Using a Blended Learning Approach to support Women returning to STEM

Journal Item

Using a Blended Learning Approach to support Women returning to STEM

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Abstract

This paper examines a blended learning model designed to support women returning to STEM after a career break and its delivery in a unique partnership between an online distance education provider and a community based equality organisation. Through this partnership additional activities such as networking events, returnships, career clinics and webinars were used in addition to a structured online Badged Open Course (BOC), which enabled a successful return to employment for many of the participants. This paper outlines the results and implications of an evaluation of this integrated model and argues that blended learning approaches need to be flexible and adaptable to be able to incorporate the needs of different groups of learners at different life-course stages, taking into consideration gender and other diversity characteristics.

Keywords

Blended learning: Badged Open Courses; women returners; employability; gender; digital badging

Introduction

New forms of distance learning using online tools designed to maximise flexible study have made a step change in availability and access of educational opportunities, and this has included consideration of new forms of micro-accreditation such as digital badging to provide some assessment and recognition of achievement. While this has been successful for a large number of students, who often then move into more formal qualifications, there remain some contexts and groups who may benefit from the collaboration more usually associated with face to face learning, and thus the use of a blended learning format. This paper examines a unique blended learning model and its delivery through a partnership between an online distance education provider and a community based gender equality organisation who collaborated to support a group of women returning to STEM professions after a career break. Through this partnership, additional activities such as networking events, returnships, career clinics and webinars were used to supplement a structured online course, resulting in the successful return to employment for many of the participants. The paper outlines the results of an evaluation of the programme and discusses how a blended learning and flexible approach can successfully meet the needs of diverse student groups.

Women returners to STEM

Women returners are generally defined as women who are out of the labour market caring for family members (usually children) and are at the point of, or in the process of looking to return to work (Tomlinson, 2006). In fact, many women often are neither wholly in nor out, instead developing a strategy that sits between the two – 'opting in between' (Grant-Vallone and Ensher, 2011). Women also move in and out across the life-course so being a returner is not a permanent state nor is it necessarily a one off experience (Herman and Webster, 2010).

In reality, many are likely to have had iterative career breaks and movements between part time and other flexible work meaning they articulate their careers in different ways – sometimes as one continuous career, other times as broken or frayed, or position themselves as career changers (Herman, 2015).

Discontinuity of employment means all returners may encounter barriers finding suitable roles. However there are particular barriers faced by qualified professional women who seek to return to STEM occupations, including gendered work cultures within these male dominated sectors, as well as the location of employment options (Herman 2014). As a result, two thirds of women still return to lower skilled roles according to the PwC Women and Work Index (PwC 2016). The index shows significant underutilised potential to the tune of £4,000 per annum per woman (or £1.1 billion in total) and a potential additional £1.7 billion in economic output per annum, indicating a clear business case to address women returners' particular training and development needs.

Research found that an estimated 1 in 9 mothers, or 54,000 women every year, report being forced out of jobs following maternity leave (EHRC 2016). Those that are coming back after maternity breaks to their employing companies can benefit from in-company interventions and structural changes to enable them to succeed and resume sustainable careers (Hewlett, 2008). Those that have left the labour market completely often require additional support and interventions to help them with on-ramping, not least if they have been dismissed, made compulsorily redundant or treated so poorly they felt no choice but to leave. For these women returners, support mechanisms also need to address issues such as building confidence and resilience, as they require more than just an updated skillset to facilitate successful re-entry (Greer, 2013). Women seeking to return require structured identity work to enable them to first understand themselves and what they can offer, then successfully articulate their value to

potential employers. It is no coincidence that most successful programmes for women returners described in the literature have these similar features including pastoral support, childcare, personal development or coaching (Panteli, 2010, 2012; Doorewaard et al., 2004; Shaw et al., 1999).

Women in STEM were early adopters of online spaces for professional networking and career support (Donelan et al., 2009a). Online networking can be performed in a number of ways, supporting different objectives. For example, professional affiliations and identity may be maintained through institutions such as professional bodies; dedicated web forums can provide the opportunity for asynchronous discussions and exploration of ideas, topics and career directions, and the growth of social network sites including those specifically dedicated to career development such as LinkedIn are increasingly being used for job seeking and impression management. These networks enable STEM women to extend their access to other professionals including female role models, which can be particularly helpful in the transition back to work after a career break (Donelan et al., 2009b). Online networks can themselves become sites of empowerment and inclusion for women, for example the case of the 'Untold' network which was set up for women digital designers in London, and developed a website and as a platform to showcase work of the network members, thereby providing visibility and increasing employment potential (Lee, 2011).

The development of innovative feminist pedagogies using a range of learning technologies is expanding rapidly, including the use of virtual worlds to provide an enhanced sense of presence that enables supportive group interactions (Collingwood et al., 2012; Herman and Peachey, 2011). Feminist principles in e-learning are needed to 'take account of power relations between learners and students, empower users, build networked communities, respect diversity and challenge existing knowledge' (Kirkup et al., 2010a). However, it is

worth noting that educational policy that advocates women's distance education is often based on assumptions about women's domestic responsibilities and their inability to travel, which in many cases can be enabling, but at the same time serves to reinforce and polarise existing gender roles (Bergviken-Rensfeldt and Riomar, 2010).

Blended Learning

Claims have been made for improvements in outcomes using blended learning over traditional face to face teaching, such as the study by Lopez-Perez et al (2011) which suggests that blended learning can increase retention and improve exam performance. In a recent special issue of this journal, Cheung et al (2018) define blended learning as learning that "aims to integrate traditional learning with technology, such as e-learning and mobile learning, in order to create a new learning environment that enhances learning effectiveness and enriches the learning experience" (p.80). Some now go as far as claiming that blended learning has become so ubiquitous that it has become the new 'normal' (Norberg et al 2011).

In a systematic review of blended learning literature Boelens et al (2017) suggest there are four key challenges to designing blended learning: how to incorporate flexibility, how to facilitate interaction, how to facilitate student learning and how to foster an affective learning climate. In examining flexibility, they found very little evidence of programmes that were able to support student choice in flexibility of the blend, something that has been hailed as a potential benefit for blended learning. "Further work is required to gain more insight in the tension between providing maximum flexibility and autonomy for students (in terms of time, place, path, space, and control over the realization of the blend) on the one hand, and carefully taking into account the need for structure and guidance of (certain) students on the other hand." (Boelens, et al 2017, p 11).

