Institute of Coding in Wales Digital Skills Bootcamps – Micro-Credentials: A Pilot Project

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ABSTRACT

From October 2021 to July 2022, the *Institute of Coding (IoC) in Wales* carried out a pilot project, delivering digital skills bootcamps across every university in Wales. The project aimed to test the universities' appetite and ability to implement mechanisms awarding university credits to those undertaking these bootcamps; so-called *micro-credentials*. As a result of this project, 349 learners were recruited onto 16 bootcamps. Six of these bootcamps saw the learners obtain university credits; the remaining ten bootcamps were non-credit-bearing which nonetheless provided essential upskilling opportunities. This paper reflects on the outcomes of this project, discussing the challenges faced, delivery mechanisms used, learner demographics, completion rates, and future ambitions.

CCS CONCEPTS

• **Social and professional topics → Computer science education**; **Adult education**.

KEYWORDS

Computer Science education, micro-credentials, micro-provisions, digital skills

1 INTRODUCTION

Widespread digitalisation has led to a global change in the economy. More and more jobs are disappearing due to the automation of basic tasks, and many new high-skill jobs are emerging. Employers are increasingly seeking employees with STEM qualifications and in particular digital skills. The high level of demand for skilled workers has resulted in employers embracing digital upskilling opportunities.

The *Institute of Coding (IoC) in Wales* provides a focal point for addressing the digital skills shortage in Wales. It is the business-facing arm of *Technocamps*, a universities-based pan-Wales school and community outreach unit. Technocamps headquarters is at Swansea University, but it has established a hub within the computer science department of every University in Wales. It represents a 30-year programme of providing digital education and professional development to regional businesses across Wales [6].

Recent additions to the offerings of the IoC in Wales have been *micro-credentials* [4, 7], in the form of digital skills bootcamps. Micro-credentials have quickly gained traction within the lifelong learning arena. Their adoption is taking place across the globe, with the Australian government investing $4.2 million developing a micro-credential marketplace [1], and the European Union supporting the development, implementation and recognition of micro-credentials across institutions, businesses, sectors and borders [3]. A UK government report on lifelong learning promotes micro-credentials [9], and Ward et al.[10] review various models for incorporating micro-credentials into UK Higher Education.

2 THE DIGITAL SKILLS BOOTCAMPS PROJECT

The IoC in Wales digital skills bootcamps were delivered as part of a year-long micro-credentials pilot project, from October 2021 to July 2022, supported by the Welsh Government and involving every single Welsh university. The ambition was to test the universities' appetites and abilities to award university credits for micro-credentials. By utilising a pan-Wales approach, universities were able to share experiences, challenges and solutions as well as best practice.

As the headquarters of Technocamps and the IoC in Wales, Swansea University led the project; and the Open University in Wales acted as an external reviewer. Surveys were carried out throughout the project, relating to both the universities and their preparedness as well as the learners and their experiences on the bootcamps.

