How high is the coding barrier? A quantitative analysis of student transitions from stage 1 to stage 2 programming.

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The CS problem

Some UK HEA facts and figures:
A sector-wide continuation rate of 91% in CS is one of the lowest;
At 60%, CS is at the bottom end of the table for percentage of students achieving a first or upper second;
A higher percentage of men (7%) than women (5%) withdrew without their award across the sector;
Men make up 43% of the student body as a whole but over 80% of CS students.
The CS problem

Computer Science concepts are hard to grasp

In a New Zealand study 60% of Java exercises submitted by CS1 students had non-compiling code

Visual programming environments allow early success with programming
The OU solution

• OU Stage 1 programming studies
  Drag and drop blocks (Scratch-based)

• OU Stage 2 programming studies
  Traditional code-writing (Java and Python)
Aims of the project

• investigate if any correlation exists between success in programming on a Stage 2 Java module and levels of student engagement with the programming taught at Stage 1, using Scratch;

• investigate if any correlation exists between failure to complete the Stage 2 Java module and student engagement with the programming at Stage 1, Scratch;

• gain insight into how well students believed they had been prepared for Stage 2 Java programming work by the use of Scratch at Stage 1.
The Open University context

Open University (OU)

- UK’s largest university
- 174,000 students
- supported distance learning

Computing & IT qualifications

- All pathways include programming
- Common Stage 1 curriculum
To investigate the first of these aims we have used 2 sources of data :-

• Analysis of Stage 1 programming assessment on the OU module:
  Average score of individual assessment questions that test programming

• Analysis of Stage 2 programming assessment on OU module:
  Average score of all assessments
Comparison of Level 1 & 2 assignment scores

Average Sense Score (Level 1) 83.9%
Average Level 2 score 73.3%

There was a moderate significant correlation between the levels ($r=0.499$, $p <.000$)
Length of time from studying Level 1

(n = 32 r = .787, p<.000)

(n = 77 r = .499, p<.000)
(n = 79 r = .574, p<.000)

(n = 205 r = .536, p<.000)
(n = 171 r = .347, p<.000)

(n = 239 r = .448, p<.000)
Students that did badly at level 1 (scoring <50%)

Average Level 2 score for this group 42.7%
Average Level 2 score overall 73.3%
Students that did badly at level 2 (scoring <50%)

(n = 125 r = .268, p=.002)

Average Level 1 score for this group 66%
Average Level 1 score overall 83.9%
Students that did well at level 1 (scoring >80%) 

Average Level 2 score for this group 79% 
Average Level 2 score overall 73.3%
Students that did well at level 2 (scoring >80%)

(n = 415 r = .331, p<.000)

Average Level 1 score for this group 91.4%
Average Level 1 score overall 83.9%
References


