AN IN-HOUSE DIGITAL ADVANCEMENT OF GEOLOGY 100 LAB

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Abstract

Our Eastern Washington University (EWU) Computer Science Capstone Team built a mobile-friendly Geology 100 Lab web service to reduce paper waste and digitally advance the introductory student lab experience. Working with faculty from Geology and Computer Science at EWU, we designed a web service from the ground up. This included creating a proof of concept as a visual agreement, and a Software Requirements Specification (SRS) document as the verbal agreement. These meetings and documents aligned our understanding of faculty vision with the implementation of our own concepts. Because of our limited time, we decided to piece out the project into waves for future capstone teams to complete. Based on the functionality of the web service and our familiarity with Object-oriented programming, we coded the web service in ASP.NET Model View Controller (MVC) and used Mono to interface with EWU's UNIX server.

Our chosen component of the project was to set up a database and complete a working model of the Lab Editor tool for the administrative side of the web service. Team responsibilities were divided between: model, view, and controller (MVC). One member created a MySQL database on the server space provided by EWU and an ASP.NET library for our back-end code to communicate with the database (model). One member designed the front-end for the Lab Editor using a Summernote rich text editor and added the ability to create and reorder a dynamic number of Lab Exercises (view). One member coded the back-end which allows the data entered by the user to save and repopulate as a Lab object between the front-end and the server (controller).

The Lab Editor can create, save, and preview (future "student view") a Geology 100 Lab. Each Lab has a title and a dynamic number of Lab Exercises, each with a response type. Utilizing the rich text editor, faculty can add exercise elements such as text, table, video, image, and hyperlink in order to build a Lab.

Current Project Status

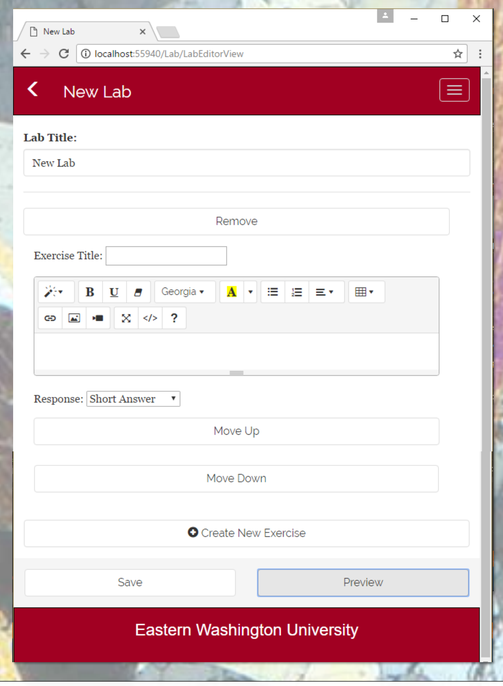
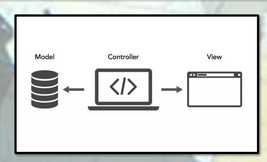


Figure 1. Snippets of the blank Lab Editor (left) and a preview of an existing Lab (right).

MVC and the Software Development Cycle



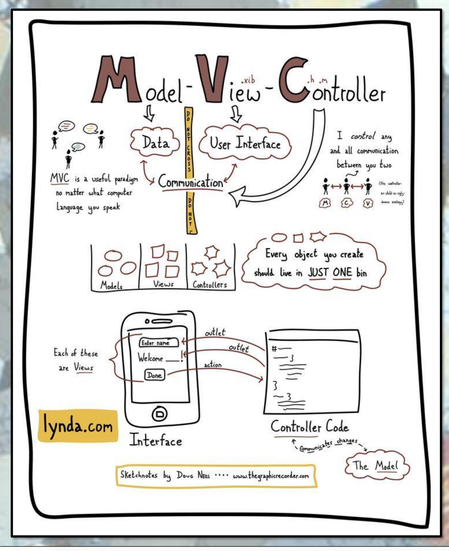


Figure 2. Model View Controller (MVC) allows for a team to work on a project simultaneously by utilizing division of labor. The MVC helps keep the components of a computer program separated in a way that allows flexibility so that a change in one component doesn't cause another component to stop working.

