semester, enabling them to track their progress.

- **Cost:**
 - Unlike The New York Times, our solution eliminates the cost barrier. While The New York Times requires students to pay for a subscription in order to use their quizzes, our application ensures all features are accessible without additional charges, providing a cost-effective solution for both students and Dr. Konrad.
- **Elimination of Irrelevant Information:**
 - Our solution ensures that quiz content is directly aligned with Dr. Konrad's teaching objectives. Unlike The New York Times quizzes, which may contain irrelevant information, our system allows for precise customization, ensuring quizzes match the real-world knowledge Dr. Konrad imparts in her classes.

The system will collect data from the administrator, user account information, performance data, and encompassing quiz content. Additionally, it processes data generated by students, including quiz attempts and results. In terms of computational processes, the system facilitates quiz creation, enabling the administrator to create quizzes through an intuitive interface, inputting questions, answers, and editing advice. Data analysis is another critical component, where student performance data is analyzed to identify trends that can be identified, so that Dr. Konrad is able to go in depth about it. The efficiency of the quiz creation and management process will ultimately benefit the administrator due to the system. It provides immediate access to results and performance data for students, which enhances their learning experience.

Red Pen			
Administration Panel			
Quiz Creation <ul style="list-style-type: none"> - Intuitive Interface - Question & Answer editing 	User Management <ul style="list-style-type: none"> - Semester grouping - Account Management 	Data Access	Tagging System
User Feature			
Registration <ul style="list-style-type: none"> - NAU login page (hopefully through ITS) 	Immediate Results <ul style="list-style-type: none"> - Instant feedback - Persistent results 	Semester-long Access	
Data Processing			
Administrator Data <ul style="list-style-type: none"> - Quiz creation logs - User Management 	Student data <ul style="list-style-type: none"> - Quiz attempts - Results & Metrics 	Quiz analysis	

Figure 1. Red Pen structure

After considering various options, including New York Times, we found they lacked the tailored features required by our client. Our solution offers a unique combination of quiz creation, data analysis, and user management that fits our clients' needs. This website application has the potential to make a significant positive impact on teaching and learning experience. It empowers our client by providing insights into student performance, potentially leading to more effective teaching interventions and improved student outcomes.

Project Requirements

Now that the problems of our client and our vision of the solution are clear, it is important to lay out the specifics of what our team is developing. For the development of RedPen, we have found that we will have all three types of requirements, which are functional, non-functional, and environmental. All of our requirements fall into one of these three categories, and all of our requirements are described in this section.

Functional Requirements:

→ Need access privileges.

To create RedPen, there must be those who make the quizzes and those who take the quizzes. As RedPen is a quiz application, we will need some authentication to make sure that users have the correct privileges. Without these privileges in place, it will not be possible for only the client to make quizzes on RedPen.

According to our privileges specification, a smaller requirement in this section is that the privileges must give the information to the right people. For example, the professor must be able to see the quiz results of the students who have taken the quizzes, however, students must be able to see only their own quiz results. If we do not accomplish this properly, then students will be able to see other students' quiz results, which will be a catastrophe.

This requirement also leads into a lot of our other requirements that we are describing in this document. For example, we plan on allowing the professor to take the data of the students who have taken the quizzes and display it in some sort of graphical format. In order for this to function, the professor must be the only person who can see this data, which requires our project to have privileges.

As an example, a student should be able to launch the website and end up on his/her accounts homepage, however, an administrator should be able to launch the website and end up logging into their accounts homepage.

→ Administrator web page to view student quiz results.

For this requirement, we need to design a webpage which can only be seen by the administrator which will allow for the client to accomplish their tasks on the website. This website should include the quiz editor interface for the administrator to make quizzes and a means to retrieve student data and display the statistics in some sort of graphical form. These aspects of the webpage need to be easily accessible for someone who is not versed in technology, as our product is going to end up being used by those who may not be as familiar with technology as our development team. Additionally, this webpage needs to be the landing page for the administrator, as otherwise it might become difficult to find for the users of the website after it goes live.

As an example, say our client pulls up the website in order to make a quiz for their course. They should easily be able to find where the editing panel is, which has an example of functionality in the next requirement, and be able to access it without triggering any of the other parts of the webpage.

