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## Evaluating a Peer Assisted Learning Programme for Mature Access Foundation Students Undertaking Computer Programming at an Irish University

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### Cover Page Footnote

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# **Evaluating a Peer Assisted Learning Programme for Mature Access Foundation Students Undertaking Computer Programming at an Irish University**

**Nevan Birmingham, Frances Boylan, and Barry J. Ryan**

## **Abstract**

Access Foundation Programmes are a widening-participation initiative designed to encourage engagement in higher education among underrepresented groups, including those with socioeconomic and educational disadvantage. In particular, mature students enrolled in these programmes experience greater difficulties making the transition to tertiary education, especially when they opt to study disciplines traditionally considered difficult. Computer programming is perceived as a traditionally difficult subject with typically lower pass rates and progression rates than other subjects.

This paper describes the first of a three-cycle action research study examining the perceived effects of a structured Peer Assisted Learning (PAL) Programme for mature students enrolled in a computer science programming module for an Access Foundation Programme in an Irish University. The focus of this qualitative study was to evaluate the perceived effect of a PAL programme on learning and whether it offered a positive learning support structure.

Findings from our study suggest that PAL programmes have an overall positive effect on subject comprehension as well as enhanced learner confidence for mature Access Foundation students. Furthermore, PAL sessions offered students a support structure that helped with their transition and acculturation to tertiary education. This study also highlights the importance the PAL leader's role has on the perceived effectiveness of the PAL sessions as well as the impact of the students' shared history on the near-peer bond. The study concludes that the implementation of PAL programmes for Access Foundation Programmes has the potential to offer mature students a supportive learning environment and to improve their learning experience.

## **Introduction**

In Ireland, formal education, based on a system of meritocracy, is free to its citizens (Skilbeck & Connell, 2000; Skilbeck, 2001; Trinity Access Programme, 2010). However, inequalities exist in both participation and outcomes based on multiple socioeconomic characteristics such as age, social class, disability, gender, and ethnicity, which result in educational disadvantage. Tertiary Access Foundation courses aim to address this unequal participation. As part of a widening participation strategy, it has been national access policy in Ireland for the last 30 years to provide targeted support for groups that have not previously benefited from full-time higher education (Higher Education Authority, 2015).

Access Foundation Programmes emerged in Ireland in the late 1990s to prepare adult students both academically and personally for their return to education (O'Reilly, 2008). These programmes, usually lasting one year, are designed to prepare students for an undergraduate programme in tertiary education by developing essential skills such as literacy, mathematics, and IT skills (Murphy, 2009). Today, all Irish universities run a form of access programme, each designed to address inequalities in access to tertiary education. Their aim is to encourage participation in higher education from underrepresented socioeconomic groups such as mature adults, persons with disabilities, and ethnic minorities (McMullin, 2017). However, for mature students—students over 23 years of age—this transition to higher education comes with its own unique difficulties.

While mature students tend to exhibit greater self-confidence, better communication skills, and higher motivation than traditional students, there are specific risk factors associated with mature learners returning to formal education including financial, psychological, academic, health, and social risks (Leonard, 1999; Twigg-Flesner, 2018; Skillen, 2019). In addition to these risk factors, research has shown that due to their increased external commitments, scheduling study time can be challenging for mature students, and this can impact their wellbeing (Raey, Stephen, & Miriam, 2002; Steele, Lauder, Anastasi, & Caperchione, 2005). These challenges can be compounded by mature students enrolling in modules that are particularly prone to higher attrition rates. In Irish universities, it is computer studies that historically suffers from the highest level of non-progression (Fleming, Loxley, & Finnegan, 2017).

