**Concept Idea Report**

**Problem - What?**

Work-from-home individuals often struggle with maintaining healthy indoor air quality and humidity levels. Many home offices, particularly in shared apartments or small living spaces, lack proper ventilation, leading to excessive moisture buildup. This can result in mold growth, respiratory discomfort, and overall reduced productivity.

Users often experience frustration as high humidity negatively affects their concentration, comfort, and health. While some may rely on dehumidifiers or frequent ventilation, these solutions are not always effective, energy-efficient, or easy to manage. Without real-time insights into their indoor environment, individuals may not take timely action to improve their air quality.

**Context - Why?**

Our team, as international students, has experienced these issues firsthand while living in Germany. The cold climate often forces individuals to keep windows closed for warmth, leading to poor air circulation and moisture buildup. Additionally, shared apartments or dormitories may not provide adequate humidity control, making it difficult to maintain a comfortable work environment.

This issue extends beyond students—it affects freelancers, remote employees, and professionals who work from home. Research shows that poor indoor air quality can lead to fatigue, reduced cognitive performance, and long-term health risks. By developing a real-time monitoring system, work-from-home individuals can actively track and control their indoor air conditions, leading to a healthier and more productive environment.

**Solution - How?**

The proposed solution is a sensor-based digital monitoring system that collects, processes, and visualizes real-time environmental data.

**Key Features:**

* **Hardware-Based Sensors**: An MQ135 sensor for air quality and a DHT11 sensor for temperature and humidity.
* **Real-Time Monitoring**: Continuous data collection and visualization through a user-friendly dashboard.
* **Data Storage & Analysis**: Secure database storage for historical and real-time data insights.
* **User Alerts & Notifications**: Automated alerts when humidity levels exceed safe thresholds.
* **Customizable Interface**: Users can personalize dashboard settings and view trends.

**Alternative Solutions:**

* Encouraging better ventilation practices in home offices.
* Investing in smart home humidity control systems.
* Educating users on lifestyle adjustments to maintain healthy air quality.

**Team & Implementation - Who?**

**1. Hardware & Data Acquisition**

**Juan - Hardware Setup and Integration**

* Integrated MQ135 and DHT11 sensors with Arduino for data collection.
* Installed necessary libraries and developed code for sensor data acquisition.
* Addressed wiring and baud rate issues to ensure accurate readings.
* Merged individual sensor codes to streamline functionality.

**2. Data Analytics & Processing**

**Ahmed - Data Collection & Storage**

* Developed scripts to fetch data from Arduino and store it in CSV files.
* Addressed permission issues and ensured seamless data logging.
* Provided formatted data files to the backend team for processing.

**3. Backend & Security**

**Anita - API Development & Database Management**

* Designed and developed a RESTful API using Flask for real-time data communication.
* Set up an SQLite database for structured data storage.
* Implemented data synchronization techniques to minimize latency.
* Ensured API security and optimized data handling for efficient queries.

**4. Frontend & User Experience**

**Anu Suya - Dashboard Design & UI Implementation**

* Developed a responsive dashboard using React.js and Material-UI.
* Integrated real-time data visualization for an intuitive user experience.
* Implemented interactive features such as system freeze and user settings.
* Optimized the UI for seamless functionality across multiple devices.

**What Next?**

**Objectives & Action Plan:**

1. **Final Testing & Calibration**
   * Validate sensor accuracy against standard environmental readings.
   * Optimize data transmission and visualization response time.
2. **Deployment & User Testing**
   * Deploy the dashboard for beta testing.
   * Collect user feedback for further improvements.
3. **Enhancements & Future Development**
   * Introduce machine learning for predictive air quality analysis.
   * Implement mobile application support for wider accessibility.
   * Integrate additional sensors for enhanced environmental monitoring.

By successfully implementing this project, we aim to provide work-from-home individuals with real-time environmental insights, helping them create a healthier and more comfortable workspace.