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Innovatory educational models for women returners in science, engineering and technology professions

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The Open University

Introduction

Women returning to work after a break have been the target of programmes and initiatives within the adult and higher education sectors for many years: they have also been the focus of government concern at times of skills shortages. Often drawing on feminist principles and pedagogies, such initiatives have generally aimed to empower women and raise their awareness of gender issues at the same time as offering skills and training in preparation for employment (Coats, 1996; Ellen & Herman, 2005, Phipps 2008). The initiative discussed in this chapter has its roots in these traditions, but by using an online environment has been able to offer a new programme to a wider and more diversely distributed target group, as well as focussing on the needs of a specific group: women already qualified in Science, Engineering or Technology (SET) subject areas.

The chapter begins by outlining the continuing problem of under-representation of women and girls in SET including the specific needs of women in these sectors. We then discuss the background to, and rationale for, a recent programme of support measures developed by the UK government, one of which is an innovative online course which was developed by an established network of educators with a commitment to gender issues. The course, aimed at women SET graduates who want to return to work in this employment sector after a career break, is described and its impact discussed. We, the authors of this paper, are all members of the team responsible for creation and delivery of this course. We have also been involved (along

with an external independent team) in evaluating how well the course has achieved its objectives. In this context we are action researchers; the research data continue to be collected on the course, and changes to the course are made iteratively in response to this research and to other aspects of the environment. We end this chapter by generalising from our experience to make some recommendations for taking forward this kind of innovatory educational model for women returners in other areas. The recommendations are relevant within a global context, but this chapter is mainly concerned with UK employment priorities, and the models discussed were developed to meet these.

Background to the problem of women's careers in SET

Despite changes in science curricula in the UK and elsewhere over the past two decades, participation in SET at higher education level and in careers remains highly gender segregated. Predictions that compulsory study of science for all up to age 16 would result in more girls flowing through the educational pipeline into SET careers have resulted in disappointingly small increases in numbers. Educational choices, particularly for girls and particularly in science, are influenced by a complex web of interacting factors so that changes in curricula alone are unlikely to alter the situation radically to result in significantly increased numbers of girls choosing to study SET subjects (Murphy and Whitelegg, 2006). This situation is replicated at an international level with many other studies showing similar patterns in other countries, and leading to global concerns about the consequences of such continued inequality

The analogy of a leaky pipeline has commonly been used to illustrate the decline in the participation of girls and women in SET through the education system and into careers. For a minority of young women who do choose to continue with their study of SET beyond compulsory schooling into higher education and beyond, the pipeline narrows

and leaks more rapidly as they encounter more and more barriers and constraints to their progress at each stage (Rees, 2001). This is illustrated by a study of young women members of the Institute of Physics who were embarking on research careers in physics. The study (Whitelegg et al., 2002) revealed direct and indirect gender barriers to progression via perceived institutional employment practices and the prevalent male culture or atmosphere in physics research which created what has been called a 'chilly climate' for women. This perception of a 'chilly climate' is not unique to working in physics research or specific to a lab environment (Erwin and Maurutto, 1998).

As revealed in this and other comparable studies, the male culture in SET is seen as being more confrontational and self-confident, and encourages sharing of new ideas and contacts within a small, usually all-male circle. Female students are often reluctant to challenge this, feeling themselves to be in a fairly powerless position, and are more likely to try to work within the culture. Those women who have gained established positions in SET careers can be an important source of support, and act as positive role models for the younger females. However, because there are few of them, their achievement becomes very visible and failure can have a disproportionately negative effect.

Women's perceptions of a career path in SET research reveal concerns about the long hours' culture, the difficulty of returning to work after a career break, especially when a gap in candidates' publication records counts against them; the need to get back up to date and the difficulty of doing this; the challenge of combining research work with childcare, and the difficulty of working part-time when employed on research grants.

These issues emerge further down the career pipeline and are not evident to young graduates. The situation in physics is mirrored to a greater or lesser extent throughout

the other SET areas. In engineering, the 'chilly climate' manifests itself by the use of gendered language and forms of address to refer to engineers, men-only social circles and the necessity of a female engineer becoming 'one of the lads' to belong; sexual visibility and harassment are also a problem, as is the limited range of topics available for conversations, and invisibility as a professional (Faulkner, 2006). Even in the Biological Sciences, where the participation of girls is initially greater than in other areas of SET, the numbers of females working at the higher levels in research or management careers is not representative of the numbers who embark on this subject. This situation has not changed over several decades.