Learning to programme a computer, sometimes referred to as “coding” in computer science parlance, is particularly challenging for students. In the technological discipline, computer programming is considered a fundamental skill for students, and understanding the underlying concepts is a central component of their learning (Piteira, Costa, & Aparicio, 2018). One global study indicated that, based on data from 161 universities and colleges, the average failure rates for an introductory programming course (CS1) was 28% (Bennedsen & Caspersen, 2019). In Ireland, computer science Level 8 undergraduate degree students are more likely to not progress in their courses when compared with other disciplines (Liston, Frawley, & Patterson, 2016). Previous studies offer potential reasons for the perceived difficulties with learning to program, including a lack of prior programming skill, a student's lack of self-awareness of their own deficiencies, and difficulties in integrating program design and comprehension knowledge (Milne & Rowe, 2002; Lahtinen, Ala-Mutka, & Järvinen, 2005; Costa, Aparicio, & Cordeiro, 2012). However, learner competence in programming can be achieved through the practice and application of the basic concepts of programming, beginning with simple problems and working towards more complex solutions (Winslow, 1996). Peer Assisted Learning (PAL) programmes have been used as an effective structure for novice students to learn programming through practice and active learner engagement (Altintas, Gunes, & Sayan, 2016).

This paper describes the first implementation of a PAL programme for a computer science programming module with Technological University Dublin's (TU Dublin) Access Foundation Programme. It will evaluate the perceived effect this implementation had on mature students enrolled in that course with

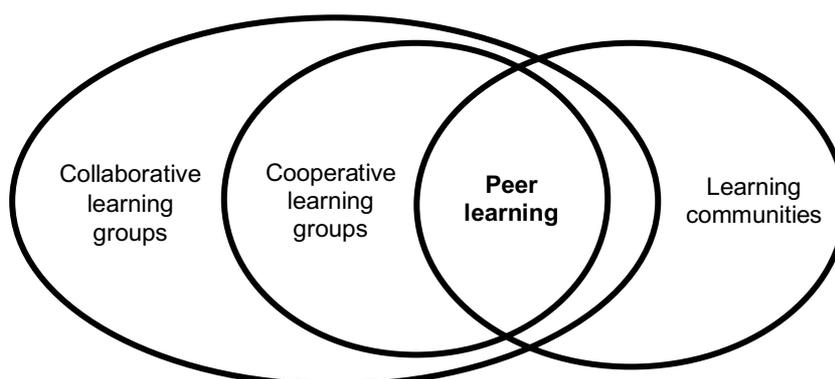
regards to their learning and whether participation offered them a positive learning support community. The programming module in this Access Foundation Programme is a 5 ECTS (European Credit Transfer System) optional course that instructs students in the basics of Java programming in preparation for an undergraduate degree in an Information Technology and Communications (ICT) programme within TU Dublin.

This iteration of PAL was implemented in the second semester of the academic year 2017–2018 and was the first of three qualitative action research cycles. Each cycle examined the findings of the implementation of the PAL programme, which in turn informed the subsequent phases. The study was guided by the following research questions:

- What are the effects of structured PAL programmes on the perceived learning of Foundation-level mature students in computer programming?
- Do structured PAL programmes promote a community of learning?
- What are the characteristics of the PAL implementation that make it successful?

### Literature Review

Peer learning encompasses a range of activities rather than any one single approach. It is broadly accepted as students learning from each other in an informal and formal setting (Boud, Cohen, & Sampson, 2014). Peer learning is based on the premise that cooperation is more effective than competition as a means for structuring learner independence and positive learning outcomes (Boud et al., 2014; Johnson & Johnson, 1987). While there is agreement that cooperative learning has the potential for positive effects on students, cooperative learning structures can be varied (Bossert, 1988; Slavin, 1990). Arendale (2014; 2019) endeavours to establish a relationship between the three cooperative learning constructs of collaborative learning, cooperative learning, and learning communities, as shown in Figure 1.



*Figure 1.* The relationship between cooperative learning constructs (Arendale, 2014).

The largest construct is collaborative learning due to its generalised definition; collaborative learning encompasses any interaction among students in a group dynamic regardless of structure. A subset of this collaborative learning is the

more defined cooperative learning, which is specific to its implementation. Learning communities utilise forms of peer-based cooperative learning activities as part of their pedagogy but tend to focus on integrating academic content from several courses. Drawing upon advantages from each, the intersection of all three is the domain of peer learning.

