Online Mob Programming: Effective Collaborative Project-Based Learning

Michael Hilton
@michaelhilton
mhilton@cmu.edu
Assistant Teaching Professor
Institute for Software Research
School of Computer Science
Carnegie Mellon University
1. Group projects are good opportunities for students to learn. Difficulties realizing this benefit in practice.

2. Students respond to incentives, optimize for completion, not learning.

3. How can we encourage learning from each other while working towards an end-product?

Grand Challenge
Herb Simon

“Learning results from what the student does and thinks and only from what the student does and thinks. The teacher can advance learning only by influencing what the student does to learn.”
What is Mob Programming?

Mob Programming is a software development approach where the whole team works on:

the same task, at the same time, in the same space, and at the same computer.

while rotating through roles:

Driver
Navigator
Mob
Facilitator (optional)
Mob Programming for Pedagogy

- Structuring group activity
- Working together rather than divide and conquer
- Seeing other perspectives
- Social support balances pressure to perform
- Ideation, Communicating around code, writing readable code and debugging.
Online Mob Programming

- We evolve mob programming into an online pedagogical exercise.
- Students work together in AWS cloud9, to solve problems.
  - Shared code space
  - Text chat only
- Roles include:
  - Driver
  - Navigator
  - Researcher
  - Discussant
- Students work together synchronously with 180 minute limit.
- Students submit final result for credit.
Online Mob Programming

Terminal

Shared Editor

Navigation

Collaborate

Facilitator

Chatbot

Chat
Experimental Evaluation – Working Professionals

6-week free online cloud computing course for working professionals.

120 students

Groups of 3-7

1 Training + 3 Sessions

High compliance! – 30% chat contributions by each role, driver did most of the code edits.

Holds up for groups of all sizes.

“I think working as a team and rotating roles worked best. It had people in the driver’s seat perform the actual programming and then had you sit back and see the whole picture. It also allowed us to see different approaches to problems by other people.”
Experimental Evaluation – University Undergrad/Grad

Semester-long for-credit online cloud computing course for university grads/undergrads.

200 students → Groups of 3-7 → 1 Training + 2 Sessions

“I think working as a team and rotating roles worked best. It had people in the driver’s seat perform the actual programming and then had you sit back and see the whole picture. It also allowed us to see different approaches to problems by other people.”
Qualitative Findings – University Undergrad/Grad

- 8 Interviews after Spring semester.
- All students:
  - Found it slower than working alone
  - Had a good experience working with teammates (minus 1 exception)
  - Talked about the different roles
- Split perceptions:
  - Students who discussed efficiency most didn’t like it
  - Students who focused on building teamwork skills for future career liked it
Experiment Timeline

● Mob Programming Training – Introduction to AWS Cloud9 and role-switching with simple fizzbuzz exercise.
● Mob Session 1 – Multithreading
  ○ Pre-quiz
  ○ Mob Session
  ○ Post-quiz and Post-survey
● Mob Session 2 – Spark and Scala for Resilient Distributed Datasets
Demo

```
1 #!/usr/bin/env python3
2 import unittest
3 
4 Task Description:
5 Write a simple function called fizz_buzz.
6 fizz_buzz prints the numbers from 1 to 100.
7 However, if the number is divisible by 3, it prints Fizz, and if it is divisible
8 by 5 it prints Buzz, and if it is divisible by both, it prints FizzBuzz.
9
10 For example:
11  1 2 Fizz 4 Buzz Fizz 7 8 FizzBuzz ... 98 Fizz Buzz
12
13 There is exactly one space between successive prints, and there should be no
14 trailing spaces.
15
16 Note:
17 If you need to install packages, you must use the following approach so that
18 the package installation process can be reproduced during the grading:
19 put the requirements in `requirements.txt` and run:
20 pip3 install -r requirements.txt
21 
22 Warning:
23 bash -i
24 Warning: PATH set to RVM ruby but GEM_HOME and/or GEM_PATH not set, see:
25 https://github.com/rvm/rvm/issues/3212
26 OPE_Bot:~$ https://github.com/rvm/rvm/issues/3212
```
Current Work

Bringing Mob Programming to the class
Large online project-course at CMU

Student tendency to divide and conquer or defer to one team-member confirmed.

Workplace learning – Learning while working towards an end product

Join the conversation!

Carnegie Mellon University