



Barr, M. , Andrei, O. and Kallia, M. (2023) Widening access to higher education through degree-level apprenticeships in software engineering. In: IEEE ASEE Frontiers in Education Conference (FIE 2023), College Station, Texas, 18–21 October 2023, ISBN 9798350336429 (doi: [10.1109/FIE58773.2023.10343199](https://doi.org/10.1109/FIE58773.2023.10343199))

The material cannot be used for any other purpose without further permission of the publisher and is for private use only.

There may be differences between this version and the published version. You are advised to consult the publisher's version if you wish to cite from it.

<https://eprints.gla.ac.uk/303409/>

Deposited on 24 July 2023

Enlighten – Research publications by members of the University of
Glasgow

<http://eprints.gla.ac.uk>

Widening Access to Higher Education through Degree-level Apprenticeships in Software Engineering

Matthew Barr
School of Computing Science
University of Glasgow
Glasgow, Scotland, UK
Matthew.Barr@glasgow.ac.uk

Oana Andrei
School of Computing Science
University of Glasgow
Glasgow, Scotland, UK
Oana.Andrei@glasgow.ac.uk

Maria Kallia
School of Computing Science
University of Glasgow
Glasgow, Scotland, UK
Maria.Kallia@glasgow.ac.uk

Abstract—Equality of access to higher education is a priority for governments the world over. For example, the United Nations Sustainable Development Goal relating to Quality Education includes a target to “ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university” by 2030 (United Nations, 2022). For those from areas of relative socioeconomic deprivation, the cost of studying for a degree qualification represents a barrier to participation. As such, apprenticeships and similar forms of work-based learning are cited as a means of overcoming this barrier, offering students an opportunity to earn a wage while pursuing their degree. The work described here explores how – and to what extent – a work-based degree in Software Engineering has facilitated wider participation in higher education, through a series of in-depth interviews with apprentices from relatively deprived backgrounds. Analysis suggests that economic considerations are chief among the concerns of apprentices from areas of deprivation; however, the relevant factors are evidently intersectional in nature, and often intertwined with a wider range of personal circumstances, including the effects of previous choices about education and work. As such, we believe this work has implications for how we understand the potential for work-based degrees in Software Engineering and Computing Science to widen access to higher education, and for universities to contribute to achieving the United Nations Sustainability Goal of affordable and quality technical, vocational, and tertiary education.

Index Terms—Inclusivity, Socioeconomic status, First generation, Student diversity

I. INTRODUCTION

Widening access to higher education is a priority for governments the world over. For example, the United Nations Sustainability Goal relating to Quality Education includes a target to “ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university” by 2030 [1]. In Scotland, where this work was carried out, the Government’s Commission on Widening Access has recommended that “by 2030, students from the 20% most deprived backgrounds should represent 20% of entrants to higher education” [2]. Here, the 20% most deprived areas are those identified by the Scottish Index of Multiple Deprivation (SIMD), which offers a relative mea-

sure of deprivation based on income, employment, education, health, access to services, crime, and housing [3]. Universities, including the host institution here, thus use the SIMD as a means of identifying students from a widening participation background, based on their home address.

The literature suggests that factors including social status, gender, and ethnicity influence participation in higher education [4], [5]. Previous work has explored how young people’s aspirations to attend university are influenced by social factors, such as their parents’ occupation [6]. However, other work has found that such aspirations do not vary with levels of deprivation [7]. The influence of ethnicity also appears complicated, with students from ethnic minority groups less likely to receive offers from the most prestigious universities [8], while, simultaneously, children from minority groups are more likely to express an aspiration to attend university [6]. Meanwhile, the influence of gender on participation in higher education is further complicated here by the fact that, while girls are generally more likely to study at university [9], Computing Science is a notoriously male-dominated subject [10].

In this paper we investigate apprentices’ experiences and perspectives on a work-based degree (the ‘Graduate Apprenticeship in Software Engineering’) to understand apprenticeships’ potential to contribute to wider participation in higher education. Therefore, the main research question of our study is: *How does a work-based degree facilitate wider participation in higher education from the apprentices’ perspectives?* In order to contextualise the work, we also explore the factors that our apprentices identify as having impacted their participation in higher education.

