**Design: Understanding and Defining the Problem**

**Context and Problem Definition**

The modern educational landscape necessitates a robust, efficient, and scalable method for handling the submission and grading of homework assignments. With the increase in class sizes and the diverse range of subjects taught, manual grading has become a bottleneck, consuming substantial time and resources that could be better utilized in enhancing teaching methods and direct student engagement.

The primary problem the "Homework Grader" prototype aims to solve is the inefficient management and grading of homework assignments across multiple subjects and students.

**Concepts Applied from the Course**

To address this issue, several concepts learned throughout the SWE 632 course were applied:

- User-Centered Design (UCD):Emphasis on creating a system that meets the needs of both students and educators by enabling easy navigation and operation.

- Design Patterns: Implementing React components that follow best practices for maintainability and scalability.

- Rapid Prototyping: Quick iteration of design ideas into tangible prototypes for immediate feedback.

- Usability Testing: Leveraging techniques like heuristic evaluation and user testing to ensure the system is intuitive and efficient.

**Argument for the "Homework Grader" Prototype**

The "Homework Grader" serves as a critical tool by automating the grading process, thereby freeing up educators to concentrate on curriculum development and personalized student guidance. This system aligns with the pedagogical shift towards continuous assessment and feedback, enabling students to receive prompt evaluations of their work.

With automated grading, consistency in evaluation is improved as the subjectivity inherent in manual grading is minimized. The immediate feedback mechanism allows students to quickly understand their strengths and areas for improvement.

Furthermore, by incorporating user authentication, the system ensures that students' work and grades remain confidential, fostering a secure and trustworthy environment for academic growth.

**Description of the Prototype to Implement**

The proposed prototype, to be implemented using React JS, comprises the following key features:

- Assignment Management: Educators can post homework assignments, including descriptions and due dates, in an organized manner.

- File Upload System: Students can upload their work in PDF or DOCX format, simplifying the submission process.

- Automated Grading Logic: A simple algorithm provides immediate grading based on submission parameters. While it currently assigns grades from A to D randomly.

- Feedback System: Alongside grades, tailored comments are generated to give students constructive feedback.

- User Login and Authentication: Personalized access for each student with secure login credentials, ensuring data privacy and integrity.

- Intuitive User Interface (UI): A clean and minimalistic UI design adheres to usability heuristics, offering a seamless user experience across various devices and platforms.

**Interface Metrics: Evaluating the "Homework Grader" Prototype Using 10 Usability Heuristics**

The following evaluation is based on Jakob Nielsen's 10 Usability Heuristics, each applied to the "Homework Grader" prototype to determine adherence and effectiveness:

Visibility of System Status

Adherence: Yes

Justification: The prototype actively informs the user of its current state by providing feedback on actions taken. For example, when an assignment is uploaded, a message confirms the upload, and when grading is in progress, a status indicator shows that the operation is underway.

Match between System and the Real World

Adherence: Yes

Justification: The prototype uses language and concepts familiar to users, such as "assignments," "grades," and "submission deadlines," which reflect the real-world processes in an educational setting. This helps users understand and interact with the system naturally.

User Control and Freedom

Adherence: Yes

Justification: Users have the ability to easily navigate throughout the application. They can log out, return to previous pages, and cancel operations without being forced into unnecessary or unwanted actions.

Consistency and Standards

Adherence: Yes

Justification: The UI design and interaction patterns follow web and educational interface standards. Consistent terminology and visual elements are used throughout the prototype, ensuring users' expectations are met across different sections.

Error Prevention

Adherence: Yes

Justification: Through careful design, the system prevents problems before they occur. For instance, form validations ensure all submission fields are correctly filled, and file type restrictions prevent the uploading of invalid formats.

Recognition Rather Than Recall

Adherence: Yes

Justification: The system displays all necessary information for tasks, such as guidelines for assignments and due dates, so users don't have to remember information from one part of the interface to another.

Flexibility and Efficiency of Use

Adherence: Yes

Justification: The prototype accommodates both inexperienced and experienced users. Shortcuts and efficient navigation options allow expert users to perform tasks more quickly, while novices can benefit from a more guided experience.

Aesthetic and Minimalist Design

Adherence: Yes

Justification: The interface design is clean and focused, containing no extraneous or irrelevant information. This minimalist approach helps users to concentrate on their tasks without distraction.

Help Users Recognize, Diagnose, and Recover from Errors

Adherence: Yes

Justification: When errors do occur, the system provides clear, concise, and helpful error messages that identify the issue and suggest a viable solution, allowing users to easily correct mistakes.

Help and Documentation

Adherence: Yes

Justification: Although the system is designed to be intuitive, it includes accessible and easy-to-understand documentation and help features that provide guidance on how to use the application effectively.