Wireframe Design

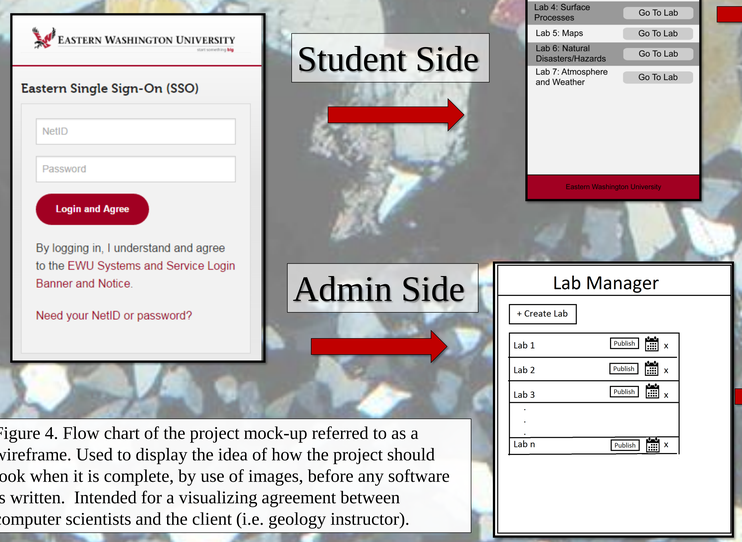


Figure 4. Flow chart of the project mock-up referred to as a wireframe. Used to display the idea of how the project should look when it is complete, by use of images, before any software is written. Intended for a visualizing agreement between computer scientists and the client (i.e. geology instructor).

UML (Unified Modeling Language)

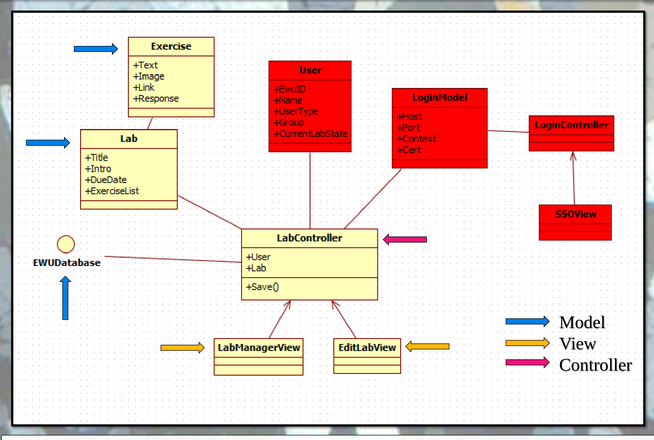


Figure 5. Unified Modeling Language (UML) diagram used to visualize the software design of the system. The blocks (classes) show how the system is connected behind the scenes. The red classes are not yet implemented into the project but show how the system is designed for extension. The colored arrows indicate which MVC role each class has.

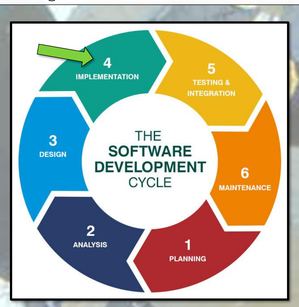


Figure 3. The Software Development Cycle illustrates the general idea of the continuous work and refactoring it takes to create, modify, and extend upon the software. The green arrow points to the current stage of the Geology 100 Lab project.

Future Work

- Implement Admin Lab Manager (see Fig. 4)
  - For instructors to create, publish or remove Labs
- Implement Student Side of Project (see Fig. 4)
  - Where students can select, fill out, and save progress on a Lab
- Implement EWU SSO (Single-Sign-On) (see Fig.4 & 5)
  - For instructors and students to login using their EWU credentials
- Integrate the Web Service (see Fig. 3)
  - See how the web service and database responds to 450 Geology 100 students per quarter using it
- Maintenance and Improvements (see Fig. 3)
  - Future capstone teams will maintain the web service and make improvements as necessary