UK Government responses

The UK has seen a renewed awareness of this problem over the past decade at a national policy level, prompted initially by the perceived shortage of a skilled labour force in SET employment sectors. As a response, the Government commissioned a review of the supply of scientists and engineers as part of its strategy to improve the UK's productivity and innovation performance. The review identified several factors specifically those contributing to the supply difficulties faced by the female SET workforce(Roberts, 2002). However, the Roberts Review, as it is known, acknowledged that it was not within its scope specifically to consider the issue of the shortage of women in SET, so Baroness Susan Greenfield was asked to prepare a separate report (Greenfield, 2002) specifically to look into this. In addition to identifying the need for training in SET, at around the same time the Department for Trade and Industry published the Maximising Returns report (People Science and Policy Ltd, 2002) which, amongst other things, identified that a large pool of female SET graduates had returned to employment, but were working in non SET sectors. This raised awareness not only of the need to make SET careers attractive places for women to participate in, but also of the need to tackle the problems that women encountered when returning to work in SET after a career break.

As mentioned at the start of this chapter, initiatives to support women in SET and women returners have been in existence in the UK for many years (see Phipps 2008), but many of these were short lived and local   One of the key recommendations of Baroness Greenfield's report was to 'reduce fragmentation of efforts and to enable stakeholders to play an active and effective part in change' (Greenfield, 2002 p.9). This recommendation led to the setting up of the UK Resource Centre for Women in SET (UKRC)[i] whose brief was to act as an umbrella organisation for all bodies who were concerned with women in SET in the UK and to hold funds for implementing many initiatives such as mentoring, networking and returners' schemes for women. In addition, it was tasked with: improving statistical monitoring; advising and working with SET employers and professional bodies; raising the profile of women in SET; running an expert women's database; producing good practice guides, and developing a means of recognising good SET employers. The importance of these tasks was further underlined by another Government-commissioned report in 2006 from the Women and Work Commission (Women and Work Commission, 2006) who were asked to examine the causes of the gender pay and opportunities gap and to recommend ways to close it within a generation. The report recommended that a £20 million package should be provided to pilot a range of measures designed to enable women to change direction and progress in their jobs and careers.

Many of the initiatives identified as necessary to improve the presence of women in SET were already in place at this time in various parts of the UK. They were organised by a plethora of organisations drawing on funding from a variety of sources. Many ran very successfully for a few years and then collapsed due to a cessation of funding (see, for example, the discussion of the Open University's Women In Technology scheme in later sections). 'Return to work' schemes are an example of this sort of initiative which the UK Resource Centre for Women in SET (UKRC) was asked to take forward and

develop on a national rather than local scale. Working in partnership with a national education provider, The Open University, which already had a track record of successfully providing educational opportunities for women, provided the synergy to launch a major new initiative to tackle this problem.

Distance education for women

In the UK, distance education has been extremely successful at encouraging adult women's participation in SET and other subjects of study, both as novices in the field and as 'returners'. Distance education, as its forerunner correspondence education, has provided many women, in many countries, with their only chance to learn when other educational institutions were inaccessible to them. As a system for women specifically it can be traced back to 1873 and the Society to Encourage Studies at Home, which offered distance education to adult women in the East Coast of the USA (Watkins, 1991).

The evidence suggests that this is a form of education that many women still find more accessible and flexible than other forms of education at specific times in their lives (Lunneborg, 1994; Swarbrick, 1980; Kirkup and von Prümmer, 1997). (In 2006, for example, women were 61% of Open University undergraduates.) But there are aspects of the system of distance education that have been criticised. A specific gender-related criticism is that distance education has reinforced the isolation and domestication of women in the home, rather than emancipating them through participation in a public educational space (Farnes, 1988). Distance education has also been criticised for being a 'Fordist' model of industrial production applied to education (Peters, 1983) - something that large scale distance institutions, now calling themselves 'Mega-Universities' (Daniel, 1996) are no longer ashamed of. They would argue that digital technologies applied to large scale educational systems allow them to become flexible,

accessible, post-modern institutions. In this chapter we sympathise with that position arguing that digital technologies have allowed us to produce something innovatory for our women students. However, we take seriously those well argued critiques of digital technologies that consider them to be gendered (Adam, 1998; Wyatt et al., 2000). Research evidence of the impact on women of digital technologies when applied to learning (elearning) is contradictory. A number of studies find women disadvantaged when using elearning, while others, for example Selwyn (Selwyn, 2007), have argued that in Western universities, although many aspects of computer-based activity (e.g. playing games and downloading music) are still gendered as male, elearning is seen by many students as being a female activity. A number of reports by the Pew Internet and American life project have shown that women and girls are more active than men and boys in many aspects of online social networking (Pew, 2008). We believe that when elearning is carefully designed to match the resources and learning preferences of women students it can be very successful.