In terms of social interaction Boelens et al (2017) found most that examples included some kind of introductory face to face session, and some ongoing online communication, but recommended further research into how this might be promoted better within blended learning models.

Much of the literature about blended learning starts from the position of the classroom face to face model, which is then augmented by adding online content and methods to enhance learning and increase retention (cf Dalgard and Godsk, 2007). In this study we take the opposite starting point, and examine how the addition of face to face communication and content has added value and increased the positive outcomes for learners enrolled on a Badged Open Course, which is further explained below. We wanted to discover whether having more types of interaction between participants would increase motivation and improve outcomes for those enrolled on the programme as has been shown in other contexts (Donnelly 2010; Hamdi and Abu Qudais 2018).

We argue that there should not be a 'one size fits all' model for blended learning. Previous work with women returners identified that approaches to employability need to take account of gender and life course in order to be meaningful for returners or career changers (Herman, 2015). There is also evidence that the use of blended learning can be used to support programmes of learning targeted at women, either as entrepreneurs or in gender segregated societies (Naaj et al 2018; Tupe, 2017). There is similarly a need for more nuanced understanding of how blended learning may be adapted to the specific needs of groups of learners. With 1 in 9 women being forced out of their roles whilst on maternity leave, women returners may struggle to return without external support due to gaps in confidence as well as technical knowledge and career development skills. Indeed it is clear that those engaged with teaching online believe that blended learning should be able to be designed in response to the

characteristics of different student groups, taking account of diverse needs (Boelens et al, 2018).

Digital badging has increasingly been used to provide micro- credentials for those engaging with informal learning such as MOOCs (Gibson et al 2013). Badged Open Courses (BOCs) have been developed as a way to accredit informal learning and increase the motivation of learners accessing free open educational resources (Law 2015; Law et al 2015). This has included a set of courses specifically to enhance employability skills. However the BOC design is for online learning, and does not include any face to face elements or indeed any online interaction. In the case study presented here, we explore how online resources may be used in conjunction with additional events and resources to add value and support positive employability outcomes.

The Returning to STEM BOC

The Returning to STEM Badged Open Course (BOC) was developed in 2016 to offer support for women returning to STEM careers after an extended break. This followed a series of initiatives to support women returners back in to STEM employment and education at the Open University UK, the most recent of which had used the unique affordances of online learning environments to engage with over 1000 women who had left STEM employment and were seeking to return (Herman et al 2011; Herman 2017). A follow up study of the participants identified a number of key strategies that had enabled women to successfully return to work in these sectors, as well as the gendered factors influencing their employability prospects (Herman 2014, Herman 2015). These findings, as well as case studies based on the success stories of returners, informed the development of the content and design of the new BOC.

A partnership project was initiated with Equate (a community based agency that supports women in STEM in Scotland), through the Open University in Scotland, and funding secured from the Scottish Government to develop a joint programme for women returners to STEM. A blended learning programme was devised that would enhance the effectiveness of the BOC by adding face to face interaction between the participants and providing a facilitator/ moderator which were not available in the design of the standard BOC environment. This responded to the evaluation of previous successful returners programmes, which had indicated the value of meeting others 'in the same boat' (Herman 2015, Herman et al 2013).

An additional innovation was to provide work placements with STEM employers (returnships) as part of the programme. Whilst Equate had offered open workshops, career clinics and topical webinars to women in STEM for some years, and had delivered a pilot returnship programme in 2016, this new partnership offered returners the first full programme of integrated activities with the added benefit of an online modular programme. This package provided a comprehensive, structured pathway to equip a pool of 40 returners to apply for either STEM returnship opportunities or advertised STEM jobs.

A project team was formed that designed an integrated delivery model combining the Equate returners programme, scaled up and revised following evaluation, and the Returning to STEM BOC, to produce a holistic learning and development package. A closed LinkedIn group was also created to require participants to use the platform, which was also included in both the BOC and many of the interactive interventions as a useful tool for networking and impression management, and as the forum for ongoing interaction. Delivery of all group interventions, and posts to the LinkedIn group, were made by the project lead and a specially recruited facilitator. A career coach was employed to deliver all the individual career clinics. This created a unique blended learning approach using both online and face to face methods, with individuals and in groups (Fig 1)