The project resulted in the delivery of 6 micro-credentials and 10 micro-provisions (non-credit bearing courses). The micro-credentials were delivered by Swansea University (x4), Aberystwyth University and Bangor University; and the micro-provisions were delivered by Cardiff Metropolitan University (x5), the University of Wales Trinity Saint David (x3), Cardiff University and the University of South Wales. Whilst all universities were involved, some were not able to deliver courses due to the time-consuming nature of processes to set up new courses (see section 2.4). The topics of the bootcamps were in the main informed or requested by industry (eg, via the IoC in Wales Industrial Advisory Panel), and included programming, computational thinking, security, software testing, and software project management.
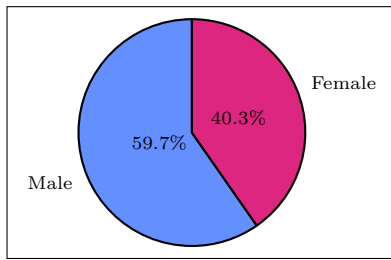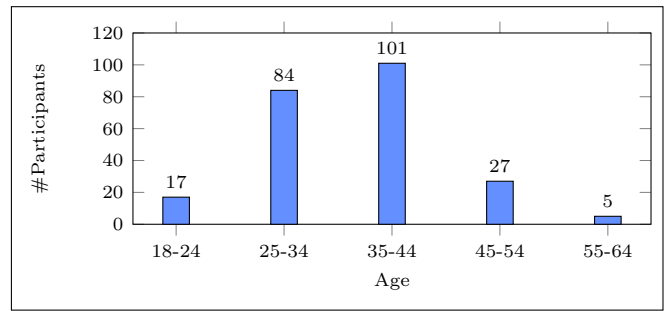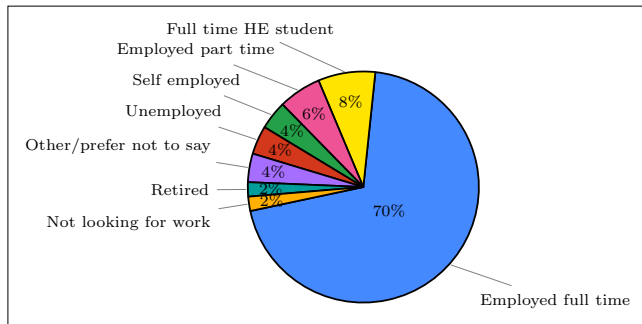
Figure 1: Gender Distribution

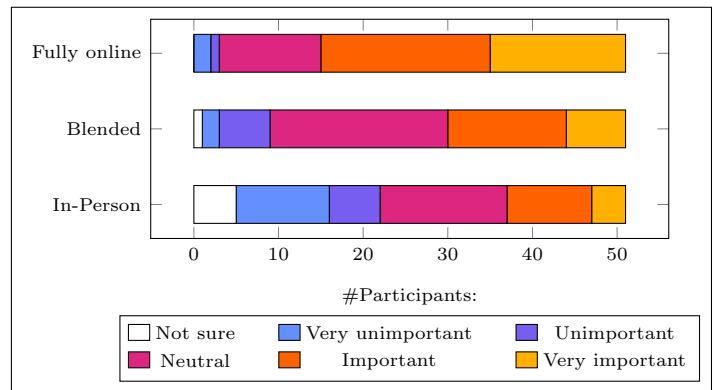**Figure 2: Working Status**

Figure 3: Age Distribution

Figure 4: Importance of Delivery Mechanism

2.1 Learner Demographics

The pilot project resulted in 349 learners registering onto bootcamps. Interestingly, two out of five of these were female (see Figure 1), more than double the 19% proportion seen in standard university computing courses [2].

The flexibility and accessibility of the courses resulted in a wide range of learner working status being observed (see Figure 2). Of the 51 who completed the learner survey, 70% were employed full-time. Therefore, these courses not only provided upskilling opportunities for the learner, but as a byproduct their employers would also benefit. To this end, each university worked closely with industry in several ways to ensure that their needs were being addressed appropriately regarding the delivery and content of the courses. In the learner survey, 35% of the respondents (17/49) stated that they were recommended the course by their employer, therefore addressing the needs of the employer; however, as not all registered learners completed the survey, the reality is likely much higher. At Swansea, for example, 71% of the learners (95/133) registered interest via their workplace.

The registered learners spanned a wide range of ages (see Figure 3), potentially reflecting a variety of career stages.

2.2 Delivery Mechanism

As the courses were delivered separately from the standard undergraduate modules, universities had the opportunity to trial different delivery mechanisms. Two-thirds of the courses were delivered using a blended approach involving mostly online study accompanied by some in-person sessions. The majority of the courses were 10 weeks in length.

The learner survey explored the importance of the delivery mechanism being used (see Figure 4). Whilst there was a mixed response towards in-person delivery, many declared that the courses being blended or fully online was either important or very important.

2.3 Completion Rate

72% (253/349) of the learners completed with a 91% pass rate. 710 credits were awarded in total to the 65 learners who completed the micro-credentials, with the remaining learners receiving certificates of completion for the micro-provisions.

As the courses were free to sign up for, the motivation of learners to participate and attend was lacking in some cases. Where the courses had an element of face-to-face study, this was much less of a problem; however, those that were (predominantly) delivered online had a much higher withdrawal/non-engagement rate. Some learners also withdrew due to underestimation of workload and personal circumstances.