Many Open University women students are investing in their own professional updating and education so as to prepare themselves better to re-enter the workforce; they are already 'flexible workers' (Robins and Webster, 1999) engaged in lifelong learning, taking personal responsibility for developing their own employment-related skills and knowledge. These women have always made up a significant part of the OU student population. As they moved in and out of the labour market, often combining family responsibilities with part-time employment, they looked to escape female work ghettos with poor career prospects and low pay by retraining in new areas, and obtaining academic credentials. Others, already professionally qualified, used the OU to keep themselves intellectually active or updated in their field while they took career breaks for family reasons. One of the first special initiatives for women's education in the OU was for women already qualified in SET fields.

The Women into Technology (WIT) scheme for women returners

In the 1970s and 1980s the Open University had recruited women to its science and technology courses in higher numbers than traditional universities. In the mid 1980s women were 16% of all students on OU technology courses and 37% of students on entry level Science courses. In 1980 Swarbrick established the first Open University scheme, funded by the UK Manpower Services Commission, and in partnership with Loughborough University, to prepare women qualified in engineering and technology, who had left paid employment for family reasons, to return to technological work. The programme was designed to promote confidence, knowledge and skills in career planning, and broaden and update existing technical knowledge. The programme included special counselling, a residential preparatory weekend, and a choice of studying from a wide range of distance learning courses in technology subjects which could contribute towards a degree level qualification. In the 1980s OU distance learning technologies included paper-based materials, television and radio broadcasting, audio materials (on tape) and some computer based activities using networked teletype machines located in local study centres, supported by local tutors. Once they were all studying their mainstream SET courses students had little contact with each other. This isolation of pre-internet distance education was a well recognised problem, and a great deal of effort was spent encouraging students to find ways to keep in contact with each other after the residential experience.

Ailsa Swarbrick and Geoff Chivers described the rationale for using distance education as follows:

> The retraining needs of experienced women engineers who wish to retrain and return to work after several years at home are not necessarily the same as those of the young male trainees who are normally found in college classes.

> There are problems of distance and travel to college, lack of childcare facilities,
>
> inconvenient timetabling, apart from the inappropriateness of courses.
>
> (Swarbrick and Chivers, **1985**, unnumbered page)

Between 1982 and 1985, 118 women received bursaries and completed the programme. Many returned to SET employment soon after the end of their studies (Kirkup and Swarbrick, 1986). The scheme was so successful that in 1985 it was expanded to offer similar bursaries to women who wanted to enter science and technology professions for the first time. Eventually changes in government funding meant that the scheme could no longer be funded because it did not fulfil new criteria. (Swarbrick, 1986, 1987), and, like many an excellent gender equality projects it ceased when its funding stopped. The success of the WITS scheme also raised awareness of gender issues more widely within the Technology Faculty, and the subsequent introduction of curriculum and pedagogical changes contributed to an increase in the numbers of women students (Bissell et al., 2003).

However despite the success of programmes like WIT, there was a continued problem of women's representation in SET at a UK and international level during this time as evidenced for example by the SIGIS report (Faulkner, 2004) . The need for direct intervention to support women returners re-emerged on the political agenda in the UK with the publication of the Maximising Returns report (People Science Policy, 2002) which highlighted the national importance of bringing women back into SET employment. The subsequent setting up of the UK Resource Centre for Women in SET in 2004, with the Open University as a core partner, provided the resources to develop a new online course for women returners. Although the experience of the WIT scheme was an inspiration in formulating the new programme, it was clear that there would be enormous advantage in delivering the course online, making use of the most up-to-date learning technologies in order to attract a wider audience.

