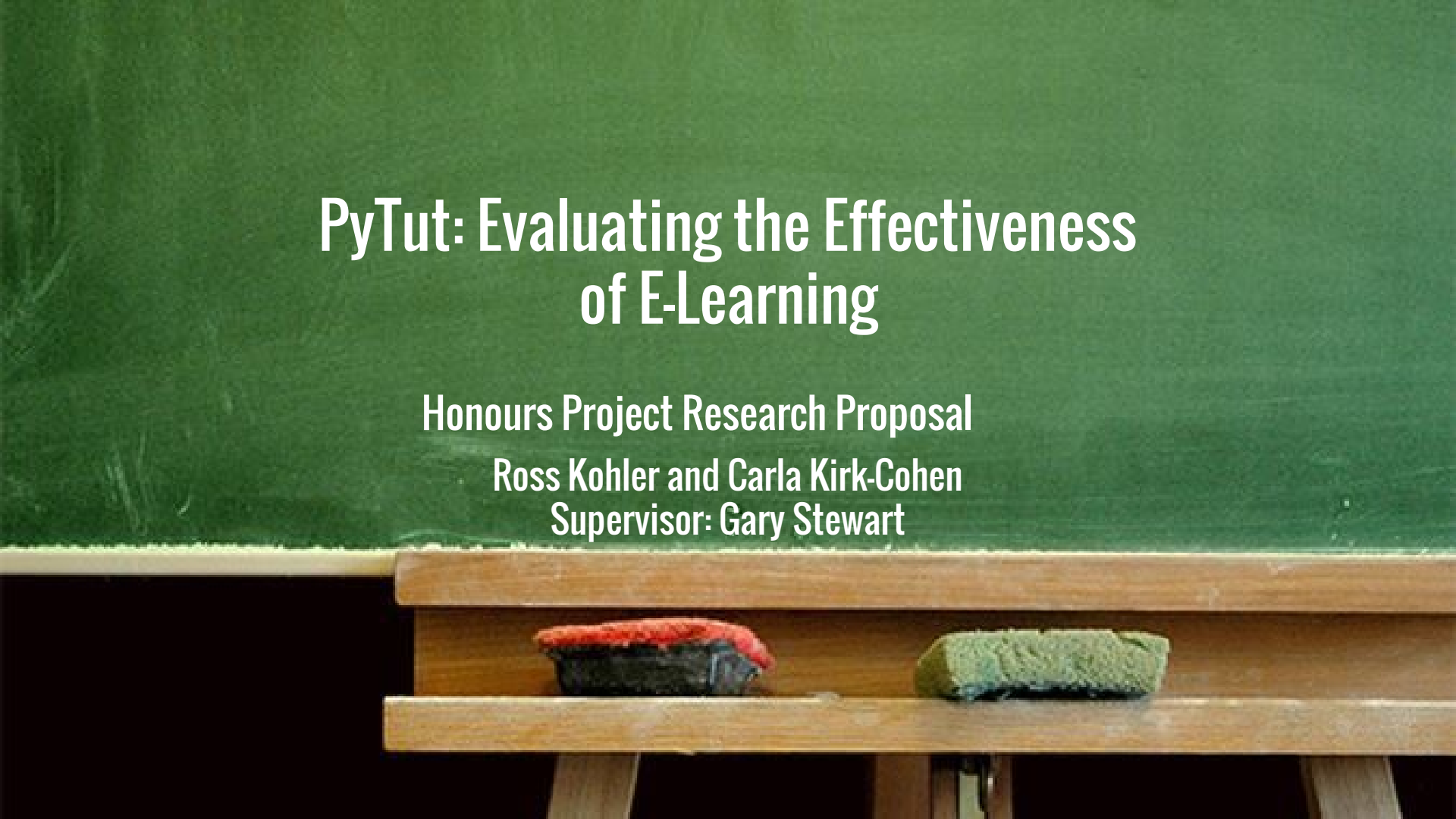


PyTut: Evaluating the Effectiveness of E-Learning

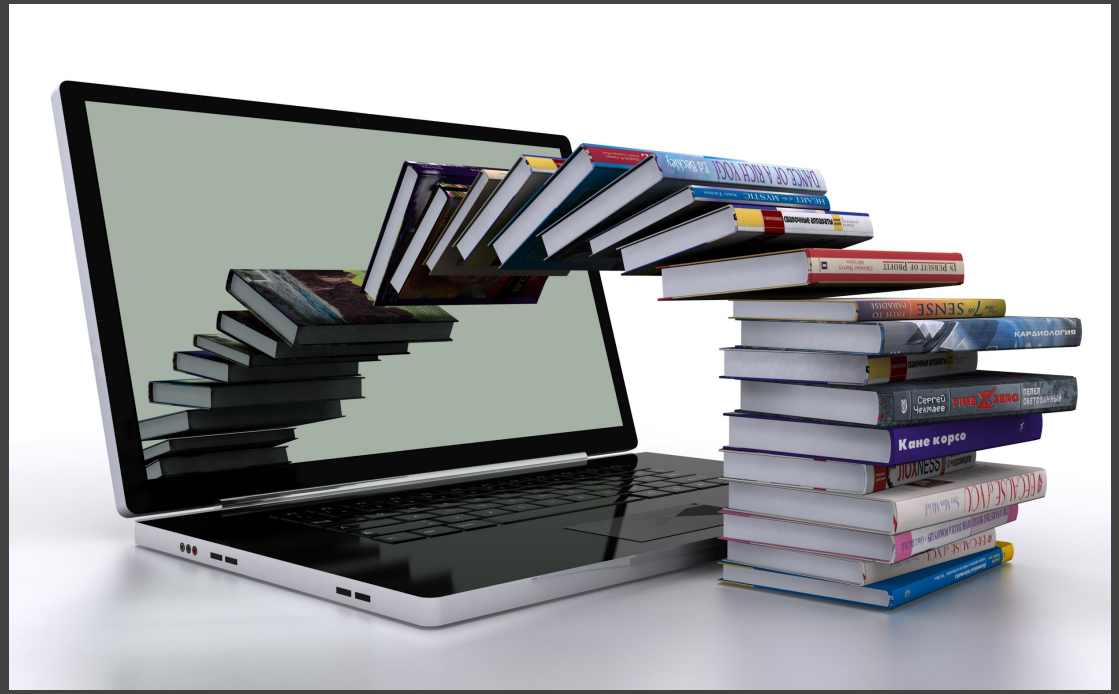
Honours Project Research Proposal

Ross Kohler and Carla Kirk-Cohen
Supervisor: Gary Stewart


Computer
Science education
is facing a retention crisis.

Cognitive Overload has been identified as one of the core difficulties that beginner programmers face.

Introduce an e-learning system as a supplement to classroom instruction in UCT's CS1010H course.



Project Significance

- Programming vital skill
- Time intensive practice required
- Not feasible to complete in classroom setting