2.4 Challenges

This section describes the challenges this project faced and some of the solutions that were found to overcome them.

2.4.1 Course Approval. Initially, the most time-consuming task at each university was obtaining approval to deliver micro-credentials. Each university has different quality and approval processes, with
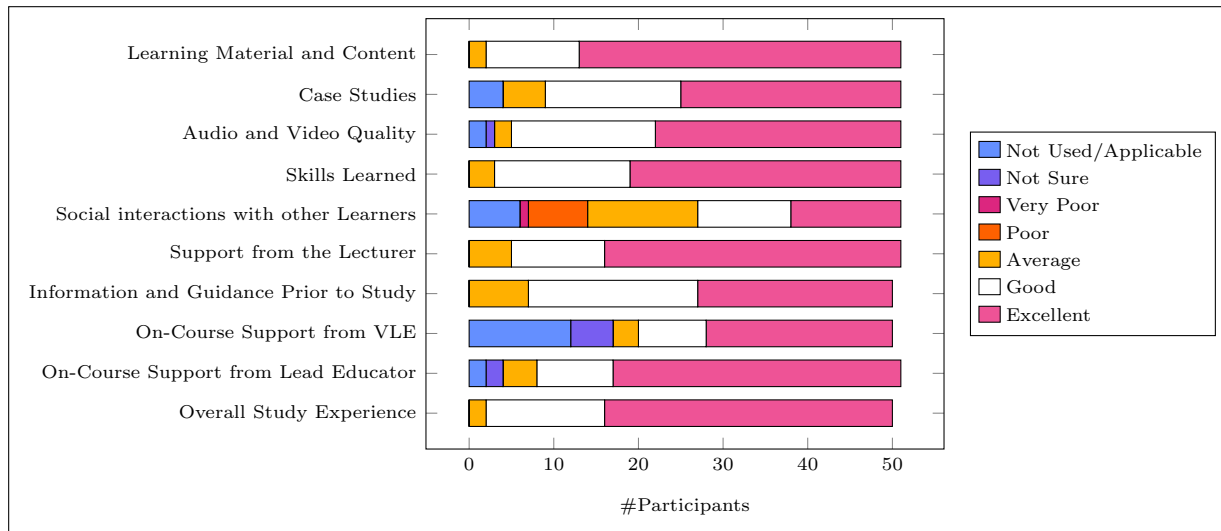
Figure 5: Course Ratings

most taking six months or more to develop and sign off new programmes. As these courses were not to be part of a larger programme, some universities were able to speed up this process.

2.4.2   Existing Systems. Though all universities attach credits to modules, these modules are part of larger programmes; offering a course as a standalone option with credits was a new concept to the majority. The existing systems were not built for this type of use, and so in some cases "hacks" were put in place in order to be able to approve them, for example, by placing all micro-credential courses into a bespoke micro-credential programme so that they were able to be attached to learners' records.

2.4.3   Regulations. Some universities used existing regulations, whilst others investigated and developed new regulations. At Swansea for example new Professional Learner regulations were developed during the life cycle of this project.

2.4.4   Marketing. The bootcamps delivered as part of this project were not targeting the same audience as standard university programmes. Thus, the marketing for these courses needed to be bespoke. Technocamps developed a dedicated webpage to advertise all of the bootcamps delivered across all universities. The IoC in Wales supports a Business Liaison Officer, who would contact local businesses, firstly to understand their needs and requirements, and then later to promote micro-credentials that were developed as part of this project. This process ensured that the courses were fit for purpose, local businesses encouraged their staff to sign up, and learners were able to upskill in areas desired by local industries.

2.4.5   Induction. The majority of the bootcamps offered required no prior experience or skill level. As a result, a diverse set of learners was attracted, with many having little to no digital skills or experience of university-level learning. Additionally, as the period of enrolment did not usually align with standard timelines, learners were not provided with standard resources/opportunities enabling them to familiarise themselves with the learning environment or

university expectations. As the first to deliver and thus experience these issues, Swansea University developed a basic induction covering the relevant systems, course expectations and shared this with all other universities to do the same prior to the start of their courses.

