



Project Title: Understanding the challenges of learning to program at level 2  
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## Executive Summary

Learning to program is a skill that some students struggle with. TT284 Web Technologies requires students to write code using a number of different programming languages: Javascript, PHP and Google AppInventor. Many students who take TT284 would have completed TU100 My Digital Life and TM129 Technologies in Practice which introduces programming using two different graphical environments.

The objectives of this research was to identify (1) the extent to which students are able to learn the technologies that TT284 teaches, (2) whether the approaches used in TU100 and TM129 successfully equips students to study TT284, and (3) the ways in which tutors deal with the challenge of working with students who struggle with programming.

To understand these issues, a number of experienced TT284 tutors were interviewed. Interviewing tutors enabled us to understand both the challenges that particular students face, the responses that the tutors make to meet such challenges, and also learn about what additional support the faculty or the module team might be able to provide.

Two experienced TT284 tutors were recruited. These tutors designed an interview plan, and then ran a short pilot study by interviewing each other. Following the pilot study, twelve TT284 tutors were interviewed. The resulting interviews were transcribed and then thematically analysed. After the analysis, the results were presented to the two tutors through a focus group, where the findings were discussed.

Based on the findings, it was difficult to answer the original research questions: students differ extensively in their background and experience. Tutors noted that some students arrived on TT284 with significant programming experience, whereas other fundamentally struggled to understand many of the concepts that were presented in the module. There was a view that TT284 wasn't a module that taught programming, and sometimes students became easily overwhelmed with the amount of resources that they had to understand and work with.

A striking finding is the extent to which the tutors differ in the ways that they use OU Live: some tutors prepare resources that are based around PowerPoint presentations, whereas other tutors use OU Live as a way to share screen displays. To take account of challenges that students face, tutors have taken it upon themselves to create videos. These videos, essentially, augment the materials that have been created by the module team.

The project, and results of the project have been presented through two internal conferences, and will also be presented at a Computing and Communications seminar. Furthermore, an abstract has been submitted for a special issue of Open Learning: The Journal of Open, Distance and e-Learning.

## Aims and scope of your project

- What were the main aims of the project?

To understand whether level 1 modules, specifically TU100 and TM129 adequately prepare students for the study of TT284 Web Technologies.

- What were the more specific goals?

To understand the student experience of studying TT284 by interviewing TT284 tutors. A secondary objective was to give a voice to TT284 tutors, and to uncover insights that could potentially inform module teams.

## Activities

- What was the overall approach (e.g. observe current practice, develop technology, plan and evaluate change, etc)?

The approach was qualitative: to ask our tutors about their first hand experience of tutoring on TT284, to ask them questions about the module and their perceptions about the challenges that their students face. Essentially, research is all about capturing and documenting practice.

- What were the planned activities of the project?

The first activity was to recruit tutors who would become co-researchers. The second activity was to work with the tutors to create an interview script and then test this script with a brief pilot study. The third activity was to interview a wider group of tutors. This would then lead to an analysis of the interviews, sharing of results with colleagues, and then publications.

- What changes did you have to make to your plan (aims, project activities, etc.) and why (e.g technical problems, difficulties in involving users/stakeholders, etc)?

The original intention was to find a single TT284 tutor who would work as a co-researcher. A call for expressions of interest was made and many tutors responded. Thanks to the quality of the responses, it was decided to choose two co-researchers as opposed to one. This proved to be very helpful, since both co-researchers worked very well together, collaborating with each other to create a very comprehensive research plan.

The completion of the project was slightly delayed due to two reasons. The first (and perhaps less significant) was a delay in obtaining copies of the interview transcripts due to the transcriber being unable to work for a few weeks. The second reason was due to the pressures of work commitments in the London regional centre.

- What data and evidence did you gather and how did you gather it (e.g. survey, interviews, focus groups, user studies, cultural probes)?

The evidence was in the form of tutor interviews. Each interview was carried out at a distance and was recorded using OU Live. The OU Live recordings were downloaded and then transcribed. The corresponding transcriptions were then subjected to thematic analysis using NVivo.