Peer learning is defined by Topping (2005, p. 1) as “people from similar social groupings, who are not professional teachers, helping each other to learn and by so doing, learning themselves.” It is through this act of teaching each other that students improve their own learning. Peer learning is based on the cognitive and social constructivist learning theories of Piaget, Vygotsky, and Rogoff (Topping & Ehly, 1998). Piaget (2013) maintained that cognitive conflict arises when new information does not fit into the existing mental schemas, resulting in a disequilibrium that requires an adjustment to accommodate this new knowledge. Vygotsky (1980) viewed interaction with peers as an effective way for learners to develop new skills. He maintained that less competent students can develop with the assistance of more skilful peers through a form of “expert scaffolding” managed within a zone of proximal development (Arendale, 2014). These theories were developed further by Ellis and Rogoff (1982) and Rogoff (1990) to show that peer tutors facilitate understanding through tailored guidance and the use of a common language understood by their peers (Topping & Ehly, 1998). Typically referred to as Peer Assisted Learning (PAL) in the UK, PAL is a common implementation of peer tutoring, a system of student support typically found in tertiary education institutes (Topping & Ehly, 2001; Smith, May, & Burke, 2007).

PAL builds on the principles and ideas of Supplemental Instruction (SI) to address poor retention and supplement the students’ learning experience (Wallace, 2003; Capstick & Fleming, 2004). SI was developed by Deanna C. Martin at the University of Missouri-Kansas City in 1973 as a student academic assistance program that aimed to improve student academic performance and retention in courses viewed as “traditionally difficult” (Martin & Arendale, 1992). A defining feature of SI is the use of regularly scheduled workshops targeting high-risk classes, as opposed to targeting high-risk students, to offer students an opportunity to improve their learning skills through collaborative and active learning (Arendale, 1994; Maxwell, 1998). While PAL shares many of the features of SI, PAL has developed its own distinct approach, especially in the UK (Capstick & Fleming, 2004; Capstick, Fleming, & Hurne, 2004).

As with SI, PAL is aimed at high-risk courses with conceptually difficult subject material and encourages student collaboration to supply missing information or help each other discover solutions to problems (Capstick, 2004; Congos & Schoeps, 1998). PAL programmes offer regularly scheduled extracurricular sessions facilitated by a fellow student undertaking the role of PAL facilitator or PAL leader. PAL typically operates in two modes: horizontal peer support, where students within the same year group support each other, and vertical peer support, where senior students support lower-year students (Black & MacKenzie, 2007). The latter is the more common model of implementation (Falchikov, 2001). The cross-level senior student is often one who has, at one time, taken the same module, has earned a high final grade in that module, and has shown to be competent in the subject matter (Arendale, 2014). These senior students acting as facilitators, in addition to tutoring in skills and subject knowledge, can offer reciprocal social support systems and can prove

to be powerful role models (Fantuzzo, Dimeff, & Fox, 1989; Parr & Townsend, 2002). To prepare the PAL leaders, most tertiary institutes provide training programmes, usually compulsory, to build leader confidence, interpersonal skills, presentation style, as well as to help them understand group dynamics and session planning (West, Jenkins, & Hill, 2017).

While the primary focus of PAL is to provide pedagogical advantages such as improved performance and student retention, it can also offer intangible benefits that transcend simple academic growth (Black & MacKenzie, 2007; Havnes, 2008). These benefits include improved learner confidence and self-esteem, and they have the potential to enable collaborative learning communities for students (Capstick, 2004; Black & MacKenzie, 2007; Havnes, 2008; Dobbie & Joyce, 2008; Cole, Rubie, Donnelly, & Groves, 2018). Other studies have shown that PAL programmes provide an opportunity for students to learn in a safe and enjoyable environment with facilitators who offer advice and study skills that can help them acculturate to university life (Glynn, MacFarlane, Kelly, Cantillon, & Murphy, 2006; Longfellow, May, Burke, & Marks-Maran, 2008; Hammond, Bithell, Jones, & Bidgood, 2010; Carr, et al., 2016; Cole, Rubie, Donnelly, & Groves, 2018).