→ **An Editing Panel to Create Quizzes on RedPen**

In order to have an interactive quiz application, the administrator must have the ability to make quizzes to give to students. So, the professor, Dr. Konrad, must have a dedicated location for quiz editing. To do this, the application needs a feature to create/modify a new or existing quiz. It is here, where questions will be added. Furthermore, upon adding a new quiz, the application will have a dedicated section to create a new question. This section should have a few different aspects – a writing and answer selection window, a place to add/update a tag, and a save functionality. The writing panel will be where the quiz is initially typed. From there, the text will appear in the answer selection window and that will allow Dr. Konrad to select the correct answer for the quiz. Continuing from there, a new section will allow the creator to select a specific tag for the question. The final functionality of the quiz creation is saving the updated question. This functionality will update the quiz with the changes in the archives so that the administrator can use it at a later time. As a stretch goal, when editing the quiz itself, the application will provide the ability to pull a question from another quiz and make a copy of it so the professor can modify the new question independently of the original.

→ **Student quiz results (like attempts and completion) need to be available to the professor.**

Dr. Konrad is mainly interested in seeing that her students have taken the quizzes that she has provided. So, we would like to provide a location for her to retrieve the results of each student for a quiz. And if time allows, will also include a section for a summary of the quiz and show the statistical results. These results/statistics will include the number of attempts taken per question and whether or not the student completed the quiz. And depending on the technological storage abilities, the results/statistics will

not be limited to the current semester, but the previous semesters as well. This is to help Dr. Konrad examine a trend throughout the semesters the class is offered and if she needs to change anything within her course plan.

→ **Data analysis for the professor between different mediums (ex: tables).**

Our Client, Dr. Erika Konrad specified from the beginning that she wanted to be able to see her students' results so she could assess what they were struggling with and potentially change lesson plans based on those results. This means allowing the administrator to be able to sort the data as they wish, as well as select an individual student's profile from this view to be taken straight to their page. Because of these specifications, we will need many ways to show and sort the data so the administrator can easily learn what they want from the data. This definitely requires tables and sort methods, along with graphs that show overall tries in a more user-friendly way rather than showing raw data.

→ **Allow the professor to be able to tag quiz items.**

For the purposes of sorting and keeping things organized, our client, Dr. Erika Konrad wants the administrator to be able to assign tags to individual quizzes. This will go hand in hand with the sorting of data, as the administrator may only want to see the data from the quizzes with this certain tag. This means a few different things from a software standpoint. Firstly, not only do we have to allow the administrator to connect tags to quizzes from within the quiz creation but we also have to create a way for the administrator to create new tags and delete old ones, along with editing tag names in case of typos. Then, once they have been created, as a stretch goal, the tags will automatically need to be added to the sort options, so the administrator can use the sorting to see specific questions that match those topics and see trends in the students' progress.

→ **User authentication needed to allow a student's account to be secure.**

Using User Authentication is a great way to provide some peace of mind when it comes to security with Red Pen. We will be using NAU's server to allow administrators

and students to sign in along with cisco Duo to prompt the user to use their mobile device or table to either push a button to allow access or generate an access code that will be used at login and this can all be done through the cisco duo app which is available for download on the app store or play store.

→ **Allow storage of previous semester information and current semester information.**

In order for Red Pen to provide access to information for the current semester and previous year, we will need to store all of that data into a database. In this case we will be using SQL to keep track of all of the information that way it can easily be accessed by instructors and alumni students that want to go on the website and look back at their previous quizzes and also view their stats from previous semesters.

→ **A student page that shows what they have done wrong in a quiz.**

Creating a student page that displays what they have done wrong in a quiz is a useful feature for educational platforms. This page can provide students with feedback, encourage self-assessment, and help them understand their mistakes. This breakdown of their quiz performance, including what they got wrong, encourages them to stay engaged in the learning process. It can motivate students to review their mistakes, seek clarification, and strive for improvement.

Instead of presenting the entire quiz at once, revealing one question at a time promotes focused engagement and thoughtfulness. Students will be able to concentrate on one problem at a time, so this will minimize the distractions and allow for more focus on the question. After answering each question, students will receive immediate feedback.

→ **Application to support all modern browsers.**

Ensuring that our application supports all modern browsers, like Chrome, Firefox, Safari, Edge, etc, is a critical aspect. This way we are making sure that no matter what browsers our users prefer, they can access and enjoy our application. Achieving this involves using the best practices, through testing and making sure it is universally

supported. By doing all this, it ensures that our app is accessible to a wide range of users, regardless of which browser they are using. This will ultimately improve accessibility, user satisfaction, and the application's success.