A feminist institutional network for SET activities

With public resources limited and subject to competition in their allocation, the ability to act quickly to take advantage of external initiatives for women's education depends usually on the prior existence of an individual or a small group of gender activists within an organisation. As part of the national Women into Science and Engineering (WISE) campaign, [ii] a new activist group was created within the OU which was subsequently able to support and promote WIT, and helped extend its life. The group developed its own momentum, aiming to expand work on the participation of women students and staff in SET subjects in the University.

The WISE group at the OU provided an interfaculty space for the development of interdisciplinary perspectives and mutual networking and support. It worked on the development of interdisciplinary Women's and Gender Studies courses, creating strong critical analysis of gender, and inserting SET content into these courses (Kirkup and Keller, 1992). It supported research activity by group members on women in SET fields, within and outside the OU (e.g. Carter and Kirkup, **1991**; Whitelegg et al., 2002; Donovan et al., 2005; Ellen and Herman 2005), promoted gender awareness of the needs of women students in the SET disciplines in the University, and advised on the design of course materials.   Members of the network were also involved in external national initiatives and campaigning groups such as the Women's Engineering Society, Women in Physics Group of the Institute of Physics and the UK Association for Women in Science and Engineering (AWise).

One aspect of the group's power lay in the influence its members wielded in various arenas including national campaigns that led to the creation of the UK Resource Centre for Women in SET (UKRC).

An online course for women returners to SET – an integrated model

Over time membership of the OU group of activists changed. Some members retired, or were pulled into working for other projects and new members joined who had different experiences of working outside the University in women's education in SET. This changing body provided an underlying continuity, while being re-energised with new people with new ideas. Several members of the OU network were key in setting up the UKRC and the associated campaign which was launched in 2004 to support women's re-entry into SET employment and research careers known as the RETURN Campaign. A key component of the national strategy was to be a special initiative for women returners to SET developed by the OU which would be delivered online: T160[iii]. This was the first time such a scheme for returners had been offered in such a format and on such a large scale, and was intended to attract women who were geographically isolated or unable to study at conventional institutions. At the same time, with the unique tutorial structure of the Open University and additional activities provided by the UKRC network of regional hubs based in Scotland, Wales and three English regions, participants were also able to benefit from localised support in their own area. The possibilities of adding other kinds of networking in addition to face-to face meetings were much greater in this project than in the WIT scheme.

In order to meet the needs of women from a range of academic backgrounds, the course was designed to offer a generic programme of personal and professional development rather than trying to update specific technical knowledge or skills. However, the online nature of the course was also intended to be a vehicle for students to renew and expand existing IT skills that would be of value in their subsequent employment. The course was designed to run over a period of 10 weeks and to be accessed via a dedicated website and online discussion areas. The learning outcomes

of the course illustrate the broad nature of the material covered. Participants would: analyse their personal career and educational history, including the development and updating of their CV; identify their professional skills and highlight their training needs; explore the impact of gender in the workplace, and develop skills to increase employability, such as job searching, interview and negotiation skills, networking and communication as well as producing a career action plan.

Course materials were designed to help to address the barriers facing women returners with emphasis on the SET specific issues. An important tool introduced within the first week of the course is an electronic portfolio that enables women to collect evidence of their achievements and collate paid and unpaid work experience, including an evaluation of skills and abilities gained. This was found to be a valuable tool that could be taken away by students for use after the end of the course (Herman and Kirkup, 2008). Reflective activities that enable women to examine critically their careers to date were built into early sessions of the course. For example, a "lifeline activity" requires students to reflect on their achievements as well as the challenges in their lives by asking them to portray these as 'highs and lows' on a chart.

The course was designed to provide practical outcomes that would help move women towards their stated goals. Two main outputs were included in the assessment requirements that could be essential tools for future career development: namely, a CV and an action plan. The CV (or 'resume') is checked and commented on as part of the first course assessment, and feedback on it is incorporated into a revised version submitted for final assessment. The action plan with clear time limited goals provides a template for continued progress for 6 months beyond the end of the course, and included a commitment to contact another student at the end of this period.