II. METHOD

Study participants were selected on the basis of their home address, using the aforementioned national index of deprivation that characterises a specific geographical area, based on income, employment, and other socioeconomic factors [3]. Many universities, in countries including Australia, Canada, and the UK, use such indices as a means of identifying students from a widening participation background. Here,

students from areas deemed to be most deprived are flagged as such in the institution's records system.

A total of 12 students took part in the interviews. Five participants identified as female, and the remaining seven identified as male. Eight of the participants identified their ethnic group as White Scottish, a further three identified as White, and one participant identified as Asian British Pakistani. Ethnic group classifications were based on those used by the UK's Higher Education Statistics Agency¹.

Interview questions were developed with reference to the literature, as summarised above. Thus, the participants here were asked to reflect on the influence of a range of factors affecting their decision to pursue a degree-level apprenticeship in Software Engineering. Questions touched on socioeconomic factors including the influence of the students' parents or carers and their jobs [8], school performance [11], and the cost of studying at university [12]. Aspirations and expectations around attending university were also explored [6], before moving on to discuss the influence of participants' gender and ethnic group on the decisions they had made about their studies [5].

Interviews were audio recorded and transcribed for thematic analysis. A deductive approach was taken to this analysis, with the literature described above providing the "lens through which to read and code the data and develop the themes" [13, p. 10]. As such, the themes agreed upon by the authors were identified as *Parental Influence, Expectations & Aspirations, School Experience, Financial Cost, and Gender & Ethnic Group*. Each of these themes was reflected in the interview questions, and an additional theme, corresponding to an initial question about the influence of participants' 'widening participation' status, was also identified a priori. Following published precedent [14], [15], a hybrid approach to analysis was intended; however, following inductive analysis of the interview data by two of the three authors, no significant additional themes were identified.

Ethical approval for the study was granted by the host institution's College Ethics Committee.

III. RESULTS & DISCUSSION

A. Widening Participation Status

Participants were asked to reflect on whether their 'widening participation' status – as determined by their home postal code – had influenced their decision to undertake the apprenticeship, or, indeed, to attend university at all. Participants' responses varied from being fairly certain that where they had grown up had influenced their academic choices, to not seeing any real connection at all. For example, one participant connected where they lived with their lack of career aspirations: "*I think definitely...I was working in retail; I was working in sales. That wasn't for me. I was basically living pay cheque to pay cheque and I didn't really have any career aspirations.*" (Participant 4). Aspirations in relation to attending university are discussed in more detail below, but it is notable that at

least one other participant alluded to career aspirations when asked about the influence of their postcode:

I didn't see a future where I was working before... I was pretty much at the top of the ladder but they were still paying me peanuts... But, doing the [Graduate Apprenticeship], because I'm working in business, has given me a big ladder to climb. – Participant 2

Others were less certain about the impact of where they lived, for example, "*Not, not necessarily no...I think maybe people from my sort of area don't really go to university. They tend to go into a trade.*" (Participant 10); "*Not particularly. I know what you're maybe getting at, like I need to maybe do well because I was maybe disadvantaged...But I don't think that really influenced my decision, no.*" (Participant 6). Another participant felt that because the school they attended "*was a bit rough*", a particular teacher went the extra mile to encourage and support their interest in computing:

There was one teacher that was very invested in me. So, he done like a coding thing and he specifically made the club and he wanted me, he asked me to join it. And then from that age, he's always been, like, really invested. So, maybe because he maybe knew it wasn't a great school, he tried to pick out the ones that he had really liked. So maybe it helped in a backwards way. – Participant 12

Finally, one participant noted the fact that their parents did not attend university, stating, "*Maybe not for me as much, but my mum and dad didn't go to uni so maybe that is to do with where we are from.*" (Participant 2). This observation connects with the next topic of discussion, that of parental influence.

B. Parental Influence

The professions of the participants' parents covered a wide range of job roles, including speech and language therapist, photographer, bus driver, pharmacy dispenser, structural civil designer, nurse, teacher, ship builder, electrician, gardener, engineer, and accountant, plus roles in quality assurance and health and safety. Two of the participants noted that their parents had completed a traditional apprenticeship: one as a miner and the other as an electrician.

