

The response of Physical Science post-graduates to training courses and the connection to their PhD studies

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Abstract

Training in both employability and discipline-specific skills has been provided and expanded over a number of years for post-graduate research students, (PGRs) in the Faculty of Physical Sciences administered by the Physical Sciences Graduate School (PSGS) at the University of Glasgow. This project explored the training provided in 2005/06 with a view to further developing a programme that students and faculty alike consider appropriate, timely and developmental for the needs of research students. The training provided by the PSGS had grown over a number of years in response to suggestions from academic staff in the Faculty of Physical Sciences. Data were collected from Postgraduate Research students (PGRs) from all the stages of the 3 year PhD process to enable a complete map of views to emerge. In particular, the way PGR students perceive the training they undergo in relation to their core PhD research and career progression was examined. The students in our study also identified clearly where they perceived they were developing such transferable skills, and training sessions are not seen as

the sole or even major source; the research group itself would appear to play a major role. The authors believe the finding could inform the provision of PGR training in other UK institutions.

Introduction

During the 1990s and the early part of this century there have been increased calls for doctoral education to include more emphasis on the development of generic/transferable skills. Gilbert (2004) describes the changing demands on PhD education from students and external agencies across the globe.

A number of authors indicate that the change in tone of the PhD reflects the changing relationship between doctoral education, the institutions and the employer, as well as the influence of increased numbers of PhD students pursuing careers outside the university (Gilbert 2004, Gilbert et al 2004 and Pole 2000). Alongside the increased numbers of students and the concentration on generic/transferable skills development for doctoral students there has also been a subtle shift in, as Deem and Brehony (2000) describe it as the emphasis of PhD from producing research work (thesis) to one of research training and development of skills. The training versus education debate surrounding the purpose of the PhD is detailed further by Gilbert et al. (2004) and describes how the changes in PhD education have been caused by two aims: to professionalise researchers and increase the capability of students and, to prepare students for careers paths other than academia and potentially multiple careers in their life time. These factors have led to programmes to support the development of transferable skills

during the doctoral education in the UK, USA and Australia (Gilbert et al, 2004; Cooper and Juniper, 2002; Cryer, 1998).

In the UK during the 1990s the research councils were concerned about PhD completion rates and outcomes of their funded doctoral students. Within doctoral education research much literature has focused on approaches to ensuring timely completion of the thesis (Wright & Cochrane, 2000; Hockey, 1991; Manathunga, 2005). Pritchard and Ingerman (2006) describe how research in the arena of the PhD has concentrated on the process of the PhD, from the relationship between the supervisor and supervisee to perceptions of their roles and the need for appropriate training for supervisors; they conclude that there is a paucity of research on the learning aspects of the PhD.

In the UK there was an additional factor in the research councils' focus on the PhD. This stemmed from the report of Sir Gareth Roberts' and his review of the supply of science and engineering skills in the UK published in 2002. The report highlighted the role higher education institutes played in supporting the development of highly-skilled scientists and engineers. It then went on to raise some problem areas in skills development of PhD students and noted that problems affecting postdoctoral and contract research staff (CRS) included "unsatisfactory training in the skills required either in an academic career or in a business research environment means that CRS are poorly prepared for potential careers" (Roberts, 2002, p. 143).

One of the recommendations of this report was that Higher Education

institutions should provide postgraduate researchers with "at least two weeks' dedicated training a year, principally in employability skills" (Roberts 2002). The research councils responded to this recommendation in 2003 with the provision of funds for each doctoral (PGR) and post-doctoral scientist (PDRA) to undergo such dedicated training in employability skills.

It is key in the context of this paper to reflect on a comment from Gilbert et al (2004):

generic skills programs have become widely accepted as part of the offerings of research higher degrees. However, given their rapid development in a relatively short period of time, it is not surprising that questions remain unanswered about the most desirable and effective form that such programs might take (p.379).