Project Issues

- E-learning found to be 6% more effective
- Success depends on small scale and focus
- Active Learning
- Other evidence indicates that there is no difference
- Anxiety over the use of computers

Aims of Work

Determine whether the addition of an e-learning system is valuable

Provide students with a system that assists learning out of the classroom

Provide insight for future work in developing e-learning systems

Reduce lecturer and tutor workload

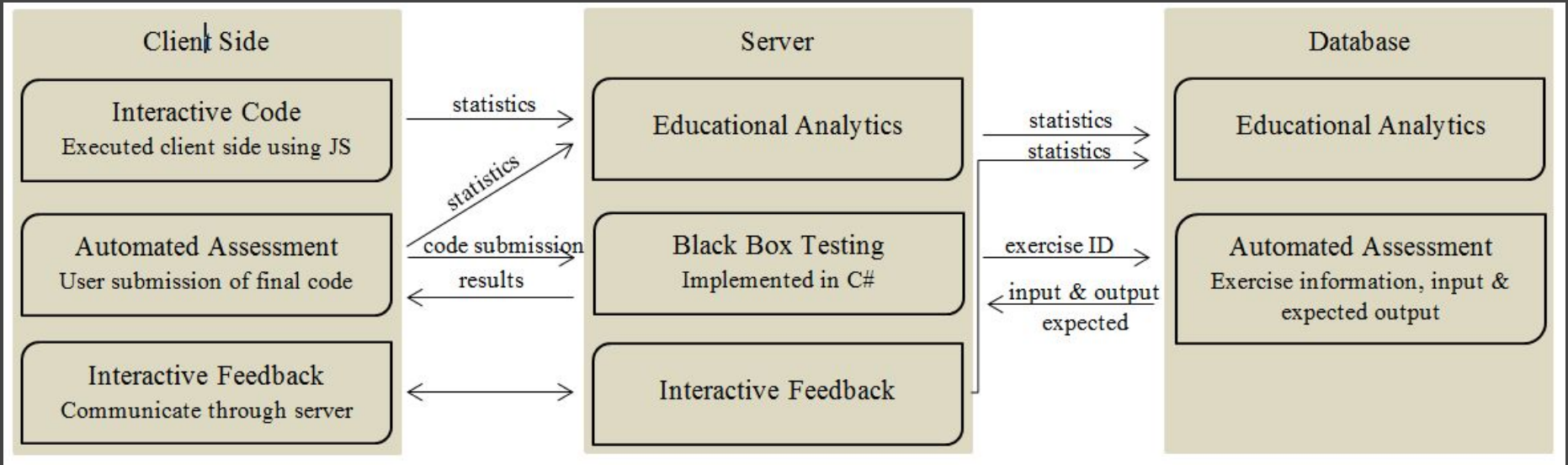
Does the introduction of an e-learning system as a supplement to classroom instruction significantly aid beginner programmers?