Overall, however, parents' professions did not seem to be a significant factor in influencing the participants' career choices, in contrast to previous findings [6]. Indeed, several participants noted that their parents had not attended university ("*They weren't very highly educated. They only stayed in high school till they were like 16 and then left the moment they could kind of thing. [University] was never pushed... It was all me.*" (Participant 6)), or that they were the first generation of their family to do so. In fact, being the first member of the family to attend university was something of a driver for several participants: "*my mum, no-one in my household had been to university, so I think that thought as well, being... the one in the family that did actually go to university, get their degree, also I think was a bit of a driving factor*" (Participant 3).

¹Higher Education Statistics Agency, <https://www.hesa.ac.uk>

However, it was observed that parents were generally supportive of attending university, for example: *“my mum and dad have probably sort of encouraged me to go to university”* (Participant 10). Others were simply supportive of whatever their children wanted to do: *“My mum and dad were always very much, do whatever you want, go to uni, don’t to go uni.”* (Participant 2). Likewise, another participant explains their parents’ unconditional support:

I guess they were always very supportive. Like with me and my brothers, there was no pressure to do anything that we didn’t want to do or that kind of thing. None of us ended up going to university. My eldest brother, he went for two years. Well, he did go but didn’t end up finishing. And my other two brothers decided they just wanted to go straight into the workforce, and that was me as well. – Participant 9

A small proportion of participants did acknowledge the influence that their parents’ jobs had on their own academic interests, for example: *“My mum’s worked with computers... for decades... Like, my mum would have the laptop and whatnot, and that kind of got me introduced to them fairly early, and that sparked interest”* (Participant 13). Another participant recalls their mother bringing work home, although the impact appears limited: *“I have always been interested in technology... When my mum used to bring some of her work home I would help solder the wee circuit boards and all that. I would say that is like an influence to an extent, but not to into push me into go and do that for a living”* (Participant 5).

While the influence of parents’ professions is limited here, their hobbies and interests – specifically around technology – are also identified as having an impact, for example: *“My dad he...kind of, introduced me to computers and got me interested in them”* (Participant 1). Although, the same participant notes that *“He didn’t encourage me”*. Whether the intention was to encourage an interest in computing or not, another participant describes a similar influence:

My dad’s always sort of got me interested in computers, from like a very, very young age. Like I got my first console at three. I always like tinkering around with stuff. So, that’s probably, my dad is probably one of the biggest like influences for getting interested in computing. – Participant 10

C. Expectations & Aspirations

1) *Personal Expectations*: Several participants stated that they had always expected to attend university, regardless of their circumstances, for example: *“Yeah, I would say so. I mean, it’s kind of like one of those things I was hoping to do or like be fortunate enough to go to”* (Participant 7). One other participant was actively expecting to go to university: *“I’d always expected to go to university. I always tried to like get good grades in school so that I could go to university”* (Participant 10). While another saw university as a means of fulfilling their professional aspirations: *“I guess I, sort of, did.*

It just felt, like, the natural progression...I think I had expected to aspire to be a professional of some sort, and maybe that was the next step” (Participant 1).

However, for most participants who had expected to go to university, they did so simply *“because that is just what you did”* (Participant 2), or because they were unaware of other options: *“I thought, oh, I should go to uni because, you know, that’s what people do and I didn’t know, like, apprenticeships existed”* (Participant 4).

Of course, several of our apprentices never expected to attend university at all, although just one participant cited the possibility of undertaking an apprenticeship instead: *“For a while especially I was thinking of going to get an apprenticeship or maybe an academy or something”* (Participant 13). For others, their circumstances or family influence was a factor in thinking they would not pursue a degree; for example: *“because that is what my school pushed for the first time, pick your favourite subject and do it at uni”* (Participant 2). This was particularly evident for high-achieving students:

I would say, yeah. Like all through primary school and high school I was always in the top classes, so I assumed. And my school pushed it a lot. And I guess, it was just almost the expected thing to do, in high school anyway. It was, that’s just what you’re doing if you’re part, if you’re in these higher classes. – Participant 6

It is also notable that several participants clearly do not feel that being directed towards a traditional degree was in their best interests. For example: *“I feel like school just forces it upon you to just choose any degree and go to uni. That is why I just did that essentially”* (Participant 5); and, more definitively, *“[University] wasn’t on the radar, but, and I think I kind of resent this, I think school was kind of like, with the grades you’ve got, you have to go to university”* (Participant 8). This participant goes on to explain how they were actively discouraged from pursuing anything other than a traditional degree:

And it was almost like I was swayed off the apprenticeship path by the school as well. And I don’t know if that’s so you can then say how many students you got onto further education versus whatever. I did get the highest results of my year at school, but I was like, my parents had been on about an apprenticeship. No, no you don’t want to do an apprenticeship. You need to go to uni. – Participant 8

The influence of participants’ school experience is discussed in more detail below. There is a strong suggestion here that these students were not well served by the education and advice they received – either because alternatives to a traditional degree such as an apprenticeship were not well understood (for example, *“If I knew about apprenticeships sooner I would have probably just have applied straight out of school because it does give you the balance of working and uni.”* (Participant 5)), or because something like the Graduate Apprenticeship in Software Engineering did not yet exist. And,

as Participant 4 suggests, the steer towards a traditional degree resulted in a less successful outcome: *“So, then I was just doing a university degree that my heart wasn’t in”*.

2) *Aspirations*: A similarly varied picture emerged when participants discussed their aspirations in relation to university. For some, when they left school, university wasn’t appealing, for example: *“I just didn’t... I wanted to study everything and nothing at the same time, so decided just to get out into the real world”* (Participant 9); or, *“It wasn’t like a be-all, end-all, I need to go for a university degree”* (Participant 4). Some saw university is a hoop through which they needed to jump: *“Having a degree just that alone hasn’t really ever been something that’s... It’s, kind of, just been a means to an end in my mind and it hadn’t been, like, this coveted goal”* (Participant 1).

Likewise, another participant, now attending university via the Graduate Apprenticeship, would happily have avoided higher education if they could have obtained the job they sought without it: *“I didn’t really always want to, though. That’s probably why I went down the apprenticeship route, because I don’t really like exams... If I could go a route down without having to [go to university], then yeah, I wouldn’t have done it”* (Participant 12). And, connecting with the sentiment identified above, in relation to how university was promoted at school, one participant was quite clear that not everyone should aspire to higher education:

I disagree with what unis, high schools do, and they push you down that path... I think it’s not for everyone and I think that it shouldn’t just be that’s what you do. I think...you should be encouraged maybe to take a year out, or like really think about what you want to do kind of thing. – Participant 6

Perhaps more notable still is the repeated suggestion that schools actively discouraged students from pursuing any form of apprenticeship. The following participant, for example, describes how apprenticeships were perceived – and presented – by their school:

Apprenticeships, in the least rude way possible, were for people who just had absolutely no chance, didn’t even think about going to uni. Like hairdressing, I could never do it, but that was looked down on as a wee silly apprenticeship you could do at school... It was all things like that and it was only people who didn’t like school that they were pushed for. God forbid if anyone that was doing well, was like, ‘I think I am going to do that’. They would be like, ‘no’. – Participant 2

Another participant enquired about Graduate Apprenticeships, but was steered away from this option by their school, despite opposition from their parents:

And I had asked about those and my school were still like, you want to go straight to uni. You don’t need to do, you don’t want to do this apprenticeship sort of thing. Why they said that, I’m not quite sure but it caused quite a bit of debate between me and my

parents. Me regurgitating what I’d heard at school versus them being like, why? – Participant 8

D. School Experience

As noted by [11], young people’s school experience is a factor that can affect participation in higher education, especially for those from more deprived backgrounds. These effects are, perhaps, more subtle than the impact of schools actively discouraging certain forms of continuing education, and relate to students’ academic performance and engagement in school – both generally, and in terms of specific subjects.

Strongly disliking school is, naturally, likely to discourage further study, for example: *“I really didn’t like school and I would have wished there would be, you know, some way just to get straight into working”* (Participant 1). Meanwhile, doing well at school means that the option of going to university is, at least, on the table: *“I done fairly well at the school. Like at higher; I think it was like almost straight As. A couple of Bs but like I done fairly well at school, so I thought, I wasn’t too worried about getting into university”* (Participant 10). However, the converse is also true:

I did poorly in school. I was just not very engaged... I did okay in my Highers... I didn’t leave with a National Five maths qualification though which turned out to be extremely important... Most of that was because of my, sort of, anxiety and how that all really ended up revolving around school, unfortunately. But I don’t know if that’s relevant to, like, maybe from a deprived area, but that, kind of, really impacted on my studies. Like, I didn’t do work outside of school because of that. I was very distracted when I was there. – Participant 1

In contrast, another Participant describes their school performance as “fairly decent”, meaning that the option of attending university “was always there” because they would obtain the grades necessary to attend. Again, this student felt they were pushed towards university by their school, based on their school performance: *“And it kind of felt, in my school anyway, it was kind of pushed towards, the grades I got was pushed towards university, not college. Like ‘you can do better than college’, even though it’s not really, but still”* (Participant 12).