The study described in this paper examined doctoral students' learning experience of training provision and further the perceived links between transferable skills training and core PhD research. It was hoped that by undertaking this examination the current provision could be enhanced. By responding in this way to training needs and tailoring the provision for the different stages of research training, it was hoped that the students' employability skills would be enhanced. This study was carried out at the University of Glasgow's Faculty of Physical Sciences Graduate School and was implemented in partnership with the Learning and Teaching Centre (LTC). Members of the LTC have worked with the PSGS to deliver some of the transferable skills training programme for doctoral students and

thus the three authors were aware of the training programme and the context within which it operated. The terms generic, employability and transferable skills are used somewhat interchangeably in the literature; we shall use the term transferable skills as this is the term used within the University of Glasgow. We offer a candid reflection on transferable skills provision within the Physical Science Graduate School and how our findings will inform future provision. It is also hoped that the findings will support other graduate schools as they tailor their training provision in a meaningful manner in their context.

Gilbert (2004) points out the tension between those who see skills training as detrimental to the PhD as it detracts from the ability of the student to engage fully in research and gain deep understanding of their area of study whilst others see it as beneficial because if the PhD is too focused on the thesis topic the students will be unable to cope in different research environments. Clark (1993) cited in Pole (2000, p. 98) fears changes in doctoral education can divide academic staff from research students and calls for the need to “retain research centred graduate education” (and to focus on the research groups within departments working alongside fellow academics and to ensure high level research-led graduate education. The University of Glasgow is a research-intensive institution and a member of Universitas 21 (this is an international network of 20 leading research-intensive universities in twelve countries, www.universitas21.com) and the Russell group (an association of 20 major research-intensive universities of the United Kingdom, www.russellgroup.ac.uk). However, like many similar institutions it needs

to support doctoral students in diverse and multiple career trajectories. Have we got the balance between transferable skills and the ability to conduct quality research right? Are we enhancing the doctoral students’ learning experience?

We invite others involved in doctoral education to reflect on their own provision and experiences of supporting the transferable skills training agenda and ask the reader to consider how the current doctoral education experience in the UK (USA and Australia) is impacting on the PhD; is the PhD in the ‘business’ of training or educating students: is there a conflict between them or can they run in parallel?

Rationale for the study

The Faculty of Physical Sciences comprises three departments: Chemistry, Physics and Astronomy (P&A) and Geographical and Earth Science(GEES); training in both discipline-specific and transferable/employability skills has been provided for PGRs in the Faculty of Physical Sciences for a number of years, administered by the PSGS. The University of Glasgow’s Employability Strategy defines employability as (University of Glasgow, 2003):

A set of skills, knowledge and personal attributes that make an individual more likely to secure and be successful in their chosen occupation(s) to the benefit of themselves, citizenship, society and the community.

At the start of the current project in 2005, the training provided by the PSGS had been developed over a

number of years, informed by ad-hoc student surveys and suggestions from staff and has been expanded somewhat

in response to the Roberts' training agenda. (See Table 1 for elements of the training course.