An evaluation of a PAL programme in Bournemouth University suggested that PAL helped students to learn more effectively, better prepared them for class, and helped them manage their workload (Capstick, 2004; Black & MacKenzie, 2007). Their study also indicated that PAL had better prepared students for assessments and examinations, and that attending the PAL sessions gave them a clearer understanding of course expectations. A PAL programme run by the University of Liverpool's department of chemistry was shown to have a positive effect on both PAL leaders and student participants, outlining the importance of the partnership between students and staff for enhancing teaching and learning (Sedghi, 2013; Sedghi & Lunt, 2015). In an Irish context, studies at Galway-Mayo Institute of Education (GMIT) and Athlone Institute of Education (AIT) have shown that PAL programmes can help first-year students acculturate to tertiary education, increase their confidence, and provide them with a social environment in which to meet others (Ginty & Harding, 2014).

### **Research Methodology**

An action research approach was chosen for this qualitative study as it is an approach concerned with incorporating changes to transform reality and generating new knowledge (Coghlan & Brydon-Miller, 2014). Action research fundamentally reflects the social constructivist thinking of peer learning in its process and practice in that both have the search for meaning at their core (Sirca & Shapiro, 2007; Armstrong, 2019). McNiff and Whitehead (2009) maintain that the flexibility offered by the action research approach allows the researcher to create plans as they progress and, at the same time, allows participants and researcher to construct new meaning as they learn and interact. Our traditional action research approach consisted of three cycles of "plan, act, observe and reflect," and the first cycle of research was predicated by a pre-step reconnaissance phase to provide initial context for the study. The study acknowledged that research is value-laden, and hence the researcher adopted an interpretivist epistemological worldview that is subjectivist and constructivist.

The PAL programme for this first action research cycle took place during the second semester of the academic year 2017-2018, with the following two cycles taking place over the subsequent two years. The cycle was aligned with the computer science module delivered to Access Foundation students at the TU Dublin city campus. Optional attendance PAL sessions ran twice per week on campus every Tuesday and Saturday, and each PAL session was approximately two hours long. The module ran from January to April, and the timing of the PAL programme intervention was aligned to the module timeline, taking into account student timetables, module start and finish dates, bank holidays, and spring recess. As the focus of this study was to evaluate the perceived effect of a PAL programme on mature access students in this particular module, a purposeful sampling strategy was used. Eligible mature students enrolled in the computer science module were invited to participate in the study at the start of term. Former Access Foundation Programme students who had successfully graduated that programme and were enrolled in a computer science undergraduate programme at the time of the study were asked to volunteer as PAL leaders. These PAL leaders provided their time voluntarily and did not receive any remuneration for their role. Participation in the study was optional, voluntary, and informed consent was central to the research. An important ethical aspect of the research was that access to the PAL sessions was provided equally to both students participating in the research study and also to those who were not. Non-participating students included young adults and international students who were enrolled in the computer science module but were not eligible to participate in the study. This inclusion ensured that no student was disadvantaged by not participating in the study, whether by choice or by not meeting the eligibility criteria.

A total of 16 students enrolled in the computer science module, of which seven were international or young adults under 23 years of age, and nine were mature students. All nine eligible mature students agreed to participate in the study. Four former Access Foundation Programme students volunteered to undertake the role of PAL leader and participate in the study. This cross-year group consisted of two third-year students, a second-year student, and a first-year student who were studying in undergraduate computer science-related programmes. One day of training based on the SI training model was provided to all PAL leaders in January 2018, delivered in-house and on campus by the module lecturer. This training addressed PAL leader organisation skills, lesson plan creation, and leadership skills. The WhatsApp mobile app was chosen collectively by the PAL leaders for the purpose of communicating with students outside the PAL sessions.