Finally, one Participant describes how the circumstances at their school – specifically, a lack of advanced maths teaching provision – affected their choice of university subject:

I mean, I wasn’t a straight A student or anything like that, but I was always in the top credit classes [for] higher... I was also in advanced higher maths and physics... Well, I went down to higher physics and just dropped out of the advanced higher maths. Advanced higher maths was in a different school, and all my friends dropped out. And I realised that really it was just not a good environment. – Participant 5

Being required to travel to another school to study advanced maths is clearly an additional barrier to learning, and one that

would not be present in a better resourced school. In addition, the poor learning environment and the loss of social support have exacerbated the challenges faced by this student, with the result that they did not apply to study a maths-related subject such as computing at university. Instead, they enrolled on a psychology course, which aligned with their interests, but not their academic strengths:

I was always maths focused and problem solving focused in school. I'm not that good at writing at like English classes whereas psychology was English and yeah, like writing and discussion based. Whereas that wasn't really my strengths, but it was what I was interested in. Whereas computer sciences play into my strengths more. – Participant 6

A preference for certain subjects at school will, of course, have a bearing on what a student decides to do next. A student who excels at – or enjoys – technical subjects is, perhaps, likely to pursue a career in computing or a related discipline: *“I always sort of chose like practical subjects, or like computing science and like technical subjects that I did, like graphic design, I liked doing that sort of thing as well”* (Participant 10). However, if a student perceives their ability in one or more subjects to be limited, this could discourage them from pursuing further study at all. This was almost the case for one participant, who noted that they *“struggled in English”* at school which, despite enjoying computing and maths, discouraged them somewhat from applying to university: *“I know you have to, even on a computing course, you need to write a lot of papers and so that was a bit off putting, but I didn't think it was enough to justify not going”* (Participant 13).

Likewise, a perceived lack of aptitude for maths, for example, can discourage a student from pursuing a degree in computing. One participant, who *“got an A at higher computing but everything else was history, politics, geography, all that”*, decided not to study computing when they first attended university, stating that they would have done so if they had been *“a wee bit better at maths”* (Participant 2). As we have seen elsewhere, this participant therefore decided to study a different subject at university when they left school, before returning to undertake an apprenticeship in software engineering after their initial degree did not work out. Conversely, another participant, who was confident at maths, decided to pursue the subject at another university, with a view to becoming a maths teacher. However, despite assuming that *“it'll be fine”*, the student concluded that *“It wasn't fine”*, and dropped out. It was only after some *“soul searching”* that this participant realised they wished to pursue a career in computing, and the apprenticeship offered such a means.

E. Financial Cost

The cost of attending university is often cited as a factor that limits participation in higher education [12]. However, our data suggest that, for these apprentices, the issue is not entirely straightforward. Certainly, money is an issue for some, and the paid nature of a work-based degree course alleviates

the pressure to find a part-time job. A couple of participants here drew on their previous experience of attending university, for example:

I was working at the same time as I was studying the first time at KFC and partly because I'm going off to uni, I ended up in lots of stressful situations. Like it was just, kind of, difficult for me but I ended up choosing to go to work. You know, I was used to earning; basically working full-time. The apprenticeship seemed like the best of both worlds. I could support myself. – Participant 1

Likewise, Participant 2 also had part-time jobs to support themselves when they first attended university, noting that *“even though it is a bit harder that you have got a full time job [on the apprenticeship], yes, the fact you get paid to study is a motivation”*. For several participants, their main practical concern was balancing part-time work – unrelated to their degree – with their studies; for example, *“the more concern I had was at the time, I would have had university, football and a part-time job, so it was more just the time balance rather than the cost, I think”* (Participant 12). Similarly, Participant 8 recalls that balancing study with working up to four nights per week *“was a massive issue and that was why like the Graduate Apprentice so kind of appealing”*.