Table 1 The Physical Sciences PG Training Programme

Training course	Faculty-wide/Departmental	Description
Faculty Induction	Faculty-wide	To introduce students to the support and administrative structures of the PSGS and University.
Introduction to the PhD	Faculty-wide	This lecture, delivered by the Dean of the Physical Sciences Faculty, introduces the students to the PhD process at the University and outlines the faculty's expectations of them.
First Aid	Faculty-wide	Basic first aid training is provided to all students
Radiation Safety Course	Faculty-wide	Basic training in the handling of radioactive materials in research.
Lab demonstrating	Faculty-wide	A centrally provided course compulsory for all students who will be employed as laboratory demonstrators (most of the PGR students in the Faculty of Physical Sciences.
Library course	Faculty-wide	A centrally provided course in database searching and data management.
Communication Skills	Faculty-wide	A workshop to help the students develop their skills in communicating science ideas to the public, to learners and to the scientific community. This is followed by support in body language and voice projection skills and an introduction to relaxation techniques.
Data analysis	Physics and Astronomy	PGRs were invited to attend a course on data analysis that was presented for the first time as part of advanced teaching in the Scottish Universities Physics Alliance (SUPA).
Report Writing	Faculty wide	A course run to support the writing of the students' first-year reports dealing with report structure, language and data presentation..
Science Ambassador's course	Optional but offered across faculty	Training provided for PGRs who volunteer to be Science and Engineering Ambassadors (SEAs). SEAs work with schools on a voluntary basis, providing support and encouragement for young people and children in science, technology, engineering and maths areas.
Frontiers of Physical Science Residential Course	This course was piloted in 2003/04 with only the P+A. Since 2004 it has been a compulsory element of training across the faculty.	Residential course for all new PGRs. Students worked in small teams to prepare and present work at the frontiers of research and engage in other team-building activities.
Poster preparation and conference	This was introduced for students in Geographical and Earth Science in 2004/05 and has been a compulsory element of the programme across faculty since 06/07.	The students receive training on poster production and presentation early in their first year and then in second semester all students present a poster on their PhD topic to which the entire faculty is invited.

The aim of this study was to evaluate the current training provision and further, to examine how PGR students perceived the training they received in relation to their research and career progression; thus we aimed to ascertain whether the wider goals of Roberts' recommendations with respect to employability were being met and further whether the students own perceived needs were being met.

The project aimed to obtain two main outcomes:

- mapping students' perceptions, at various stages of the PhD process, of current provision
- identifying gaps in the provision/recommendations for more effective developmental training.

In this study we have been attentive to looking for evidence that is more than just 'they enjoyed it', whilst important we also wanted to explore the relations between the training programmes and the students ongoing PhD activities. In a review of a PG transferable skills programme at the University of Melbourne, Devlin and Tjia (2004) noted that: "In a University based

evaluation there is often confusion between student satisfaction and student learning. 'Level of enjoyment' becomes a proxy for measurement of 'learning outcomes'".

The study

The study investigated the training provided mostly during year 1 of the PhD. We employed several forms of evaluation to elicit student response to/enjoyment of training and also to explore their learning within these training events. Questionnaire and focus group interview data were collected from all the stages of the PhD process, i.e. at the beginning (early in year 1), during (years 2 and 3) and after graduation (by accessing the responses of PDRAs) to enable a complete map of views to emerge.

At the start of the project in August/September 2005, there were 177 PGR students in the Faculty of Physical Sciences with similar student numbers at each stage of PGR training (Table 2). In addition, the Faculty of Physical Sciences has a large number of post-doctoral scientists (PDRA).

Table 2. PGR and PDRA distribution among Departments in PSGS – October 2005.

Year	1	2	3	Writing thesis	PG Total	PDRAs	Total
P&A	20	17	21	23	81	60	141
Chemistry	24	22	16	16	78	29	107
GES	2	4	7	3	16	6	22
Archaeology	0	*1	0	0	1	0	1
#SUERC	0	1	0	0	1	0	1
Total	46	45	44	42	177	95	272

P&A = Department of Physics & Astronomy and GES = Department of Geographical & Earth Sciences. SUERC = Scottish Universities Environmental Research Centre. Note that the Department of Geographical and Earth Sciences (GES) spans four Faculties and the numbers in Table 1 are for those in the Faculty of Physical Sciences. *Because of the nature of this student's project it was decided that it would be more appropriate for them to be registered in the Faculty of Physical Science. # SUERC is affiliated to the University of Glasgow students undertaking their PhD at SUERC are registered in the Faculty of Physical Science.

Training in employability skills relevant to all PGR students is provided at the Faculty level. Agreed subject-specific training is provided at Departmental level. Full expansion of training in response to Roberts' funding did not immediately take place in 2003 due to the delay in information regarding the financial resource being made available from the Research Councils to cover the cost of the expanded training programme.