Nonfunctional Requirements:

→ Ease of use.

When using a new program, it may take awhile to get used to. Features may be new to the user and difficult to use/find. As a result of this, one of our goals is to eliminate this difficulty. We need a simple interface that both our sponsor and their students can gain knowledge of in a quick manner.

This may include buttons or sections within the interface that are descriptive of what they are for. For example, if a student wants to see a list of their possible quizzes, it may have the title of "Available Quizzes". And while taking a quiz, the student will clearly see the name of the quiz and a label of each question. On the other hand, when the professor is making a quiz, the application could clearly label "Tag:" for the tag section if they want to tag it. And a text panel clearly labeled "Editing Section" to know that it's the place to write/edit the desired content for the question. And this theme will carry out throughout the rest of the application.

→ Price.

One of the most important requirements for this project was ensuring it is kept free to use, both for the users and the administrator. Because of this, it is imperative that the website is as low cost to run as possible, doesn't cause expensive problems, and is easy to keep up and running. By doing these things, we can limit the loss of revenue as much as possible and ensure that this site stays free for everyone intending to use it.

→ Easily Maintainable and Manageable.

Maintaining an application that is easy to manage and maintain is a top priority for us. This involves designing our software with clean and organized code, as well as implementing a well-structured architecture. The benefits of this approach is that it reduces the risk of introducing errors during updates and makes it easier for Dr. Konrad

to use this as a solid foundation for her future projects. By ensuring our application is easily maintainable and manageable, we are not only streamline the development process but also provide a cost-effective and robust solution for ongoing improvements and scalability.

→ **Quiz Interaction Page should be instant.**

For this requirement we are going to want to make sure that navigating to the Quiz page can be done quickly and efficiently in order to have the best user experience possible. This would make it so that none of the students wanting to take the quiz have a long wait time which means the page weight would have to be as small as possible and also minimize the number of files used in the interaction page.

→ **Database upload/download should be within 1 second.**

For this requirement, we should be able to write and/or read to the database within one second. This is for the user experience, as if we make a product that is very slow to use, it will not be very enjoyable for both the client and their students to use the software. So, we need to design our database with speed as one of the main concerns, as otherwise it will result in a piece of software that is not used as much.

Environmental:

→ **The client wants the website to look NAU like.**

From the beginning, the client wanted the website to be a similar structure and look to the NAU website's look. This is especially important now that we are going through NAU's system. This means NAU colors, following ADA guidelines and keeping it clean and easy for students and professors to navigate. The client also mentioned that she prefers the standard font contrast, dark text with light background, which is actually the opposite of the NAU default. This means our web page will actually be an inverse of the typical NAU design.

→ **ADA and NAU logo guidelines.**

For our website, we wish to make it look like an NAU website, so in order to do that we must follow the NAU logo guidelines that are outlined on NAU's website in order to use the proper NAU logo. Additionally, we wish to follow ADA guidelines, which are disability guidelines, in order to allow for anyone to use the site.

→ **PHP to SQL.**

To give a brief background, SQL is a database language that can interact with MySQL, the actual database. SQL provides the ability to manipulate a database using simple commands. However, the language does not entirely work when it comes to purely writing SQL commands in a web-based environment. So, this is where PHP comes in. This language is not purely for, but provides the ability to write code directly into web-based files with simple tags. And using this, we can use SQL code within PHP to connect to and modify the database whenever needed, and can also generate interface code dynamically based on what is retrieved from the database. In addition, one requirement to receive a server from NAU ITS is that the languages are stable and do not change often. These two languages meet this requirement as they do not change often and are stable.

Potential Risks

While our interactive quiz website (Red Pen) is under development, we want to make sure we conduct a very thorough analysis of the potential risks that could impact the overall success of our website including the user experience we provide for our sponsor and the students.

→ **Accessibility**

This is the main risk we want to prevent for Red Pen to be successful. If there are any users that are not able to access the website or have any issues with using any of the tools provided to use the website, it can lead to a very poor learning experience. We want to make sure admins are able to log in, create quizzes and view student's stats without any problems. We want students to quickly access the website to take the

quizzes and view their stats as well. To make this possible we will strive to create a user-friendly site and we will go through repeated tests with different scenarios to ensure the great quality of our site.