With the support of national government and European funding, the course has been free of charge to participants including reimbursement of travel and childcare expenses for attending two face-to-face tutorial sessions. While not all women have attended these sessions, for many this opportunity to meet other women in similar situations and to resume social networking in a professional capacity proved to be important in regaining their confidence; indeed, this has been an important theme throughout the course and in the subsequent support provided by the UKRC network of regional hubs. This is underpinned in the course by material on networking that explores how to make and maintain useful contacts, encouraging women to join online networks to enhance their own sphere of influence. Additional face-to-face networking events, held in conjunction with UKRC regional partners, have proved very popular, offering women practical experience of networking in a formal professional environment (including activities such as 'speed networking'). The course also features the stories of nine 'role model' women who have successfully returned to work after their own career breaks, highlighting important personal issues such as work-life balance. Indeed, the exploration of work-life balance is an important theme throughout the course, and reflections by students on this topic highlighted the difficulties they encountered in reconciling multiple roles (Herman, 2006). While the course aims to encourage and support these women in their return to employment, it is also important to allow them to explore the difficulties they could face both practically and emotionally in reconciling family and work commitments, and to develop an understanding of how these conflicts can be shaped by gendered assumptions about domestic and workplace roles

Students use a range of online discussion forums to structure and carry out course activities, creating a sense of intimacy and shared experience. The OU has had experience of using online group activities for learning since the late 1980s, and the course team understood how to design online activities for maximum participation (Salmon, 2002). In addition, there is an online activity where guests from industry and

the research community are invited as 'visiting experts' to answer students' questions over a two week period. Questions have ranged from specific issues about working in particular academic and industrial sectors, to more generic questions about how to reconcile work and family life.

Collaboration between the OU and other UKRC partners has enabled the course to be accompanied by a range of other support activities which added value: mentoring; work placements; individual advice and guidance, and networking events co-ordinated with the aid of a central database of returners held at the UKRC national headquarters. The significance of this integrated model was highlighted by the external project evaluation report: 'This coherence is innovative and significant to the service user, who can expect support at several points during her preparation and search for a return to SET employment'. (Webster, 2007)

 Mentoring has been one of the key support activities provided. Course participants register to have a one-to-one mentor or join a peer mentoring circle in which they mutually support other women returners in the same situation as themselves, meeting regularly as a group after their initial training from one of the mentoring co-ordinators. Student feedback, which we discuss later, suggests that these local support networks are crucial for developing and building self-esteem as well as contacts which are invaluable in seeking employment. Indeed, networking has also been a central component of the integrated model. While on the course, women are encouraged to identify and join relevant networking organisations including professional institutes and learned societies, and national/international organisations and groups supporting women in SET. The final component of the integrated model has included the provision of work placements for some participants in order to give them relevant up-to-date work experience.

The outcomes of an online 'returners' course

Between 2005 and 2007 the T160 course had over 700 women participate in five cohorts and has contributed significantly to the overall national objective of supporting the return to work of women qualified in SET. Since 2008, after the initial funding period elapsed, the course has been integrated into the OU's mainstream provision and continues to support about 100 returners per year.

An evaluation of the course and its impact on participants was conducted in 2007 involving three groups of students (458 participants). Data were collected from registration forms, an online survey (63% return rate) and a selected, representative sample of 19 interviews (Dale et al, 2007). The illustrative participant comments used below are all taken from this evaluation.

Results indicate that difficulties and barriers are still likely to be encountered in returning to work, and these are very similar to the barriers highlighted in the SET Fair report (Greenfield, 2002). Most of the participants had taken a career break, usually, but not always, because of children. Their average age was 40 with most in the age range 30-50 years. Most had been unemployed for over three years. Some were 'underemployed' (i.e. working at a skill level below that of their qualifications and experience) or working in some other field in order to be able to have local, flexible or part-time employment. They were all SET graduates with a range of subject backgrounds – 31% Physical Sciences and Mathematics, 23% Biology, 15% Computing and IT, 11% Engineering, with the rest having backgrounds in specialised or inter-disciplinary fields. Difficulties and barriers to returning to work were identified as:

- Lack of work experience (71%)

- Out-of-date skills (70%)

- Lack of confidence (57%)

- Lack of available work at an appropriate level (57%)

- Location of employers (51%)

- Lack of interview practice (49%)

- Lack of contacts (49%)

- Unavailability of part-time work (46%)

- Finding child care (26%)

The majority of course participants said they were planning to return to work on completion of the course or in the near future. About a third wanted full-time employment, about a quarter wanted part-time employment. A significant number were exploring opportunities for self-employment and portfolio careers. More than 20% believed that they would require further training before they were likely to be successful in their aspirations. Some women were hoping to use their scientific and technical skills differently, perhaps as technical writers or scientific journalists. Others, who were disenchanted with the culture of SET, both in academia and industry, were seeking to take their SET qualifications and skills elsewhere. About half expected to seek employment at a lower level than they had enjoyed before they took a career break. A variety of reasons contributed to this expectation: many felt the need for re-training and re-skilling before they could establish themselves at the same level; many were looking for part-time work to start with, or their employment opportunities were location-limited, and it was not clear how one might change career, but immediately work at an equivalent level. Some women reported experiences of having felt the need to 'drop down a level' and then having to deal with resentment from bosses who felt intimidated because they were less qualified than the returners.