## Findings

- What are your main findings? What evidence supports these findings?
1. It has been difficult to find evidence about the impact that the TU100 and TM129 modules make to the student experience on TT284, but it is clear that students differ widely in terms of their experience. Perhaps unsurprisingly, those students who have prior programming experience do well. Those with little programming experience struggle.
  2. There is a wide variety of OU Live practice amongst tutors: some tutors run structured sessions based around PowerPoint presentations, whereas other tutors use screen sharing. Opinions about the recording of TT284 sessions are mixed.
  3. There is a consistent view that block 2, which is about JavaScript, PHP and SQL is the most difficult of all the blocks, perhaps due to the amount of materials that students have to contend with. Students

are encouraged to look outside the module for information, and some students can struggle to navigate the different information sources effectively.

4. Some tutors hold the view that there isn't sufficient context to help students to understand the principles of PHP, and that information about 'content management systems' is missing.
5. Students consistently struggle with the a part of the module that is about regular expressions, which is used for email validation.
6. Tutors report that students do struggle with programming skills, particularly in terms of dealing with debugging and errors. Other points have included the difficulties of working with and understanding the different control structures that are used in code.
7. To address these issues, tutors have created their own videos, which can be used by students and fellow students. In doing so, they are, in effect, filling the gaps in the module, and establishing what could be terms a 'virtual community of practice'.
8. Opinions differ about the mobile block where students create their own app. For example, one tutor reported the AppInventor component as an 'unnecessary diversion'.
9. Tutors have expressed opinions about the fact that the case study is aging quickly, and that although it is well thought out, it is not as intergrated within the module as it could have been.
10. Tutor group forums are not significantly used. Instead, students tend to use the national forums a lot more. The TGFs are used as notice boards.
11. Tutors are happy with the tutor notes that the module team have prepared.
12. Tutors appreciate the responsiveness of the module team.

- Do you have you any particular successes to report?

In terms of the research, an important success has been the response rate: tutors were very willing to give up their time and be interviewed; All tutors who were approached agreed to participate, and all participants were very generous in terms of their time and were very willing to present their opinions.

In terms of successes from the research, there is a consistent view about the difficulty of the second block, and it is very apparent that tutors create their own material to respond to issues experienced by tutors.

- Has your project generated any unanticipated outcomes or unexpected opportunities and how have you taken account of these?

An unexpected outcome from the research it that is has helped tutors to get to know each other more and helped to foster closer working relationships. The research interviews also helped tutors to share tutoring practice and this, in turn, offered reassurance that they were supporting students effectively. Moving forward, one idea is to try to find a way to capitalise on this approach to develop module specific AL development activities.

### Impact

#### a) Student experience

- In what ways has your project impacted on student learning?
- How is your project contributing to increasing student success (i.e. retention, employability, etc.)?
- Have there been or will there be any benefits to students not directly involved in your project?

This research does not directly impact on the student experience, other than it has allowed tutors to share experience with one another. The biggest impact is likely to be interms of communicating tutor experiences to different module teams. This, in turn, can make a positive impact on the student experience.

#### b) Teaching

- How have you affected the practice of both yourself and others within the OU?
- What has been the impact of your project outside the OU?

The biggest impact of this research is to provide a group of tutors a voice. It allows different module teams to learn more about how a group of tutors work together, and how they offer students additional support by creating additional materials. It has also been instructive in terms of exposing significant differences in OU Live practice.

In terms of impacts on programming, a significant finding that will be continued to be communicated to module teams is the importance of helping students to carry out problem solving and troubleshooting by the use of different tools. To offer help to our students, tutors have created videos. A key recommendation is that video resources are used to show students how to work with code, whilst bearing in mind the importance of addressing accompanying accessibility challenges.

#### c) Strategic change and learning design

- What impact has your work had on your Unit's or the University's policies and practices?

Dissemination of the project results is continuing, so the impact on the work of the unit is not yet clear. One to one meetings with module chairs is planned, along with exposing important aspects of the research during module team meetings.

#### List of deliverables

A poster that was presented in November 2013

TT284 tutor interview plan, prepared by Dave McIntyre, Jon Williams and Chris Douce

Four internal presentations have been prepared:

- TT284 research presented at eSTeEM conference, April 2015
- TT284 lightning talk at OU scholarship event, June 2015
- TT284 research presented at Computer and Learning Research Group conference, June 2015
- Understanding the tutor's perspective: TT284, T320 and TU100, Computing and Communications department seminar, November 2015

An interim project report was written in July 2014

An abstract has been submitted to the Open Learning journal, September 2015