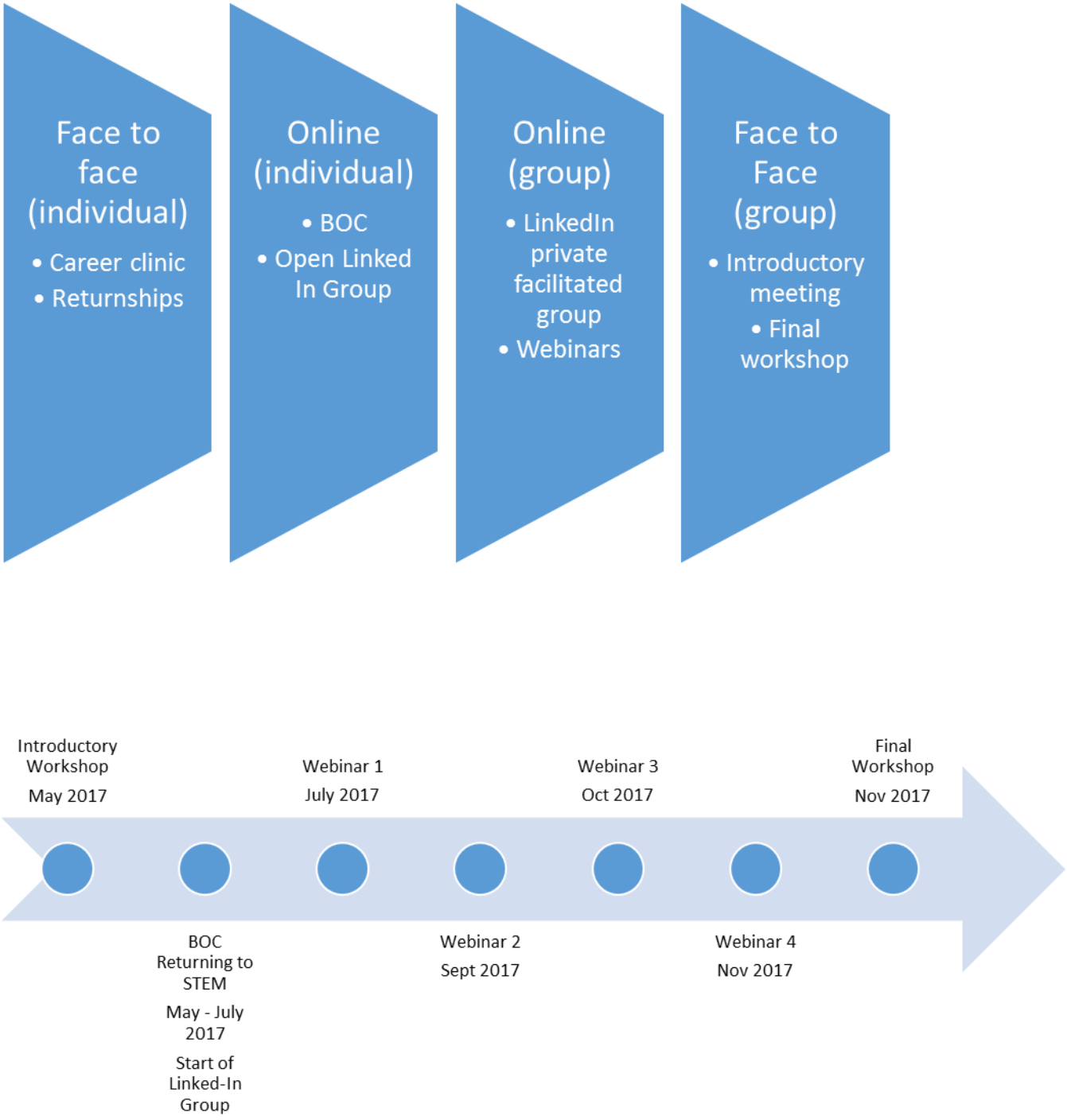


Figure 1 – Blended learning techniques used in the design of the Women Returners 2017 programme showing Project Timeline

Methods

The participants in the study were a cohort of 40 women in Scotland who took part in the programme in 2017. Equate advertised through their networks, their partner's networks and

social media for STEM qualified women, who had not had a STEM role in the last two years but wanted to return to work. There was no selection of candidates; providing they met the criteria they were accepted to the core programme.

The study used a mixed methods approach and was designed to take a holistic view of the integrated programme of activities, as well as individual elements of the blended learning model including the online course, career clinics and returnships, and the webinars. The original number of participants was planned as 40, so it was considered that quantitative data was important to establish the main themes for discussion and further analysis. Further qualitative evidence would also be gathered to illustrate and provide deeper insight into the main issues identified through the survey, and subsequent analysis could highlight crucial points for the success or failure of the project. Nuanced responses were also important to elucidate the impact of the different elements used in the project in terms of their learning and employability impacts.

The research team held regular Skype meetings to discuss operational issues as well as to examine and analyse the data being gathered, and the impact and outcomes for participants. In order to respond to emerging development needs identified by the participants, the research team needed to maintain flexibility to ensure that the evaluation study responded to such changes during the operation of the programme.

The tools used for the gathering of data were threefold: survey questions with both graded and open questions to acquire both relevant quantitative and qualitative data, feedback from face to face and webinars, and an hour long open interview with the LinkedIn and webinar facilitator. Qualitative data analysis consisted of content analysis of the various data sources gathered, namely the open comments in the survey responses, the written feedback from webinars and workshops, and the interview transcript. A mixture of conventional and summative approaches to content analysis (Hsieh et al. 2005) was applied.

The survey instrument was designed and tested by the research team, consisting of a series of questions using a Likert scale as well as open questions. All participants on the programme were invited to take part in the survey via Survey Monkey. It was initially advertised through the LinkedIn group and later a follow up/ reminder email was sent by the programme organiser which increased the number of responses. Quantitative data analysis carried out on the survey response data consisted of percentage calculations as illustrated in Figures 2 to 7. As response numbers were small (n=16) we did not carry out any further validation tests.

The research methods and their implementation in the fieldwork observed the principles of veracity, anonymity and confidentiality. All participants gave their consent to use the information derived from the survey. A confidentiality clause was included in the survey and used in subsequent contact with the participants. The participation of the participants was voluntary. Findings were triangulated via the quantitative and qualitative responses from the survey and feedback from the sessions, and further corroborated by the information gathered through the open interview.

The initial intention had been to interview a small group of participants, but this coincided with the time at which participants were undertaking returnships in industry and therefore these were replaced later in the programme by the observation of webinars. This change in methodology during the study responded to the changing circumstances and events. In this sense our approach adopted the principles of action research, since a major objective of the study was to arrive at recommendations of good practice to take forward the programme (Denscombe, 2002 cited in Bell, 2005:8). The programme deliverers used their interactions with, and ongoing feedback from, participants as well as their own observations as 'feedback loops'. As a result of this continuous process of reflection, 'the worth of the work is judged by the understanding of, and desirable change in, the practice that is achieved' (Brown and McIntyre, 1984 cited in Bell, 2005:9).

There is further explanation to be made regarding the inclusion of the feedback sessions following the webinars as part of the qualitative gathering process. Ongoing interactions between the pool of returners was essential to retain them and maintain their motivation. The initial workshop that launched the programme created a massive sense of excitement, community and peer support for the women who attended. The LinkedIn group was intended to be the forum to facilitate the informal interaction between the formal interventions, including peer communication that would be self-run and unmoderated, though prompted by the delivery team, for example by including prompt questions linked to the topics covered sequentially by the BOC.

However, during conversations between the delivering partners it became clear that since there was not a critical mass of users who were learning at a simultaneous pace, the LinkedIn group was not turning out to be an effective forum for collaborative exchange. However, the LinkedIn group delivered as a networking tool: some participants did often connect with each other and guest speakers on LinkedIn following face to face events or webinars, and were more likely to comment on the LinkedIn posts of those they had previously made a connection with. In this sense, with the LinkedIn group being underutilised as a forum, the use of webinars as well as the interactions between the deliverers and learners were crucial to gather feedback and understand the success of the process and the outcome of the programme. Reflection on the use of webinars and their impact was therefore incorporated in the study.