So, the cost of attending university is, indirectly, a factor here, because it means that students do not have to balance unrelated part-time employment with a full-time degree course. But being paid is, for some, not the sole reason for pursuing an apprenticeship degree:

But being paid, yeah, that's definitely a...it wasn't the main selling point but it definitely has helped and it has relaxed the, kind of, money concerns at home, big time. it's a golden ticket, essentially. If you get accepted onto this you get everything paid for, you get a job, you get the career. – Participant 3

Indeed, it is the promise of work experience and the associated career prospects that makes an apprenticeship appealing to many, for example: *“I don't want to do a degree and then get to the end of it and not be able to get a job.”* (Participant 12); or, *“it wasn't really for the money, it was more to get in a good fulfilling career”* (Participant 6). Or, as another participant suggests, it's about not taking the time out of their career (and losing out on four years' salary): *“I didn't want to learn and not earn. For four years, I would just lose momentum and I wouldn't feel valuable, I think”* (Participant 8).

Finally, underpinning many of these responses – particular those from participants who have previously attended university – is the idea that the apprenticeship offers a 'second chance'. As discussed above, young people do not always enjoy the best advice when they leave school, resulting in sub-optimal decisions about what they should do next. Opportunities to return to university may be limited by a number of financial factors, including the increased cost of university fees and the likelihood that older students will be burdened

with additional financial responsibilities: “*I wouldn’t have the financial ability to do a second course, which might be better or more suited to me*” (Participant 6). Another participant explains in more detail:

Any chance of going back to university would be gone, unless I got a stupidly expensive loan and got myself in... and there’s so much more stress and worry and, kind of, panic, like needing to do well. Whereas this way my employer is paying for it, and obviously there’s still I need to do well enough to keep my job and do all that. But it’s less of a personal financial burden. So, it does, kind of, remove that side of the stress. – Participant 4

We can observe in these data, then, that degree-level apprenticeships offer a means of overcoming the direct and indirect financial barriers to participating in higher education.

F. Gender & Ethnic Group

While the socioeconomic factors discussed above have – to a lesser or greater extent – proven relevant to our apprentices, the influence of factors relating to gender and ethnicity were found to be much less pronounced. While the literature suggests that these factors play a part in limiting participation in higher education [5], it is important to note that the ‘widening participation’ flag used to identify participants is based on *socioeconomic* measures of deprivation.

Female participants were largely dismissive of the idea that their gender had influenced their participation in higher education, with responses ranging from a flat “*No*” (Participant 10) to “*Not at all*” (Participant 9). Others, however, did acknowledge that their choice of subject could have been influenced by their gender. For example, one participant, who opted not to study computing when she first attended university, noted that “*In my computing class there is only me and one other girl and the same in advanced higher computing... Yes, I think that probably did have a wee influence subconsciously on what you are into*” (Participant 2). Another female participant also noted the gender imbalance in computing:

To an extent I think I noticed there is obviously in tech or computing science it is balanced more towards men than it is women. Even in my classes at school I think I was the only one doing computing science. I think that was quite daunting before I applied to go to uni, but it has not really stopped me from doing it. – Participant 5

Even in these cases above it is clear that participants feel the impact of their gender is limited. This is not surprising, given that these female students are already enrolled on a computing science degree. Gender imbalance in computing science education is a significant, multifaceted phenomenon in its own right (see [16] for an overview), which this study is not designed to examine directly. However, while the male participants generally did not think that their gender had directly influenced their decisions about higher education, several responses did acknowledge the potential subconscious

influence of being male, for example: “*I think I’m probably following on more of a traditional path, in that it’s still more accessible to someone like myself than someone not my, of not my trait, shall we say?*” (Participant 8).