The findings presented in this paper from this initial action research cycle emanate from the semi-structured interviews and reflective journals that investigated both the mature students and also the PAL leader experience of the PAL sessions. Weekly PAL leader journals and researcher journals were used for triangulation of data as described by Creswell and Poth (2017). Triangulation is a common validation strategy that utilises more than one source of data in a study of a research phenomenon. Journals were chosen for reflection as they could provide a disciplined means for capturing experiences and for participants to use their reflections to create further actions (Coghlan & Brannick, 2005). Semi-structured interviews were chosen to gain insights into the experiences, values, beliefs, and knowledge of the participants while allowing the researcher a level of flexibility to change wording and ask ad-hoc

follow-up questions depending on the context of the responses (Horton, Macve, & Struyven, 2004; Kumar, 2019). Member-checking, described by Lincoln and Guba (1985, p. 314) as “the most crucial technique for establishing credibility,” was used in weekly feedback sessions to bring researcher interpretations back to the participants so they could confirm the credibility of the narrative account. This strategy was used to better understand the participants’ perspective, and it helped identify any researcher bias by allowing participants to challenge incorrect interpretations.

Braun and Clarke’s (2006) thematic analysis approach, where emergent themes are linked closely to the data, was used to analyse the qualitative dataset. Thematic analysis was chosen as an appropriate and flexible inductive method that allowed for rich descriptions and nuanced accounts of themes through the systematic analysis of the data.

### Findings

Data from the reflective journals and semi-structured interviews with mature students and PAL leaders were analysed, and emergent themes were identified. These themes are summarised in Table 1, grouped according to the relevant research question.

Table 1

*The main themes that emerged from the data, organised by research question*

<p><b>Research question 1:</b> What are the effects of structured PAL programmes on the perceived learning of Foundation-level mature students in computer programming?</p>	<p><b>Theme 1:</b> PAL sessions influenced learner confidence.</p> <p><b>Theme 2:</b> PAL sessions influenced learner comprehension.</p> <p><b>Theme 3:</b> Participants were motivated to attend PAL sessions.</p>
<p><b>Research question 2:</b> Do structured PAL programmes promote a community of learning?</p>	<p><b>Theme 4:</b> PAL creates learning support structures.</p> <p><b>Theme 5:</b> PAL offers support to students outside of the PAL sessions via mobile apps.</p>
<p><b>Research question 3:</b> What are the characteristics of our structured Peer Assisted Learning implementation that make it successful?</p>	<p><b>Theme 6:</b> Environmental factors affect the success of the PAL sessions.</p> <p><b>Theme 7:</b> PAL leaders have a direct effect on success of PAL.</p> <p><b>Theme 8:</b> Training prepares PAL leaders.</p>

#### **Theme 1: PAL sessions influenced learner confidence**

One of the dominant themes that emerged was that attending the PAL session had a perceived impact on learner confidence. Two subthemes emerged to

describe distinct aspects of this confidence. The first was that attending the PAL sessions themselves improved student confidence through engaging with others. The other was that the PAL leaders had a strongly encouraging effect on the learners' perceived self-confidence. Feelings of confidence were closely linked to feelings of pride and accomplishment.

I could honestly say they cleared up everything in my mind and made me feel like I'm ready, I'm able, I can do this, I can do it. It generally gave me a lot of sense of pride or accomplishment (Student 3).

One student referred to confidence in terms of their ability to complete the coding task and produce a viable solution that worked. Other students stated that their confidence was derived from being able to help other students, that the act of explaining a concept improved their own understanding of the concept.

I can explain it fine, and the guy understands it from my explanation and I'm like, "Well, that's my confidence there" (Student 7).

### **Theme 2: PAL sessions influenced learner comprehension**

Students reported that the PAL sessions facilitated an enhanced understanding of the subject material. Student participants perceived coding concepts as particularly difficult to learn, and this created some anxiety. Reasons for this included that for mature Access Foundation students, coding was a completely new concept, and they had no prior experience with programming.

Computer science is totally different from anything else (Student 1).

Looks really advanced and it kind of scares you a little bit (Student 2).