The data were collected and analysed over an 8 month time period in 2006 as shown in Table 3. First, research data for the mapping of the perceptions of training of PGR students (all 3 years) and PDRAs (in their first year of postdoctoral research) in PSGS were gathered by the implementation of a detailed online questionnaire designed to elicit responses with regard to appropriateness of content, timing, usefulness with regards to employability and PDP and links to the PGRs' core PhD research. (The online question is shown in Appendix 1.) Secondly, the questionnaire data were

augmented by, and greater depth and richness of data were obtained from, semi-structured, focus group interviews with two groups: first/second year PGRs and third year PDRs/PDRAs. Thus, the questions were very similar. In both cases students were asked about the training they had been on to date, their recollection of the events and connections to their current PhD studies. Additionally we explored with students their response to the notion of personal development planning and transferable skills as well as gaps and timing of training events. In the interviews the depth at which each aspect was explored, depended on the response of the interviewees to the question. The focus groups were repeated with the 1st and core PhD studies. (Appendix 2 gives an outline of the topics raised in the focus groups.) 2nd year PhD students in June to explore if the previous 6 months of training sessions had impacted on them in a way in relation to their personal development planning and their core PhD studies. (Appendix 2 gives an outline of the topics raised in the focus groups.)

Table 3. Project Timetable

January 2006	Online questionnaire sent out to all 1st and 2nd year PhD students in the Faculty of Physical Sciences (N=19) 2 Focus group interviews with 1st year PhD Students (N=4) 2 Focus group interviews with 2nd year PhD students (N=4)
February 2006	Online questionnaire sent out to all 3rd year PhD students and PDRAs in the Faculty of Physical Sciences (N=18)
March 2006	Focus group interviews with 3rd year PhD students (N=4) Focus group interviews with PDRAs (N=3)
June 2006	Combined focus group interview with 1st and 2nd year PhD students (N=4)
July – August 2006	Analysis of questionnaire and interview data

The numbers in brackets indicate the number of responses received from the survey and the numbers involved in focus groups.

The analysis of the online questionnaires and focus group interviews explored in depth the students' experience of skills training with the emphasis on their learning rather than their enjoyment.

An inductive interpretive approach was used to analyse the interviews to enable themes to emerge from the transcripts rather than be imposed by the researchers (Thomas 2003). The first two authors undertook a close reading of the interview transcripts and then compared themes and arrived at common collection of emergent themes with supporting quotes for illustration. The online questionnaires were also analysed for themes and the two data sets were then pooled to provide both breadth in terms of the larger sample size for the online questionnaire and depth obtained from the smaller sample size for the interviews. Results described come from the pooled data set.

Results

Students' perceptions of training provision

The first part of our research project, was to map students' perceptions of their training. Analysis of data pooled from online questionnaire and focus groups interviews raised a number of areas of concern with regard to current provision, namely:

- Training requirements are only of value if they are relevant.
- Training is likely to be more effective if tailored to particular stages of research training or career.

Training provided was informed by, and might be skewed by, the

perceptions of the academic staff of the Faculty since the programme had grown in a somewhat ad hoc manner and thus, the training provided might not be relevant to PGRs and PDRAs at the early stages of their career. Students (or staff) may not see the 'value' of such training and the relationship between employability skills, their PhD or research.

Evaluation of the links between Skills training and the PhD

From the pooled data set of the interviews and questionnaires there are three themes that emerge from the data. Each theme is considered, and its implications discussed in more depth below.

1. Students' perceptions of required skills for a PhD
2. Where students identify developing transferable skills
3. Links between skills training and PhD

1. Students' perceptions of required skills for a PhD

Irrespective of the year of the PhD student or PDRA there were a number of skills identified by all questionnaire respondents as important for the PhD.

- Time management
- Writing skills – reports, papers
- Oral presentations
- Research skills – data gathering
- Teaching
- Interpersonal skills
- Computer skills (not PDRAs)

There were a few notable differences between years and skills they identified as important for them.