In the previous quotation, the participant is referring to themselves as being male *and* white, which they go on to explain more detail:

Yeah, maybe more subconsciously, just in terms of... what the kind of stereotypical career paths are, you know. It’s always something that I’ve seen as open to me. And something that I am into doing, but as, you know, you would maybe see it as what you think someone of that kind of ethnicity might be into doing. – Participant 8

While most respondents do not see their ethnic group as a factor in their engagement with higher education, beyond acknowledging, as Participant 6 puts it, “*being White Scottish and male is the majority, or the norm*”, it must again be acknowledged that these are students already enrolled on a degree. In fact, one of the few participants to identify as other than ‘White Scottish’ was also keen to dispel the notion that their ethnic group was an influence:

From what I’ve like heard some people say, it can be a bit of a, like a stereotype in that sense. Because a lot of, like, Pakistani/Indian people do work in software engineering. But I don’t really think that’s influenced my decision on like that. It’s just fun to me, you know. It’s just like one of those things which is like, I want to learn more about. – Participant 7

In summary, there is evidence here for how the apprenticeship has helped overcome socioeconomic barriers to participation in higher education, but the study design – involving students already enrolled on the degree course – makes it difficult to examine the full extent of factors such as gender and ethnic group.

IV. CONCLUSION

While there is a broad understanding that work-based degree courses may improve access to higher education, little prior work has explored the experience of those ‘widening participation’ students who are now enrolled on a degree-level apprenticeship. In this paper, we set out to document these experiences, and to begin to understand how a work-based degree facilitates wider participation in higher education from the apprentices’ perspectives. Our work necessarily focused on the socioeconomic factors that prior research suggests may hinder participation in higher education, finding that some of these factors are more relevant to our apprentices than others.

For example, the nature of the job roles in which apprentices’ parents are employed has, according to our apprentices, had little impact on their own career aspirations. Further parental influence is limited to a few examples where the parents’ hobbies or interests may have sparked an interest in the *subject* that the apprentices eventually elected to study at university. Thus, we cannot say with any certainty that the

work-based degree considered here has interacted directly with the influence of parents' careers on participation in higher education, as this influence is limited.

The cost of attending university was also found to be a less direct influence on the apprentices interviewed here, although there are *indirect* influences that the apprenticeship has clearly addressed. For example, many of our participants acknowledged that financial pressures would require them to take up a part-time job to support themselves through a traditional degree, potentially to the detriment of their academic performance or mental health. Indeed, there were several examples where apprentices had previously attended university and dropped out of their course as a result – at least in part – of the difficulty of balancing a part-time job with university study. Another indirect effect of the financial cost is the perceived need to establish and develop a career as soon as possible, and not take the time out to pursue a degree before starting to earn a salary. A degree-level apprenticeship removes these pressures, as the participants here acknowledge.

More obviously in line with previous work on widening participation is the finding that many of our apprentices did not necessarily aspire to attend university at all. And, those who had previously attended university did so – for the most part – simply because there was a vague expectation that they would. This observation connects with perhaps the most notable feature of our findings: the influence of apprentices' experience at school. While performance at school will naturally influence a student's decision to study at university, and which subjects they might pursue, many of our apprentices reported that their experience at school had led them to conclude they should attend university even if this was not the right decision for them. Furthermore, several of our participants were discouraged from pursuing subjects in which they were interested – computing science, in this case – and advised against exploring any form of apprenticeship. As a result, many of our current apprentices have previously embarked on a university career that was almost certain to end in failure.

The Graduate Apprenticeship in Software Engineering, then, has provided students from a widening participation background – ill-served by the education and support they had hitherto received – with a second chance. For these students, the apprenticeship is an opportunity to pursue a degree qualification in a subject for which they possess a passion, whilst earning a salary means that the financial pressure of doing so is alleviated. Meanwhile, those students for whom the apprenticeship is their first experience of university have found a course that allows them to participate in higher education without facing some of the challenges typically encountered by students from a widening participation background. The results of this study suggest that apprenticeships do, indeed, have a role to play in widening participation in higher education. As such, work-based degrees offer a means by which universities can help ensure more equal access to education, in line with the aims of the United Nations Sustainable Development Goals – goals to which many higher education institutions aspire to contribute.

Future work should explore the impact of work-based degrees on widening participation in higher education in more detail; certainly, the picture revealed here is not straightforward. The apparently limited parental influence on these apprentices' decisions about higher education should be examined more closely, as this does not align with previous work on widening participation, and more subtle effects than this study was designed to detect may be present (for example, the impact of parents' cultural and academic background). The indirect financial impacts should also be examined in more detail, including how apprenticeships address the perceived loss of income (or career development) associated with traditional university courses and the challenge of balancing study with part-time work. To better understand these issues, any future work should involve more than one institution and aim to recruit a greater number and variety of apprentices.