The PAL sessions improved understanding of coding by enabling students to review complex concepts presented in the lecture and take the time needed to process them. Interacting with other students and practicing coding problems helped simplify complex concepts and in turn helped them learn the concepts.

The PALs just gave you more time to do the same of what you were doing in the classes and it just gave you, it gave you a great opportunity to "you do it" (Student 6).

This improved understanding also had a positive effect on how students viewed the course and the lecturers. For one student, it changed their undergraduate destination choice.

I was only talking about this this morning with my wife, and over the next week or two, I'm actually going to sit down and I'm probably going to change one or two of my choices on my CAO<sup>1</sup> and put computer science in place of one or two others (Student 6).

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<sup>1</sup> CAO: Central Applications Office processes applications for undergraduate courses in Irish higher education institutions.

**Theme 3: Participants were motivated to attend PAL sessions**

Student participants indicated that they perceived a value in attending the PAL sessions.

I found them very helpful, especially at the beginning because with the Access programme, I saw how many modules, you're getting pulled in so many different directions (Student 3).

This perceived value manifested in some students attending more than one session each week and stating that they would like to see PAL sessions offered in other subjects they perceived as difficult, with mathematics and engineering specifically mentioned.

The PAL session environment was seen to be more favourable than that of the lectures in programming, as lectures were seen to lack the student interaction of the PAL sessions.

And you're still in an environment like where it's a classroom and tutorials. You're not there with students that are helping you (Student 2).

A dominant motivation for attending the session was that students believed it could help their academic performance and hence their grades, and conversely that not attending the PAL session could have an adverse effect. Some attributed their success in the module directly to attending the PAL sessions.

I got to a point where I, if I'd had gone and done [sic], carried on or even given up going to it [the PAL sessions] at that point, I would definitely be failing computer science (Student 6).

Without a PAL session [and] having zero knowledge in coding, was impossible for me to even pass the test (Student 8).

**Theme 4: PAL creates learning support structures**

PAL sessions were viewed as a supportive learning environment where learning was both with and from other members of the group. Part of this group dynamic was sharing any new understanding back with the group. Watching other students solve a problem in coding helped them create their own cognitive construct as to the best solution, which in turn improved their overall understanding of the concept.

Like if you're alone there, you're lost, but if you're with someone, like you can help each other, and you look at each other and you work together (Student 9).

You're going to get support from people in the class (Student 2).

PAL leaders also reported recognising this effect, and they actively encouraged this group support structure.

Because I think the students learn more from the students, being in that same seat as everybody else, I think is a major thing that we overlooked (PAL Leader 4).

In addition to the PAL participants supporting one another, the PAL leaders also formed their own support structure amongst themselves for assistance and reassurance.

PAL leaders are in contact more, as seen on the WhatsApp group (Researcher Journal).

You know, you have your own doubts and whatever and then you speak to somebody else and it kind of gives you that little sense of comfort (PAL Leader 2).

#### **Theme 5: PAL offers support to students outside of the PAL sessions via mobile apps**

Students created virtual groups using the mobile communication application WhatsApp to communicate with each other and with their PAL leaders outside the scheduled PAL sessions. On a basic level, this tool was used to organise the session and to alert participants of any cancellations. However, it emerged from the findings that this medium was being used to provide help and support to students with coding problems when working alone. WhatsApp provided a virtual learning community in which both PAL leaders and students could offer support to each other beyond the scheduled PAL sessions.

Just know like you have some other [person] to answer questions if you have them. Really helpful (Student 9).

In addition to providing help with coding problems, this virtual support group was also used to offer students advice on topics not necessarily related to the course material. As the PAL leaders were former graduates of the computer science module, their advice was considered particularly valuable.

I was able to give them some advice on what they will handle in the college if they are going for computer science (PAL Leader 1).

I did notice from WhatsApp conversations and stuff they were very, very helpful with stuff outside of the course material as well as what was in the course material (Student 4).

WhatsApp was considered more instant than other mediums like e-mail, and it was a platform the students and PAL leaders were already familiar and comfortable with.