How effective are interactive code, automated assessment and interactive feedback in aiding beginner programmers?

Procedures and methods

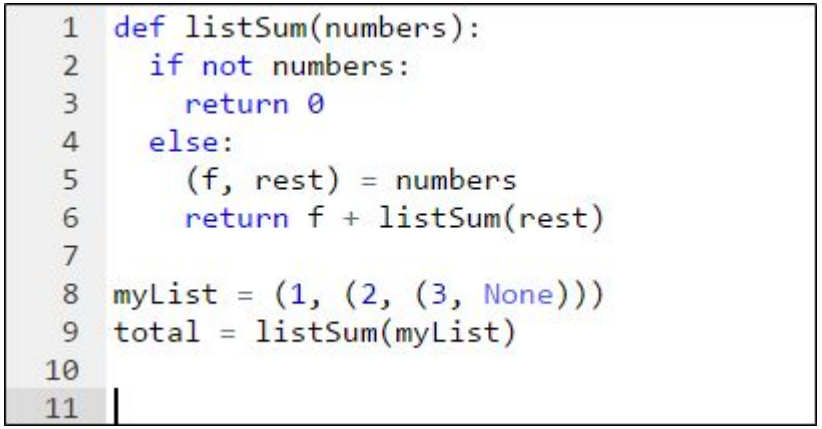
- Develop a prototype system for one module
- Introduce system to CS1010H class
- Evaluate using surveys
- Determine impact of system using survey results and analytics gathered

Design Features



Interactive Code

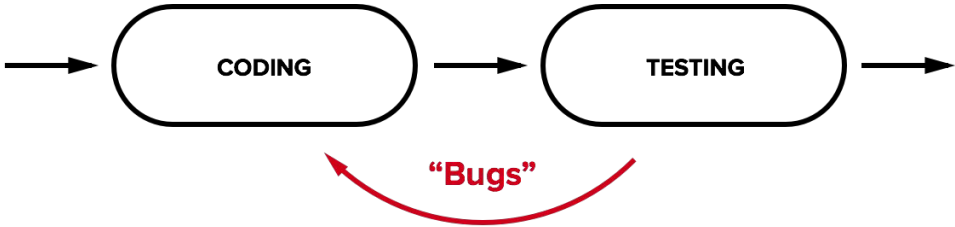
- Beginner Friendly
- Client Side execution
- Execute using JavaScript



```
1  def listSum(numbers):
2    if not numbers:
3      return 0
4    else:
5      (f, rest) = numbers
6      return f + listSum(rest)
7
8  myList = (1, (2, (3, None)))
9  total = listSum(myList)
10
11
```

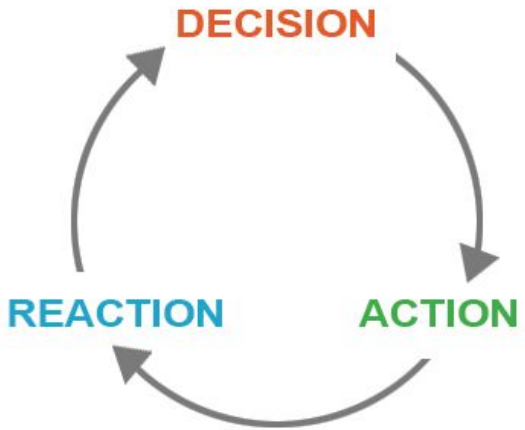
Automated Assessment

- Student submits code
- Code compared with model answer
- Student provided with feedback



Interactive Feedback

- Student sends message to tutor
- Response from tutor
- Student reacts and corrects



Data Storage

- Data stored server-side
- Microsoft SQL database
- Back-end handles all transactions

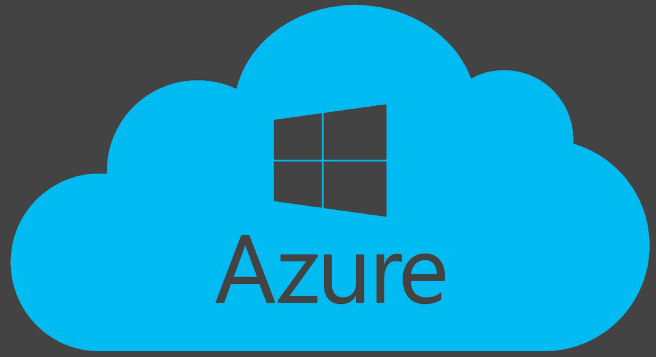
Student Information
Educational Analytics
Unit Tests
Programming Exercises