Results

In the results below we present qualitative and quantitative results of the survey, followed by analysis of feedback from the career clinic and webinars.

Survey Responses

40% of the original 40 participants (n=16) took part in the survey, which was made available for 3 weeks during July 2017. The Project co-ordinator and tutor posted regular messages in the LinkedIn group and then emailed the women individually to encourage them to fill in the questionnaire and share their views. This interaction was reflected in the increase in responses immediately after the communication had taken place. This effect suggests that the personal contact and trust built during the programme are of considerable importance.

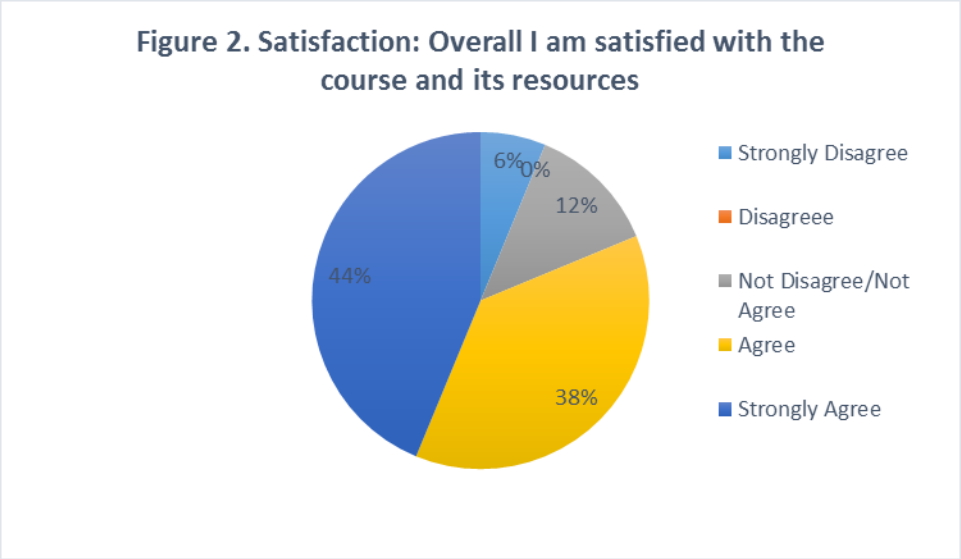
Experience of studying

One of the objectives of the survey was to understand whether the 'blend' in the blended learning was appropriate for this group. In particular we wanted to know how much time they had spent on the online materials and whether they felt this was adequate or excessive. Survey responses show an overall satisfaction of the participants regarding the content and time invested in the course. The average time spent was 3-5 hours per week with only two respondents declaring that they used more time than expected because of their motivation and added value that the course offered to them.

We were also interested in whether they had previously had any experience of online learning, in particular to understand whether the experience of undertaking a Badged Open Course would provide a route for them to continue further online study. The survey results showed that 44% were undertaking an online course for the first time, and that 60% would consider the possibility of undertaking another online course.

BOC content and delivery

Looking at the overall satisfaction, 81.5% of respondents expressed that they were satisfied with the course with 44% strongly agreeing and 37.5% agreeing (Fig 2).



When looking in detail, there are some areas that were more pertinent to the participants than others. For example, variables such as 'originality', 'excellence, 'challenge', 'impact' and 'organisation and responsiveness' reached an average of 70% to 80% of the responses[1].

In terms of the ultimate goal of the programme, the results showed the majority of the participants expressed confidence in their ability to succeed in returning to work (fairly confident 31%; very confident 37.5%). In their open comments, some participants reflected out how the course had fulfilled their expectations, but also how they gained focus, confidence and clarity in their search of job opportunities, illustrating that the course had supported them in their 'on ramping' (Hewlett, 2007) through their retraining, creating new contacts and networks.

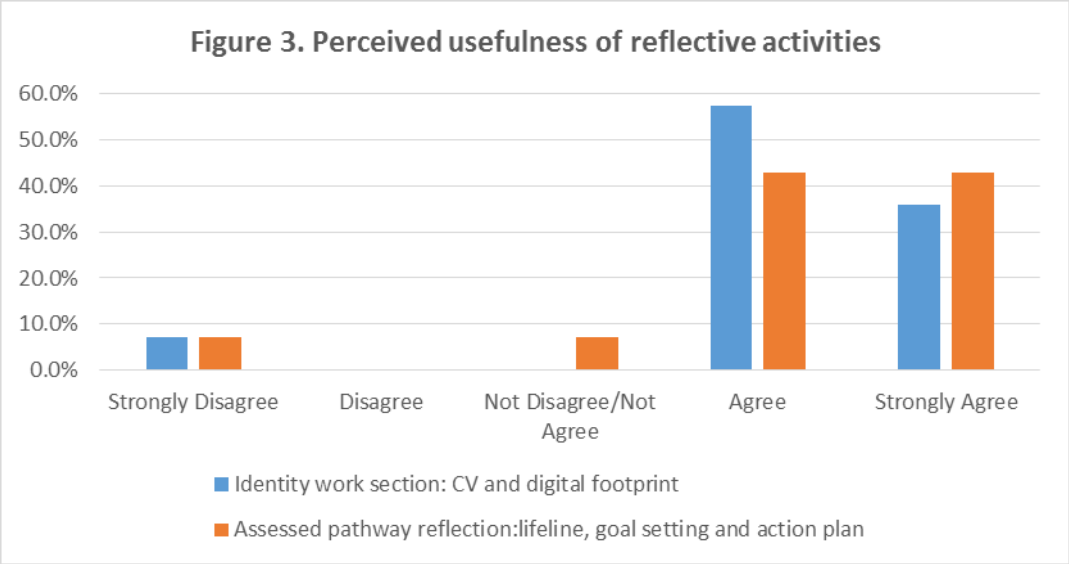
'It's been better than I'd imagined and has encouraged me to look seriously at why I don't have a job in my sector and what I can do to gain the confidence needed to work in a stem role'.