Participants had three main objectives for studying the course:

- To help them return to paid work (66%).

- Personal development (54%).

- To help change career (37%).

More specifically they wanted to know about options open to them after their career break and needed to develop knowledge of, and confidence in, current recruitment and selection procedures.

These objectives align with the purpose, design and learning outcomes of the course, and most participants felt that their objectives for taking the course had been met. When asked about the impact of the course on their lives most comments were extremely positive and emphasised the importance of the personal development:

> The course has enabled me to look at my needs and wants. It has made me aware of my personal barriers to returning to a work environment and has started me looking at ways I can overcome them. (IT graduate, 48 years old)

Most participants were very positive about the impact of the course on their skills, confidence and future prospects. The emphasis and support in developing a CV was universally appreciated, and doing company research was felt to be really useful. An improved CV, in particular, had boosted their confidence in their future careers. 'I feel more confident … that I have better career prospects' (Technician, 27 years old). 'It really helped to see longer-term and has given me more confidence.' (IT graduate, 49 years old)

For some the experience bore immediate fruit:

> I got a job and am so happy! I would not have applied for the job without T160 guiding my thoughts and motivating me. It also gave me the confidence to apply

> high and now I realise that it was not beyond my capabilities, also, and I would
> have had a much less impressive CV and cover letter without the course.
> (Psychologist, 36 years old).

The online networking aspects of the course were perceived as valuable by many:

> I am very happy I took this course. I am very aware now that I am not the only
> SET trained woman who is not employed. It has also given me the opportunity
> to form a network. (Chemist, 28 years old)

Some would have liked more opportunity for face-to-face networking on a more local basis, or continued contact within the framework set up by the course. A few participants, however, did not fully grasp the nature of an online course and they missed out on electronic networking possibilities. Because T160 is a relatively short course, some participants only understood the nature of the online communication possibilities too late in the course to benefit greatly.

One part of the course focussed on structural gender-based barriers to employment in SET. Many found this helpful as they realised that their lack of success in finding career paths to return to was often due to structural and institutional rather than personal factors. The converse of this was that some participants felt disheartened and discouraged by the analysis of institutional discrimination. The course tried to mitigate this anticipated feeling of disempowerment. A theoretical gender perspective encouraged the sharing of experiences of dealing with gender issues in a work environment.

Those participants who had started with the objective of returning to work or changing career had not necessarily been able to do so within the short time-frame of the course,

but they did feel well prepared to go forward. They had developed five-year goals and action plans and written inspiring but realistic visions. They had re-examined their goals, their achievements and their skills. They described having clearer objectives, greater focus and were often much more optimistic – indeed many had now changed their plans:

> …the course has made me examine my motives and I've altered my objectives. I am much clearer in my own mind. (Geologist, 51 years old)

> …spending time focussing properly on the thought of returning to work instead of just thinking about it in passing …. I have reconsidered my original career which I had previously dismissed the idea of returning to. (Chemist, 49 years old)

> …to be honest my life is now changing completely – sometimes I can't believe it! (Technician engineer, 40 years old)

Inevitably, the balance the course took in addressing issues did not suit everyone. Some participants felt that there was too much emphasis on the needs of women returners with children and insufficient attention given to issues of location, age and updating of skills. Career breaks happen for many reasons, some from choice, others not. There was also concern that the course was not challenging enough for highly qualified women. A short course like this cannot address, in equal measure, all the barriers facing these women. However, our data suggest that it has been successful in supporting women to develop confidence, improve their career focus and initiate action. It has enabled participants to up-date some general skills and help them assess the need for further training. It has facilitated the formation of personal networks and, through the wider RETURN campaign of the UKRC, introduced participants to existing support networks. It has enabled some to experience individual mentoring and peer

mentoring circles nationally and to access work placement and 'returner' fellowship schemes.