#### **Theme 6: Environmental factors affect the success of the PAL sessions**

Students reported that the environment of the PAL sessions was critical to their perceived success. PALs need to be organised, and students stated the importance of sequencing the PAL session after the laboratory sessions and the lectures to better structure the learning process.

After the lab, I think would have been hugely beneficial this year (Student 5).

Allowing a weekend and a weekday session to accommodate the other commitments of the mature student participants was important for flexible time management.

It was just really convenient. Like I have two children as well but still I can give up a couple of hours in the morning no problem on a Saturday (Student 3).

The physical space was important. Students wanted to use interactive mediums such as whiteboards for learning activities, but they stated that having technology available, for example a compiler program on a PC, was useful for confirming the accuracy of the solutions. A relaxed environment that offered a social dimension and a safe space to ask questions was viewed as important for the success of the PAL sessions.

I think it mattered greatly to me because look, on one hand it was, there was a social aspect to it, I was making friends, I was learning, I was thriving (Student 5).

#### **Theme 7: PAL leaders have a direct effect on the success of PAL**

In addition to the environment, the PAL leader was viewed by students as having an influential effect on their perception of the PAL sessions.

The leaders were excellent, like I said, before, they could have been teachers before, I wouldn't have known the difference (Student 3).

Personality is the reason, I think that's the reason the PAL sessions were so successful on a Saturday anyway, I think (Student 2).

However, PAL leader traits that were perceived as negative by the students were seen to have an overall negative impact on their perceptions of the PAL session.

I just thought there was, like [sic], there was like an impatience on behalf of the PAL leader (Student 5).

Like an anger or something emanating from the chap, like a bad vibe or something like that, it was something that reminded me of being in a classroom when I was a kid (Student 5).

I get the sense that he didn't really want to help people, he just wanted to get the experience (PAL Leader 4).

Students chose the PAL leader that they perceived to have the traits that made PAL a success for them. Students moved sessions to find a PAL leader that best matched their learning needs, reflecting the value they perceived in attending the sessions.

I changed and decided to go on [sic] the Saturday, which on a personal level was awkward for me, but it was better than going in and confusing myself more (Student 6).

Using former Access Foundation students as PAL leaders was perceived as having a positive impact on the success of the PAL sessions. The shared history

and experiences of the PAL leaders and student participants as Access Foundation students helped bond the group and build trust.

We all know where we started off, they started off the same place we did (Student 1).

### **Theme 8: Training prepares PAL leaders**

PAL leaders understanding their role was viewed as critical to the success of the PAL sessions, and training was a key aspect of this.

Maybe I didn't understand properly what to think or what you want from us as PAL leaders (PAL Leader 1).

It is definitely important to define clearly what the role is, so we don't overstep our mark (PAL Leader 2).

Training was viewed as essential in preparing the PAL leaders to plan their sessions and build their confidence, especially at the initial stages.

It can be completely overwhelming having students come in and they're completely brand new to programming (PAL Leader 4).

PAL leaders saw most value in training that simulates a PAL session and prepared them through role playing potential scenarios.

I definitely think more practical examples...maybe simulating some kind of peer group session and seeing how it works and stuff like that [sic] (PAL Leader 4).

In addition to PAL leader training, student participants also expressed a desire to be briefed on what was entailed in attending the PAL sessions. Not knowing the purpose of the PAL sessions or what to expect at the first session caused them some initial anxiety.

A bit apprehensive, I didn't know what to expect, what we'd be doing (Student 1).

Yeah, I was just a little bit nervous just because I wasn't sure what to expect (Student 2).

### **Discussion**

Mature students typically experience unique challenges when they engage with higher education. In Access Foundation Programmes, these are typically the students with lower levels of prior educational attainment, and they are particularly disadvantaged when they return to education. The findings from the first cycle of our action research study into a PAL implementation were overall positive.