REFERENCES

- [1] United Nations, "United Nations Sustainable Development - Education," Nov. 2022. [Online]. Available: <https://www.un.org/sustainabledevelopment/education/>
- [2] Scottish Funding Council, *Report on Widening Access 2020-21*. Edinburgh, Scotland: Scottish Government, May 2022, no. SFC/ST/06/2022. [Online]. Available: <https://www.sfc.ac.uk/publications-statistics/statistical-publications/2022/SFCST062022.aspx>
- [3] Scottish Government, *Scottish Index of Multiple Deprivation 2020*. Edinburgh, Scotland: Scottish Government, Jan 2021. [Online]. Available: <https://www.gov.scot/collections/scottish-index-of-multiple-deprivation-2020/>
- [4] J. T. E. Richardson, "Degree attainment, ethnicity and gender: a literature review," York, UK, 2008. [Online]. Available: <http://oro.open.ac.uk/11535/>
- [5] J. T. E. Richardson, J. Mittelmeier, and B. Rienties, "The role of gender, social class and ethnicity in participation and academic attainment in UK higher education: an update," *Oxford Review of Education*, vol. 46, no. 3, p. 346–362, May 2020.
- [6] A. Berrington, S. Roberts, and P. Tammes, "Educational aspirations among UK Young Teenagers: Exploring the role of gender, class and ethnicity," *British Educational Research Journal*, vol. 42, no. 5, p. 729–755, 2016.
- [7] W. Baker, P. Sammons, I. Siraj-Blatchford, K. Sylva, E. C. Melhuish, and B. Taggart, "Aspirations, education and inequality in England: insights from the Effective Provision of Pre-school, Primary and Secondary Education Project," *Oxford Review of Education*, vol. 40, no. 5, p. 525–542, Sep 2014.
- [8] V. Boliver, "How fair is access to more prestigious UK universities?" *The British Journal of Sociology*, vol. 64, no. 2, p. 344–364, 2013.
- [9] C. Crawford and E. Greaves, *Socio-economic, ethnic and gender differences in HE participation*. London, UK: UK Department for Business, Innovation & Skills, Nov 2015, no. 186186. [Online]. Available: <https://www.gov.uk/government/publications/higher-education-participation-socio-economic-ethnic-and-gender-differences>
- [10] E. Taylor-Smith, C. Shankland, S. Smith, and M. Barr, "Mobilising more women into computing," in *2022 SRHE International Research Conference: Mobilities in Higher Education*. Online: Society for Research into Higher Education, Dec 2022.
- [11] P. Boxer, S. E. Goldstein, T. DeLorenzo, S. Savoy, and I. Mercado, "Educational aspiration–expectation discrepancies: Relation to socioeconomic and academic risk-related factors," *Journal of adolescence*, vol. 34, no. 4, pp. 609–617, 2011.
- [12] T. Bowers-Brown, "Widening participation in higher education amongst students from disadvantaged socio-economic groups," *Tertiary Education and Management*, vol. 12, no. 1, p. 59–74, Jan 2006.
- [13] V. Braun and V. Clarke, *Thematic Analysis: A Practical Guide*. SAGE, Oct 2021.
- [14] B. N. Anderton and P. C. Ronald, "Hybrid thematic analysis reveals themes for assessing student understanding of biotechnology," *Journal of Biological Education*, vol. 52, no. 3, p. 271–282, Jul 2018.

- [15] W. Xu and K. Zammit, "Applying thematic analysis to education: A hybrid approach to interpreting data in practitioner research," *International Journal of Qualitative Methods*, vol. 19, p. 1609406920918810, Jan 2020.
- [16] B. B. Morrison, B. A. Quinn, S. Bradley, K. Buffardi, B. Harrington, H. H. Hu, M. Kallia, F. McNeill, O. Ola, M. Parker, J. Rosato, and J. Waite, "Evidence for teaching practices that broaden participation for women in computing," in *Proceedings of the 2021 Working Group Reports on Innovation and Technology in Computer Science Education*. ACM, 2022, pp. 57–131.