Conclusion and recommendations

There are five interesting lessons for other projects in women's education that come out of this one. These are to do with: distributed learning course design; inter-organisational partnerships for educational provision; the importance of buy-in and leadership from the top in organisations in order to achieve culture change; the importance of internal, informal networks of gender activists; the impact on women's identities of provision and support for women 'returners'.

The feedback from participants and the high level of positive outcomes (over 300 out of the original 700 are known to have gone on to employment or further study at the time of writing) show that an online course plus integrated local support can offer a successful model for the re-integration of women returners following a career break. This course confirms the experience that distance education can be accessible, flexible and the preferred mode of formal education for retraining to return to work, or for developing the careers of many adult women. While similar resources may not be easily available to small education and training providers, it is clear that more extensive use can be made of online tools for developing supportive networks by those who design courses for adult women. Extensive use of the internet among women in the developed world makes it easier to use online social networking tools to build communities for women who are geographically isolated, or working in the domestic environment, and this does not necessarily incur expensive infrastructure development. The particular online and distributed pedagogical model that this course has adopted has enabled students to draw on national resources and networks while being very involved with local support activity, developing local knowledge and networking.

The individual responses of the women who were supported through the RETURN campaign, including the T160 course, indicate that these women were able to (re)-identify themselves as scientists and engineers, while envisaging and relocating themselves in the current SET employment landscape. Engagement with a group of women in very similar positions allowed them time to reflect on and plan for their future careers. Having direct access to role models and mentoring, to many different networks and to a variety of support services, at national and local level, all contributed to a sense of progress and change of direction with which these women felt confident and comfortable. Their experiences should contribute to and enhance the services and support available for future returners, and perhaps also influence the SET employment climate.

This integrated model of support provided by the OU and the network of UKRC partners, within the context of a strong commitment of collaboration and partnership, has been vital to its success at a national level. Being both national and local it draws on the strengths of both, and is likely therefore to be more robust than the local courses that we have been more familiar with in the past. While small organisations and community education providers may not have access to national level partners, the networking capacities of the internet would also enable a consortium of small providers to create, at a more local level, something similar to the course and partnership we have described here.

Working in partnership with a national organisation, such as the UKRC in this instance, enabled access to influential policy-makers, professional bodies and senior managers in SET industries. Changes to culture and working practices will only take place if those in high level positions proactively support change, so opportunities provided by access

to such people of influence are an important factor in achieving progress for women's career development in SET employment.

Our experience is an example of the importance of the development of informal networks of gender activists in educational institutions. New methods of online networking might make it possible to strengthen these networks and keep them live during quiet/inactive periods. We suggest that universities and further education colleges, for example, should actively support informal internal networks of staff with a particular interest in women's education, and allow space for their activities. Such networks usually ask for very little in the way of institutional resources: they rely mainly on the small amounts of time members give to them. However, these networks provide the institution with the capacity to bid for funding when special initiatives for women are announced. They provide a location for external parties to make contact with for future projects. They provide the support base that individual innovators need if their projects are to be sustainable. They also provide continuity between different funded projects, because in the gender field we are used to sporadic funding and periods of scarce resources.

The particular issues faced by women in SET continue to be significant despite many years of policies, interventions and initiatives. Wider social and cultural issues continue to play an important role, and despite good intentions there is no 'once and for all' educational solution to the 'leaky pipeline' in SET. For the foreseeable future, women's careers will involve time away from employment as women still take primary responsibility for childcare and family work. Consequently, there will continue to be a need for special educational initiatives to help women return to SET employment after a career break, to allow both them and the State to take advantage of the previous investment in their education and skills. However, employers and policy-makers must ensure that educational activity is combined with changes to workplace practices and

culture which will enable retention and progression for women in their careers. A closer partnership between educational providers, employers and professional organisations could ensure the availability of re-training and part-time working opportunities at all levels of a career.

Acknowledgements

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[i] http://www.ukrc4setwomen.org/

[ii] WISE began in 1984 and was run by the Engineering Council and the UK Equal Opportunities Commission to promote the participation of girls and women in SET education and careers. The campaign still exists and continues to work particularly with schools on these issues.

[iii] All Open University courses are known by Faculty initials as part of a unique course code - in this case T stands for Technology where the course is located.