School of Computing

Year 4 Project Proposal Form

SECTION A

Project Title: Code Correction Coach

Student Name: Bernard O'Connor

Student ID: 14367821 Stream: CASE

Project Supervisor Name _____

[Note: It is the student's responsibility to ensure that the Supervisor accepts your project and this is only recognised once the Supervisor assigns herself/himself via the project dashboard. Project proposals without an assigned Supervisor will not be accepted for presentation to the Approval Panel.]

SECTION B

Proposal Description – using the following headings:

General area covered by the project

My proposed project will cover two main areas; the teaching of programming and the promotion of quality code through source code analysis.

The main part of the project will be a web application where students can do coding exercises. When they submit their code, not only will the web app test if the code is correct, it will also analyse the code and make suggestions of how the code could be improved. Initially I shall specifically focus on teaching Clojure code, but I want to design the project in sections so that the teaching of other languages could be added in at a later date.

If I have enough time, I would like to design the web app in a modular fashion so that I take the component responsible for the code analysation, and create an IDE plugin from that as-well, as an additional tool for students and programmers in general who wish to improve their code quality.

Outline of the proposed project

Background - where the ideas came from

I have an interest in tutoring. In first year I was a programming lab tutor here in DCU. In the summer of Second Year I was considering approaching my old Secondary School to see if I could set up some sort of programming club / bootcamp as a summer job before I got my internship over the summer.

The idea of teaching coding stuck with me, and I felt that a tool that would give students feedback about the quality of their code would help make teaching a group of people more manageable.

Achievements - what functions it provides, who the users will be:
As I've mentioned before I wished to create a web app and then if possible an IDE plugin. To do this I would try to split the project into 3 parts;

- The first part is a web application that presents the user (a secondary student or a first year college student) with a programming exercise. The user may submit their answer (either through a file upload or through a text area on the web page). Their answer will be compiled and run, and if it passes the test cases for the exercise they shall see that they pass. Along with showing that they pass, I will also run the code through the second part of the project
    - An additional feature for the website which is currently not a priority is a user login system, where a user can log in, see the past work that they've done, keep track of their improvements and store code that they are working on. These features will be added in after the code analyzer has been written, as my main aim of teaching quality coding can be achieved without the use of a user system.
    - Another additional feature that could be added is a lesson section of the website, where video tutorials could be uploaded. I believe this may be out of scope for the final year project but I would like to add that section myself at some stage if I do go ahead and use this project outside of DCU to teach coding.
- The second part is a source code analyzer. This shall take some source code, either from the web application or through an IDE plugin (discussed below in part three). The source code analyzer will check if the user is using good programming practices/styles, and if there are some optimisations that can be made. These suggestions will be returned to the user
- The final part of the project that I would like to get done if there is enough time is an IDE plugin that runs my analyzer code.

Justification - why/when/where/how it will be useful
I want to develop this project not only to help people learn how to code, but also to make it easier to teach people how to code. I imagine this being used in secondary school coding clubs where the teacher may have limited knowledge of programming. It's my hope that the feedback that my program provides the user will both help the student to learn and to lessen the burden on the teacher/tutor giving the class.

Programming language(s) - List the proposed language(s) to be used
I plan on using Clojure for the backend and ClojureScript for the frontend of my project

Programming tools / Tech stack – e.g. compiler, database, web server, etc.

- Leiningen (compiler & project manager)
- Clojail (Sandbox for Clojure code)
- Elasticsearch (database for if I decide to store user information)
- Figwheel / Jetty (Development and production web servers)
- Bootstrap (Web Elements Structure)
- Compojure (Routing library for clojurescript)
- CLJS-Ajax (ajax library for clojurescript)
- Reagent (interface between Clojurescript and React)
- Phantomjs (Clojure/Clojurescript testing suite)
- Intellij (IDE)
- Grafana (graphing software to show the progress of students. Currently a stretch feature).

Learning Challenges - List the main new things (technologies, languages, tools, etc) that you will have to learn

- I have never written an IDE plugin before, so I need to learn the project structure,how to create an IDE interface, and any limitations that a plugin may entail.
- I have never remotely compiled and run user submitted code before. Learning how to achieve this in a secure manner will be a challenge

Hardware / software platform - State the hardware and software platform for development

- I will develop the project on a Linux laptop (Ubuntu). As Clojure and Clojurescript compile to java and javascript code respectively, the project should be runnable on both linux and windows devices, though I will focus my efforts on linux. I envision the final product to be run on a linux server.
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Special hardware / software requirements - Describe any special requirements.
No special requirements required.

Make use of figures / diagrams where appropriate.

Note: The final revision of your proposal form should be converted to a **PDF** in your GitLab repo from where it will be automatically collected.