→ **Privacy And Security**

The thought of not having any safety while accessing a website crosses everyone's mind. With Red Pen we not only want to create a great user-friendly interactive website quiz, but we also want to make it awesome, affordable and most importantly safe. Red Pen will be collecting sensitive data from both admins and students in order to provide a great learning experience. Something like a data breach could cause some important information to be accessed such as the answers to quiz questions or even admin and student data. We are working closely with NAU IT team to implement our application into canvas and NAU's secure database with user authentication so our users can feel safe when accessing Red Pen

→ **Quality of Creating or Taking Quizzes**

With Red Pen, we want our admins to have no issues in creating quizzes for their class. If Red Pen does not provide the ability for admins to efficiently login and create quizzes, it can lead to frustration and can compromise the learning experience the instructors set up for their students whether a quiz is poorly made or creating a quiz is so complicated it may never get done. We want to provide a very easy and efficient way to create these quizzes so that instructors don't have to spend a lot of time figuring out the bells and whistles of our site. Same thing goes for the students taking the quiz. We want to make sure that students have a great experience taking these quizzes so that way they can be done in a timely manner and have no issues in using the tools provided.

Project Plan

1. User and Administrator Home page
2. User & Administrator log-in
3. Getting the Quiz Display page working
4. Saving the Quiz results
5. User page that tracks progress
6. Administrator Page that displays the results
7. Administrator Quiz Creator

The first things that will likely get done are the home and log-in pages. These will require little PHP, at least at the start, and will provide a good foundation for expansion once we do have the other parts ready. The actual integration of password protection and unique user profiles is what will be the real challenge for this milestone, but the implementation of the home pages should be fairly straightforward.

As a group, we decided that the priority should be designing the Quiz Display page as it's the project's foundation and may be a fairly difficult integration. Our group will be starting with a simple handmade database, that way we can know what it's supposed to look like so we can ensure it's working properly. It will require fine-tuned interactions between front-end and back-end, as well as database integration. This is why a lot of time has been allocated for this milestone, and the home pages and login are listed above them. They will likely be a quicker and smoother integration, and we can have everyone working on a project so we can best optimize our time.

Once the quiz display is implemented, the team can focus on accessing the data and saving it to a database. This will require learning how to connect PHP to SQL as well as setting up a good structure for the database. This should hopefully not take too long, but there are quite a few factors to consider such as designing the database to be accessible for both the student and the administrator, while also connecting multiple databases to the administrator's view. Once the saved databases are finished, the focus will be on displaying them for the individual students, formatting their attempts, and quizzes in a way that is accessible to them.

Once we get the individual students' databases displayed, we will focus on making them accessible to the administrator, as well as giving at least 2 different types of display for the data. The administrator also needs to be able to access an individual student's data by simply clicking on a result, so this part could take some time to implement for both frontend and backend. Last will be the quiz creator page. This was decided to be last because there are quite a few complications specific to this that we will not completely understand until we have everything else implemented. It will have very little to do with the result database, but does require an administrator page to work, as the administrator should be the only one able to create quizzes. This would also be where we ensure that created and active quizzes are made available to the students under the administrator, so we need a working student page to test the implementation.

Red Pen Current Status					
October	November	December	2024	2024	May 2024
Technology Feasibility	Requirements Specifications	Tech Demo	Development Process	Testing Process	Final Product
	Quiz Display Page	User & Administrator Login/Home Page	Database/track progress Admin Privileges		

Conclusion

As can be seen throughout this document, there are many issues with the current way that our client is dealing with quizzes in their teaching, such as availability and cost, that make her course less effective at teaching students properly for going out into the technical writing field. The main issues that are being seen in the current solutions on the market are limited quizzes for the students to take, a lot of these quizzes are locked behind a paywall, and quizzes not being fully tailored for the courses that our client is teaching. Throughout this document, we have detailed the issue that has affected our client, how we generally plan to fix these issues, the specific requirements for the final product that we will deliver, some risks we plan on seeing, and finally our plan for development. Overall, throughout this document our team has gotten a very clear

understanding of exactly what product that we will need to build, and as a result of our fast progress through the design phase of our product we should be able to start development sooner than expected. With this expedited start of development, we should be able to make the product much better than if the development of the product started later in the semester.