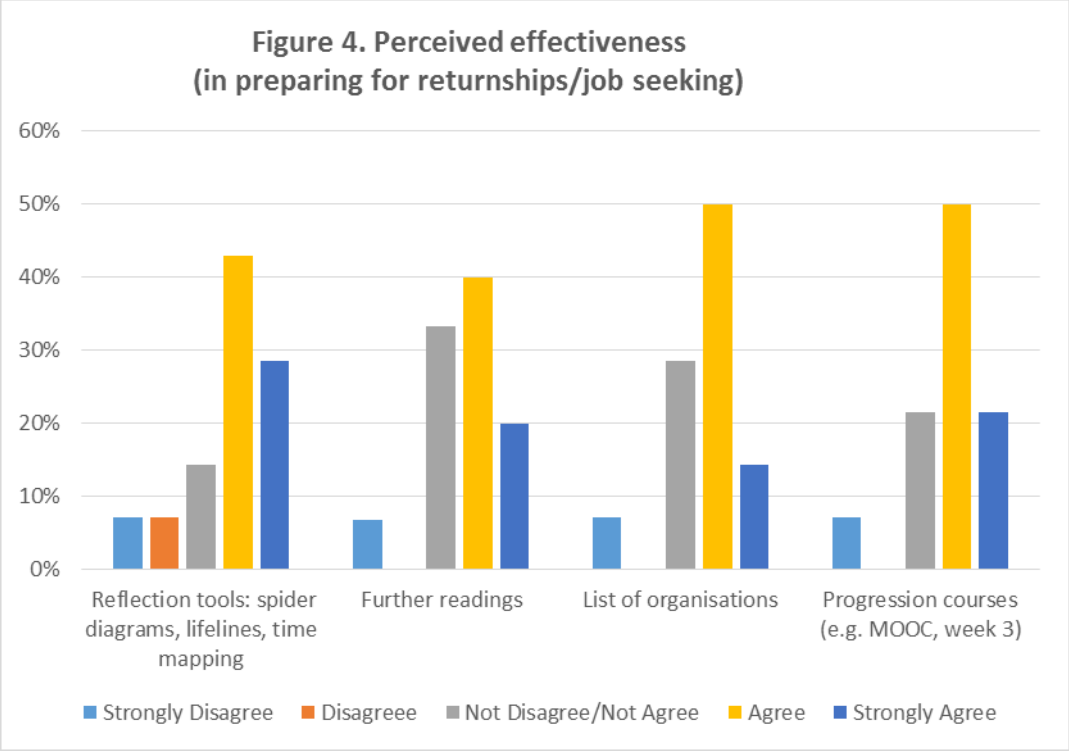
'The course has been useful in allowing me to reflect on what roles I have enjoyed during my career and therefore where to focus my goals and how/where to update my skills. It has also

[1]If the response 'agree' and 'strongly agree' are amalgamated. In fact, unless otherwise stated, the responses were divided among those two highest values with little variance.

given me a bit more confidence to ask about the different ways of flexible working when I do come to apply for a new role'.

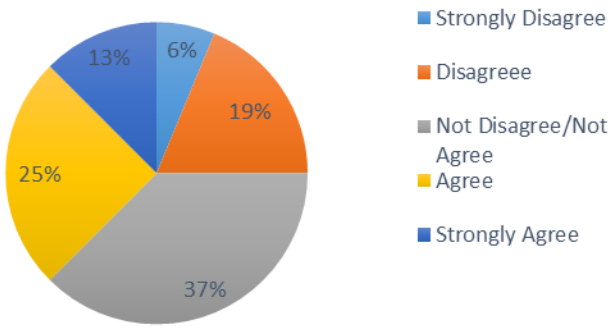
In terms of the tools to support them with their job hunting, respondents found the 'identity work' (Smith 2010) such as CVs and digital footprints most useful (see Fig 3), and the lists of progression courses and organisations most effective (see Fig 4).





One of the key characteristics of the blended learning model was to enable to participants to learn as a cohort rather than individually. We asked whether the group experience had supported their learning. 38% of the respondents agreed or strongly agreed that community had supported their learning, however a similar number (37%) expressed a neutral opinion, while 25% did not think the community had impacted on their learning (see Fig 5). The implications of this are discussed later in the paper.

Figure 5. Community: Working in a group supported my learning during the course (*shown in percentages n=16*)



LinkedIn Forum

An additional method for community building was planned with the provision of the LinkedIn Forum. This was considered to have been useful in terms of acquiring new skills and finding related information, it did not provide the platform for the community of support that was envisaged at the beginning of the forum.

However in practice this was only lightly used as an interactive forum - instead participants used it to search for information and as a platform to continue researching elsewhere. Moreover it was used by the project team for announcements, networking opportunities and reminders. Thus the LinkedIn group could be considered as 'passive engagement' (Smith & Smith, 2014) with participants continuing with their learning although belonging to a 'silent

community'. However participants were actively using other social media platforms such as Facebook (for seminars, courses, relevant organisations), Twitter (to investigate potential placements and companies) and YouTube (for interview skills and interpersonal tools).

Another aspect that might have an influence on the traffic in the LinkedIn group is its usability. It was pointed out by the participants, that there were some problems to register and it was not as intuitive as other portals and social media they used. In this sense, the portal is not very easy to navigate in terms of threads and developments compared to other online forum platforms. The fact that the visitors could not quickly spot the latest developments or see the focus of the thread, may have had an influence in its overall use and motivational value. One participant suggested Slack as a better, more informal alternative to consider for a future cohort.

The size of the group may have been an important factor in facilitating the project team in managing and interpreting the needs of the group and responding with customised content in the webinars etc. There was also continuity of contact with the participants from the project team, which built a more personal relationship with the participants as well as considerable individual email support ongoing with participants when required. This was an important aspect of feeling supported which was commented on by one of the participants as playing a key contribution to her successful return to work:

"I found great support from the women running the programme, making me realise my strengths and improve my professional profile. I finally got a job!"

