Transition from passive learner to critical evaluator through peer-testing of programming artefacts

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Plan

- Overview of motivations of the project
- The web platform implemented
- Study evaluating usefulness of platform
- Outcomes of evaluation
- Perspectives going forwards
Situation

- **CompSci Courses** use *individual* programming tasks for coursework
- **Feedback** on programming artefacts is not **timely**
- Students focus on working to solve a problem, and so don’t always **critically analyse** and evaluate their solutions
Solution

- Peer-Testing: A web platform for peer-feedback on programming artefacts
- Students working together means faster turnaround of feedback
- Students get a chance to critically evaluate work of others
- Web allows for access across campus, home
- Platform integrates testing
Background

• **Peer-Assessment** has many benefits \[1,2\]
  – Improves students understanding of task
  – Students learn strengths & weaknesses
  – Improves attitude to learning

• **Peer-Testing** extends this
  – Focus on testing

Background

- CAP System for **Peer-Feedback** on reports[^1]
  - Highlights importance of anonymity
  - Peer Marking was positive experience

- Ceilidh System for **Automating Feedback**[^2]
  - Helps students get feedback quicker
  - Lets teachers track progress

[^1]: Davies, 2000 – DOI 10.1080/135580000750052955
Overview

• I took this on as an Honours Project
  – Teacher-informed experimental prototype
  – Student-led investigation
  – Feedback from students
• This is a QAA funded project (CS Education)
PEER-TESTING WEB PLATFORM
Features

• Offers programming support & testing
  – E.g. Python & Python unit testing
• Lets students interact anonymously
• Feedback sharing between tester, developer
Stage 0
Coursework Setup

- Teacher creates coursework
- Makes available to students
- Students can download relevant files
Stage 1
Development & Self-Testing

• Upload solutions & tests
• Define and run tests
• View test results
Stage 1
Development & Self-Testing

- Upload solutions & tests
- Define and run tests
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Submit 1 solution, May submit new versions
Submit many tests, May submit new versions
Stage 1
Development & Self-Testing

• Upload solutions & tests
• Define and run tests
• View test results

Pre-Built oracle, and signature test available

Use menus to choose
A test and solution

Links provided to View result

Self-Testing

• You can run your tests here to make sure that your solution is working correctly
• You can also run your tests against the oracle to see what a correct solution does

A test case to run:
My Test Case #2
A solution to test:
My Solution
Run Test

View results for running tests:
- [view] My Solution against Signature Test
- [view] My Solution against My Test Case #2
- [view] Oracle Solution against My Test Case #3

http://peer-testing.com:8000/student/cw/oNQF7c66
Stage 1
Development & Self-Testing

- Upload solutions & tests
- Define and run tests
- View test results

Student Peer Assessment Site

All source files involved listed
Results of test also listed
Student can inspect output of test to fix bugs
Stage 2
Peer-Testing & Feedback

- Group peers
- Run tests
- Test results & feedback
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Peer can’t see who really created a submission

Own solution listed when feedback ready
Stage 2
Peer-Testing & Feedback

- Group peers
- Run tests
- Test results & feedback

Results view similar to self-test
File contents not anonymized
Back and forth discussion
Evaluation Methodology

• Initial prototype of web platform
• Evaluated interactions
• 17 year 2/3 students
• Across campuses (Edinburgh & Dubai)
• Small python exercises
  – Quicksort, binary search tree
  – Tasks completed using email or web platform
Evaluation Methodology

Online post-experiment cross-campuses discussion
Opinions on Peer-Testing

• Giving & receiving feedback helps learning
• Helps understand code testing & review
• Peer-Testing exercises should be part of university courses
• Exercises using a web platform could be part of university courses
Improvements to platform

• Participants in Study requested improvement to
  – Back-And-Forth Feedback
  – Managing Uploaded Files

• Managing Investigation revealed need for
  – Peer Groups
Positive Outcomes

- Provides experience with testing
- Web Platform encourages test-driven development
- Cross-Campus Activity
- Shares Information that might not be common teaching in both campuses
- “Once you realise you’re working cross-campus, the learning becomes more interesting”
PERSPECTIVES GOING FORWARDS
Integration

• VLE (Virtual Learning Environment) Integration
  – Built-in file uploading support

• O365 Single Sign-on Login

• Peer-Feedback Platforms
  – Aropä, WebPA
  – Built-in ways to manage peer activity
Deployment

- Extend support to Java & JUnit
- Ensure this works with an existing course
  - Trial with unmarked lab exercises
  - Then full coursework exercise
Public Release

- Eventually release this web platform to allow others to use it

- Contact M.Maarek@hw.ac.uk if interested
ANY QUESTIONS

More info at tiny.cc/peer-testing