Development Platform

Hosted on Microsoft's Azure Cloud Platform

System designed using ASP.NET MVC framework

Develop and publish using Visual Studio



http://pytutor.azurewebsites.net

System Evaluation - Survey 1

Please answer the following questions regarding the programming environment used in this practical:

- It is easy to start programming in the environment
- Initially, I had trouble determining how to run my program
- When my program contained errors, the environment helped me detect them
- When my program did not appear to have errors, the environment helped me determine why it wasn't behaving as expected
- This environment is helpful to me when writing programs in practicals
- I find it easy to do work outside of classes or practicals using this environment

System Evaluation - Survey 2

Please answer the following questions about the use of automated assessment:

- This feature helps me to write correct programs
- When writing a program, this feature is an important part of the process

Please rank the following features by how useful they were to you (1= most useful, 3 = least useful)

_ Interactive Code Snippets

_ Automated Marking

_ Instructor Feedback

Ethical, Professional and Legal Issues

UCT Ethics in Research Guide

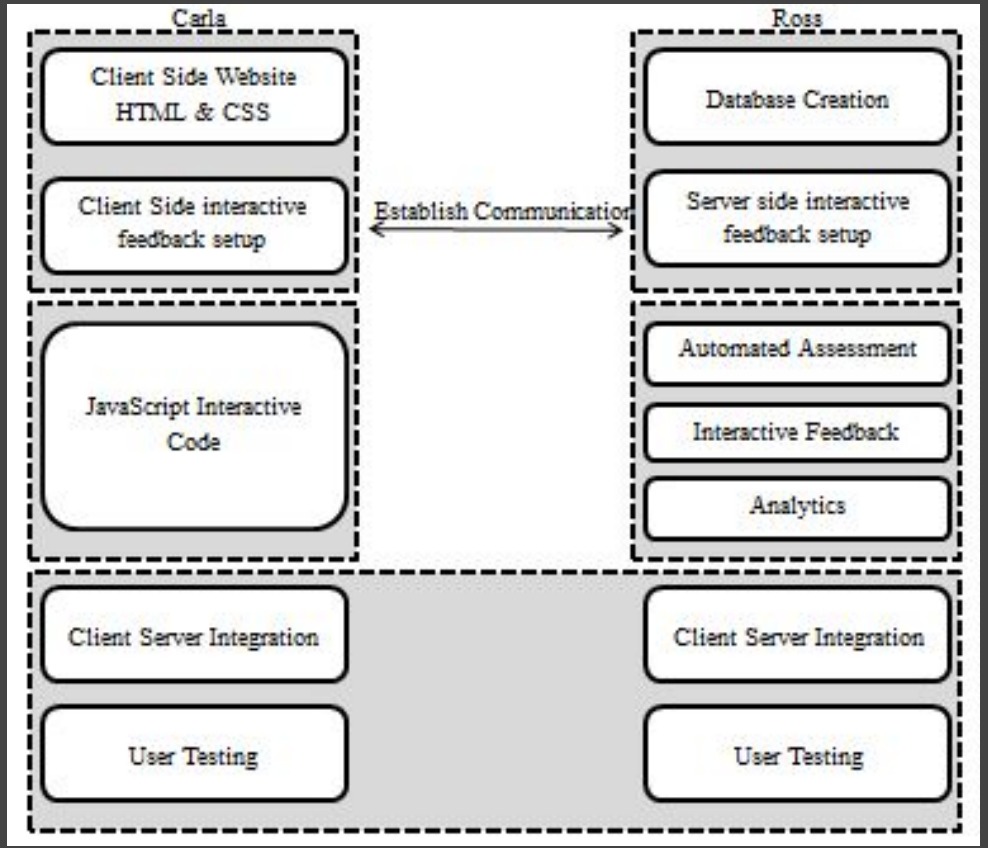
- Interference with other research.
- Take data without permission
- Infringing on the confidentiality or privacy of others.
- Recording observation in secret without the knowledge of the subject.
- The use of unsubstantiated or unvalidated data.
- Destroying or not publishing data that does not fit the desired result.

Anticipated Outcomes

- Reduces barriers to programming
- E-learning valuable addition
- Student use tools provided
- Automatic Assessment, interactive code and feedback valuable

Work Allocation

- Carla working on client-side code
  - Javascript
  - Interactive Feedback
  - Performance analytics
  - Look ‘n Feel
- Ross working on server-side code
  - Data storage
  - Automated Assessment
  - System structure
- Integration



Project Plan

Risks

- Fail to integrate two halfs of platform
- Poor planning leads to missed milestones
- System designed poorly and does not achieve goal

Required Resources

- Software
- Hosting
- Guinea pigs (aka CSC1010H)

Milestones

System designed in 3 iterations

11 July - First iteration before initial demonstration

15 August - Second iteration tested with students

19 September - Final iteration before final demonstration

Report submissions

18 October - Completed draft

28 October - Final report

Thank you
Any Questions?