The major benefits of a PAL programme were found to be improved learner confidence and subject matter comprehension. These findings are similar to the findings of studies in Bournemouth University that concluded that PAL can help improve understanding of both the basic and complex parts of a course by clarifying subject matter and helping students consolidate and construct

knowledge (Capstick & Fleming, 2004). Improved self-confidence and improved student motivation are two of the more commonly reported aspects of PAL (Wallace, 2003; Capstick, 2004; Ginty & Harding, 2014).

The PAL sessions also offered the participants a community of support that extended beyond those sessions, helping them acculturate to tertiary education. The findings of this study highlight the importance of the role of mobile communications apps, such as WhatsApp, for creating this learning community. Havnes (2008) similarly concluded that while peer learning is about individual learning, it also builds social communities in which learning is but one of the activities that occurs there. WhatsApp as an online collaborative learning tool can be used effectively to promote social learning and communities of practice (Nyembe & Howard, 2019).

An intangible benefit of PAL was that the sessions helped with the anxiety experienced by some students when undertaking a module that they perceived as difficult. This anxiety is not always immediately obvious to lecturers. The creation of a safe learning environment within the PAL sessions can lead to a reduction in feelings of intimidation (Capstick, 2004; Longfellow et al., 2008). Using former graduates of the Access Foundation Programme as near-peer PAL leaders encouraged a bond and social support structure that added value to the student experience and helped cultivate a more positive view of the discipline in general. Their shared history was an important aspect in building trust. Falchikov (2001) maintains that this near-peer bond creates PAL leader credibility that derives from students viewing them as having previously succeeded in the course. As a result, students may be less reticent about asking questions of a PAL leader than they would a lecturer. Capstick (2004) also concludes that PAL can address student anxiety through sharing experiences that create early awareness of university and course expectations.

PAL leader personality traits had a strong influence on the success of the PAL sessions. One issue that did arise was related to the effects a PAL leader can have on damaging learner confidence. Negative effects occur when the PAL leader lacks awareness of the role requirements or when the training does not adequately provide the skills needed to be an effective facilitator. PAL leaders adopting a more directional role than considered appropriate can arise from misconceptions or incorrect expectations of the role (Capstick, 2004). A study by Herrmann-Werner et al. (2017) concluded that to guarantee the high standards of a PAL programme, PAL leaders need to be adequately trained and regularly supervised. PAL leaders have less knowledge and experience when compared to regular teaching staff, and this inexperience can create difficulties for unprepared PAL leaders when confronted with deeper discussions in the sessions.

However, despite any negative impacts, PAL programmes offer a safe and enjoyable environment in which to learn, and all participants acknowledged the value the PAL sessions had toward their understanding of the material. This perceived value was particularly evident from the willingness of students to seek out the PAL leader they felt had the traits that most fit their learning style rather than abandoning the PAL sessions. Other studies have also shown that regular attendees to PAL sessions reported a positive perceived value in attending the sessions (Capstick, 2004; Zacharopoulou & Turner, 2013; de Menezes & Premnath, 2016). Building PAL sessions into regular student

timetables improves the students' perception of the value of the PAL sessions. Arendale (2014) similarly maintains that embedding PAL within the course can increase its effectiveness for the participants.

### Conclusion

Findings from the first action research cycle of this study suggest that PAL programmes can have a positive effect on learner confidence and subject matter comprehension for mature Access Foundation students. These PAL sessions also offer a learning community that continues to provide support to students outside of the PAL environment through smartphone communication apps. PAL programmes that focus on building skills in coding require an environment that students feel is relaxed and closely aligned with the course delivery. This study found that PAL leader behaviours and personality traits had a direct effect on the students' perceived effectiveness of the PAL sessions, highlighting the importance of PAL leader training in helping leaders to understand the scope of their role. There is a gap in the research on the perceived damage that a poorly matched PAL leader can have on the student cohort, and this is an area the authors feel warrants further exploration. While it is a limitation of this study that findings relate to one module in an Access Foundation Programme at one Irish higher education institution, the findings are relevant to other Access Programmes in similar organisations both nationally and internationally with mature student cohorts enrolled in modules traditionally perceived as difficult.

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