Career clinic and returnships

Women joining the returners programme were strongly encouraged to attend one of Equate Scotland's one hour career clinics as soon as possible, with another after six months on the programme. The aim was to provide dedicated, bespoke one to one advice and / or support to

complement the advice and support provided to the group as a whole. In practice there was an ongoing series of clinics offered by the same career coach so the timing varied for every woman. Outside of the clinics individual queries were generally dealt with by the group delivery team. Over 90% of the participants agreed that the career clinics had been valuable in providing individualised support in addition to the online course.

The one to one nature of a career clinic provided participants with bespoke support, for example with their confidence building, focus and clarity in their future pathways.

'[the career clinic] helped highlight the areas of my strength and how to focus on my short and long term goals. Overall, it increased my confidence in my positives and skills that will enable me return to work'.

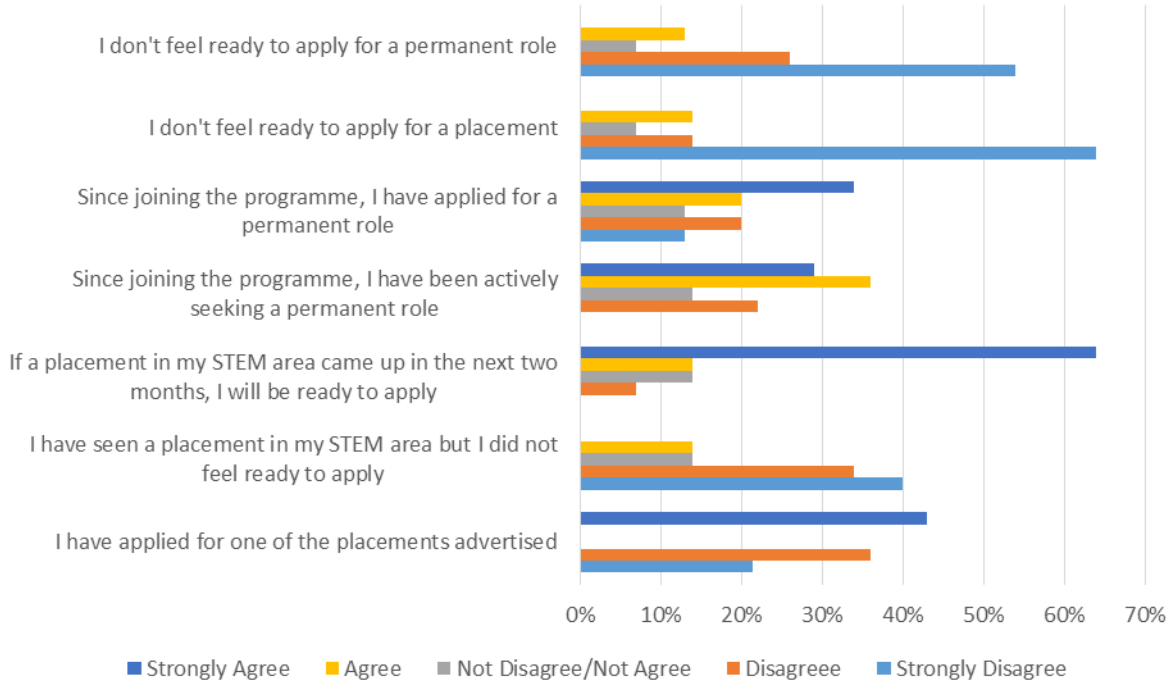
'The comments and suggestions given during the career clinic helped me to strategize my efforts for applying jobs. There were many aspects of job hunting which I was unaware or ignorant about'.

They also offered practical help with presenting skills and experience to employers:

'Helping to understand that my CV wasn't really selling my skills set and how to change the layout to improve my image to employers'.

The overall aim of the programme was to support the women to secure permanent employment, either directly or following a returnship. We did not evaluate the returnships in this study but responses in the survey indicated that the majority (over 60%) felt ready to undertake a returnship within the next two months.

Figure 6: Opinion on Returnships



Webinars

Originally, there was an intention to analyse the interaction within and use of the LinkedIn group. However, as stated above, the group was not utilised in the intended way due to a variety of reasons. Thus, during the lifetime of the project it was decided instead of providing two single topic webinars delivered by an external consultant, to have the programme deliverers run shorter, more frequent, interactive webinars to increase the sense of belonging and trust building within the group. It was felt that this might be able to fill the gap due to lack of use of the LinkedIn group as a forum. This section will focus on the impact that these webinars had on the participants' development within the programme.

Participants stated that the webinars had fulfilled their expectations, had provided very useful information regarding maximising the use of the LinkedIn group and deepening knowledge on topics presented in the BOC, and benefitted from listening to other people's experiences as well as tips on training for interviews. Specifically, in terms of the content, it was broad and responded to need, including topics such as:

- Update on programme development: returners' experiences, placements available, etc
- Interview techniques: this aspect was developed from the information provided in the BOC and directly responded to participants' needs. It covered issues such as presentation skills, body language, managing feedback and reflection.
- Sharing experiences: in addition to the comments happening during the webinar, returners and ex-programme participants made contributions regarding their journey, their successes and failures
- Self-care: issues regarding managing feedback, participants' stories and influence on progress, etc.

The webinars provided a platform to create a social connection, share experiences, provide reassurance as well as further technical support.

Concerning the impact on the participants, this focused mostly on the fact that the participants felt better informed about the course, were more aware of how to maximise the resources available, raised their confidence, and, crucially, supported them in becoming more active in searching for jobs and continuing with the course and the opportunities on offer.

An important element highlighted throughout was the renewed sense of confidence and the learned tools to become more resilient. As some participants responded, when asked what actions they would take forward from the session:

- *'Continue to nurture self belief via networking / events / reflection'*
- *'Write elevator pitch. Send CV to past interviewer for constructive criticism'*
- *'Be able to transition: close doors which are not useful to enable space for new ones'*
- *'My main action is networking. Although I have secured a placement I may need network connections in the future. This is something I have been reluctant to do for several reasons'*

Participants were very positive about how the webinars complemented the content of the BOC, and provided a sense of cohesiveness to the group, increasing the connection between the participants.