3   LEARNER FEEDBACK

Feedback was gathered both via standard university-led module surveys and the learner survey. As seen in Figure 5, most feedback was very positive with the majority of ratings being good or excellent for every category of feedback obtained.

Respondents to the learner survey were provided with a 5-point Likert scale and asked *"How likely would you be to recommend this course to others thinking about studying?"*; and *"Having studied this course, how likely are you to study another course with this platform?"*. 96% confirmed they were likely or extremely likely to recommend the course to others, with 84% likely or extremely likely to study another course. When asked to provide feedback on these answers one learner wrote *"I've put down extremely likely because I don't think that you'd get as much value anywhere else. This course has been provided by an established academic institution which had a good reputation as a university, something I think a lot of online training providers can't compete with."*.

Other reasons participants provided describing why they would likely study another course were:

- *"Hours easier to fit with shift work"*
- *"Easy to plan and fit the course in my schedule"*
- *"Easy to access"*
- *"It's very convenient way of learning"*
- *"I'd like to do more in a part-time basis to further my education and professional development"*

The reasons for being less likely to further study typically related to their current work schedule, personal life or the level of commitment expected.

4 NEW PATHWAYS INTO HIGHER EDUCATION

Due to the flexibility and accessibility of the micro-credentials delivered, they are much less intimidating for learners than a traditional degree programme. As described in the QAA Micro-credentials Characteristics Statement [7], they have a recognised role in up-skilling and reskilling the workforce and in creating accessible pathways into higher education. Micro-credentials open the higher education market to those who previously thought they would not suit higher education or those who could not access it, thus addressing the social mobility problem affecting large communities in Wales [8]. They also provide the option for learners and employers to access courses as and when needed, only addressing gaps in knowledge as they are discovered.

At the end of the project, high-achieving learners at Swansea University were approached to discuss the potential of enrolling on the Applied Software Engineering Degree Apprenticeship programme; Two successfully applied for a position on the programme starting in 2022, with a third looking to change roles to be able to join the programme in 2023. This can only be seen as a great success, highlighting a new pathway into higher education with micro-credentials being utilised as a stepping-stone, providing learners with an insight into higher education before committing to longer programmes of study.

4.1 A Model for Stackable Micro-Credentials

As part of this project, a *pathway* was drafted, which would allow learners to accumulate or *"stack"* credits from micro-credentials earned at different universities, resulting in a *Certificate of Higher Education* being awarded by one of the universities [5]. This could potentially be used to gain direct entry into the second year of a relevant university degree programme. The proposal requires that a minimum of 40 credits be obtained at the awarding body, and would include:

- 20 credits in programming;
- 20 credits in software engineering practice;
- 15 credits in concepts (eg, systems and architectures);
- 15 credits in logic and (discrete) mathematics;
- 15 credits in computational thinking.

The remaining 35 credits would be a free choice, allowing learners to select modules that suit their preferences.

5 CONCLUSION, LIMITATIONS AND FUTURE WORK

The pilot project described in this paper successfully allowed universities to consider the use of micro-credentials; indeed some managed to implement and deliver them. With 253 learners successfully completing micro-credentials and micro-provisions, there is clearly a market for such courses.

The data collected in the learner survey provides insight into the experience and opinions of those on such courses; however, as not all learners completed the survey, it is difficult to generalise these findings. Additionally, many learners participated in the courses for a significant period of time but did not complete them. It is difficult to capture the impact of the courses on these learners as there are

no measurable outcomes. The data collected and obtained by each university also differs depending on the enrolment criteria, thus making drawing conclusions more difficult.

The grand ambition, as described above, is to develop the mechanisms for stacking micro-credentials across a number of universities to obtain a Certificate in Higher Education. However, it is a grand ambition to create and implement such a novel programme, fraught with local regulatory complications; more time – and government support – is needed to fully explore and implement such stackable, portable qualifications. To this end, follow-up funding was provided by Welsh Government to further develop the catalogue of IoC in Wales Digital Skills Bootcamps, with a target of delivering 30 micro-credentials in 2023 to 600 learners.

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