Thus, the success of the webinars specifically responds to the four challenges in designing blended learning proposed by Boelens et al (2017). The flexible attitude of Equate and the facilitator to listen to feedback and observe the behaviour of the participants enabled them to incorporate flexibility, facilitate greater interaction, facilitate deeper learning and foster an affective learning climate. This understanding was also important to acknowledge in group, as well as individual settings, to accommodate and respond appropriately to the needs of participants who were at different stages in their life course, on their personal journey back to work and in overcoming personal barriers, such as previous difficult experiences.

This flexibility responds to Laurillard 's (in De Freitas 2002) Conversational Framework (discursive; adaptive, interactive and reflective) through establishing and negotiating task goals, using conceptions and understandings of the deliverer and the learner to direct the dialogue; providing space for the learners to achieve the task goal, receiving intrinsic feedback, and supporting the process in which the learners link their feedback to the development of their actions on a particular goal, in this case, employability. Participants were very complimentary not only about the content of the webinars in themselves but also about the opportunity to listen to other people's experiences, which supported them in their journey.

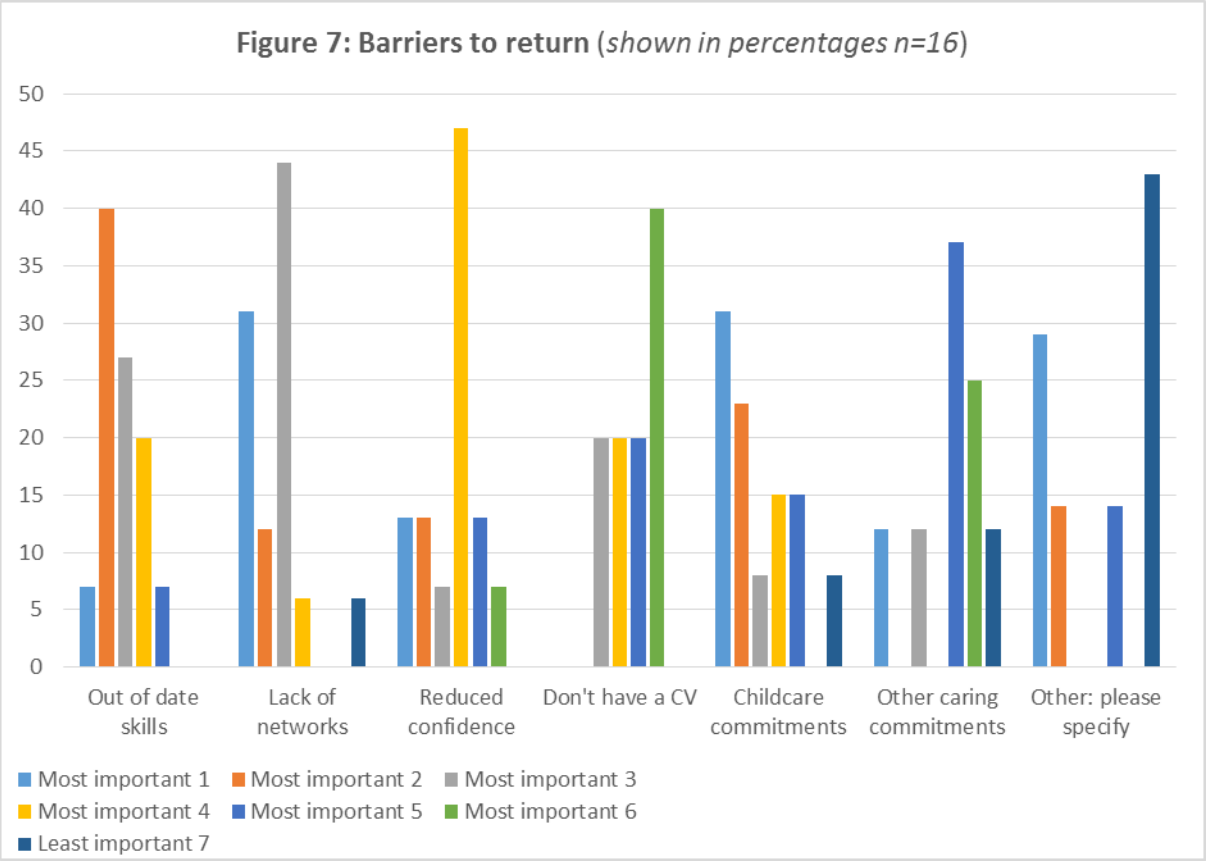
In this context the deliverers adapted, changed and focused on topics in a logical order, starting with writing CVs and covering letters, moving on to interview techniques and then how to reflect on performance following an interview and bounce back if unsuccessful; topics of particular interest to the learners and directly related to their particular journeys. Responses

to individual queries also often referred participants back to a specific section of the BOC, to give consistency to the delivery and meaning to the different elements that conformed the programme.

As delivery of the webinars by the project lead rather than an external consultant was a change to the planned approach, responding to a real need to support the participants, there were some limitations in terms of the technical side of the tool which could have improved if the webinars could have been planned from the beginning of the programme. However, it is acknowledged that this development provided the opportunity to the delivery team to learn technical skills to be able to support it and modelled the willingness to both learn new things and not wait to perfect something before trying it out.

Barriers to Return

The last question of the survey focused on perceived barriers to returning into a STEM job.



As Figure 7 illustrates, the most relevant barriers are the need to retrain, build networks, and attend to childcare commitments. It is worth illustrating that 'reduced confidence' is not in a high rating, which reinforces the opinions gathered throughout the survey.

Individuals were aware of the barriers but recognised the value of the programme in supporting them to return

I do suspect that, having been away from STEM for such a long time, I would be unlikely to be selected for any STEM job. This is why I believe that the projects that Equate offers are absolutely key to getting back to work'.

Equate Scotland and other organisations continue to work with STEM employers to try and tackle the wider systemic barriers to women returning to work, rigid recruitment processes that screen out candidates with career gaps, the availability of part-time posts and flexible working, the need for innovative hiring approaches, such as returnships, as well as better retention of existing female staff who take breaks in employment, continue to be part of the narrative.

Employability

The majority of the responses suggest that the programme had the intended impact in that participants were actively looking for work, and that the programme had supported them to adopt a more active role in seeking STEM employment opportunities commensurate with their experience. This is illustrated by the level of confidence they expressed in their own employment potential, as shown in the two following extracts.

'I was applying for jobs even before attending the program. However, as I mentioned earlier, the career clinic and the program has further boosted my confidence and helped me strategize my approach'.

'I have felt confident to apply for two roles in the sector I have chosen and have received feedback from one employer (somewhere I had previously applied to but not heard any feedback from) which was that they had candidates that were more closely suited to the role but welcomed me to apply to future roles within their company. I would not have been confident enough to apply previously'.

Discussion

In this paper we have argued that blended learning approaches need to be flexible and adaptable to be able to incorporate the needs of different groups of learners, and to take account of gender and other diversity characteristics to facilitate effective learning and an affective learning climate.

Badged Open Courses provide teaching content and assessment, some also provide learning spaces such as forums for asynchronous communication. This paper argues there is a role for a blended learning environment in which BOCs are combined with synchronous learning events such as webinars, especially when the participants require development in particular skills such as networking and confidence. Our data suggests that the participants particularly benefitted from synchronous communication, both online and face to face, and that asynchronous interaction (the LinkedIn Forum) had less engagement and poorer satisfaction. However it is unclear whether this was due to the limitations of the platform itself and whether a more integrated forum would have been more effective. What is clear is that interventions to support and empower women can successfully adapt and respond to the changing possibilities of technology enhanced learning to provide new models of feminist pedagogy (Herman and Kirkup 2017).

It also presents a model for community organisations to be involved in the delivery of BOCs and has identified some key features they provided to promote engagement and collaboration:

- Specialist knowledge means they can curate appropriate content and present clear outcomes and benefits to participants that are particularly target to their needs.
- Flexibly adapt the blended learning environment to suit the needs of participants.
- Motivation to participants to progress through the materials.
- Provision of routes for participants to other specialist help, which could be delivered by the community organisation itself.
- Availability of resources to host face to face meetings and other support measures

As previously discussed, some students seemed to underuse the resources provided, which might raise a wider question regarding the use of online technologies in teaching/learning. We should be wary of taking a technological determinist view, assuming that the technology alone provides a solution to problems such as attendance, accessibility and flexibility. Alternatively we could see this 'underuse' as an example of personalised learning where students are making active choices about which materials they engage with. In the context of online learning, and more specifically in terms of participation, Smith and Smith (2014) would argue that even if students are not participating actively, there is a passive engagement in the discussions from which they benefit. Sfard (1998) and Seely Brown et al. (1989) look at the role of the community, the need to use certain 'norms' when interacting in that setting and to situate and contextualise the discussions to achieve a sense of community and the impact on their learning. From here, Sfard (1998) goes further to discuss that students learn not only by doing but also through the participation of others.

This study has highlighted the value of using open educational resources in partnership with community based providers to add value and create new models of blended learning. The partnership itself was an important element in the success of the overall programme, building on existing relationships between the key actors who had all worked on supporting returners

to STEM in the past and thus shared a common vision and set of values and objectives. The Returning to STEM BOC was devised to support a very specific demographic with identified shared interests and prospects. Yet the flexible structure of the BOC materials enables participants to pace their own learning and thus provides opportunities for those at different stages of their careers and at different proximities to returning to work.

This level of flexibility, which was also highlighted by Boelens et al (2017) as a requirement of success in blended learning programmes, is recurrent in the analysis of the successful areas of the project. In the case of this project, the relatively small numbers of participants meant the delivery team were able to respond to the changing needs of the group with customised content in webinars and personal discussions.

Continuity of contact was a feature of the design that enabled the delivery team to develop a more personal relationship with the participants. There was also considerable individual ongoing email support with participants when required. The study has highlighted that this continuous support provided by a consistent delivery team was paramount for the success of the programme providing a backbone of support, and building trust through interaction (Boelens et al 2017).

We turn now to consider to what extent this blended learning model was able to make use of social and collaborative aspects of learning. The survey results (see Figure 5) highlighted that only a minority of participants (38%) felt that working in a group had supported their learning. This finding suggests two issues. On the one hand, it illustrates the central role that the project deliverers played in the success of the project, in providing the overall support and facilitation, without explicitly requiring collaboration between learners. Secondly, it could indicate a shortcoming of the platform used for communication (LinkedIn), and points to the need for an alternative mechanism for participants to share the expertise, opinions and

perspectives they develop during the project and beyond. The initial design of the programme had considered it important to create a platform to support social interaction and exchange throughout the process. If such a platform existed it could potentially form the basis for a long term self-support group, to provide sources of information, personal support and facilitate face to face interactions as appropriate.

As discussed earlier, most examples of blended learning programmes included some kind of introductory face to face session, and some ongoing online communication (Boelens et al 2017). In fact as Dalgard and Godsk (2007) pointed out, much of the literature about blended learning starts from the position of the classroom face to face model, which is then augmented by adding online content and methods to enhance learning and increase retention. This programme started with a face to face meeting, with 31 of the 40 women attending, but the main focus of engagement in the programme was the BOC, which was then complemented by the webinars, optional career clinics and interactions. In this context, the inclusion of face to face communication and content has added value and increased the positive outcomes for learners enrolled on a previously exclusively online programme. This project has also shown that having a range of different types of interaction between learners and deliverers of the programme, can increase motivation and improve outcomes for those enrolled on the programme.

Potential areas for further development of the model include delivering all online elements via a single portal using the same platform to access all information and interactive elements. This could also include an e-portfolio tool through which the participants can follow their personal as well as their professional progress during the programme, and an informal online discussion forum to replace the formal LinkedIn group.

This study has shown the advantage of adopting a flexible blended learning approach. The programme successfully supported over 60% of the pool of 40 women returners into placements, full time work in STEM or to pursue further STEM qualifications. The successful outcomes reinforce the conclusion that even within a small group of relatively similar learners, one size does not fit all, and that with a range of ways to engage with content and support, participants can personalise their own learning and benefit from whichever of the components are appropriate. With the BOC at the core of a blended learning programme, participants were able enrich their current knowledge, gain accreditation and develop their own individual pathways back into STEM employment.

"In a nutshell, the programme's got me from, in the beginning, not knowing where to start, to now, in a couple of week's time, I'm going to start a 6 month placement."

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