- Technical skills, i.e. learning how to operate new equipment (1st and 2nd years)

- Specific communication skills, e.g. thesis writing, communication with people outside HE (3rd yrs)
- People management skills, e.g. web design skills, how to run meetings (PDRAs)

In addition to asking students to reflect on the training they had received to date, they were also asked to identify any gaps in the PSGS provision. Participants identified the following skills which might usefully be supported through the provision of training session;

- How to write abstracts
- How to read papers – critical reading skills
- How to take minutes and run meetings

2. Where students identify developing transferable skills

Students identified a range of environments as supportive of learning the skills they thought were part of the PhD process. These were:

- Supervisors, training sessions, research groups, peers, self
- Giving presentations, writing papers
- Teaching, collaborations, life!

It is worth noting that only some of these areas are formally picked up in the training programme offered to PhD students, i.e. presentations and teaching. The others are all focused in the main on the research group and the networking within and beyond their immediate work related peers. The consideration given by students to developing transferable skills in settings outside the formal training sessions highlights the fact that the very nature of the research group (if there is one) has a key role to playing

is supporting the students' academic development.

In particular, it was apparent that the PGRs saw PDRAs as performing a key function in developing skills to support them in their PhD studies;

'I believe Postdocs play a significant role in an efficient research group. They are the ones who can spend the time teaching new students'. (PGR Yr 2)

Akerlind (2005) reports on a number of concerns surrounding postdoctoral research ranging from varying definitions of the role in different countries and postdoctoral researchers concern about the lack of support for their career development. The PDRAs that participated in our study shared experiences that resonate with Akerlind's study as they described a lack of systematic career support and training both in the PhD and on their post doctoral work. The quote below highlights how the PhD did not prepare the student for post doctoral work and indicates that their post doctoral experiences to date have not yielded any opportunities to further develop their skills as they would like.

"I honestly think that the pressure of being – the change in responsibilities from going from PhD to RA [postdoctoral research assistant] means that I have to be much better. I didn't feel that, despite wanting to in my PhD and there was no training, so we didn't have any type of management training." (PDRA)

3. Links between training and PhD

One of our aims at the outset of the project was to explore how PGRs relate their experiences of transferable skills training to their core PhD work. The comments from the students seem to reflect some stress around the

relationship between transferable skills sessions and their doctoral studies.

“thought that it would be good to give you some feedback on the courses that we had, especially in October because I don’t feel that they covered the amount of things that they should have at the start of the course. I don’t think they prepared us adequately for really the first 3 or 4 months of the PhD.”. (PGR Yr 1)

Cryer (1998) highlights the importance of skills training being linked to research skills. The need to make this more explicit is echoed in the following quotes:

“because we’re doing a Science PhD and the training that we get should be relevant to doing a Science PhD not just like training that I could go to any other job and get.” (PGR Yr 1)

“You would take what you learned from it and you could transfer it to something else..... ..I mean you have to learn what you’re going to do first before you can learn how to transfer it to something else, especially when we’re not going to be worried about doing that for another 2 years. It’s like, well this is what’s important now, which I think should be the case.” (PGR Yr 2)

The need to integrate transferable skills training with the PhD was highlighted by Gilbert (2004):

‘such skills [transferable skills] will remain abstract and superficial unless closely integrated with the practice of research itself. Doctoral study is not an extension of general education, so the idea of generic skills at this level has limited relevance if they are seen to be independent of the development of expertise in a particular field’ (Gilbert 2004, p.305).

Gilbert (2004) considers there to be a number of questions remaining around generic skills and their relation to the PhD and raises the issue about what

would be considered core and optional skills for a student to develop during their studies. He goes on to comment that if these skills are important for PGRs then they should be assessed as many of them cannot be assessed by the thesis alone. Students in our study were concerned about the skills session and the lack of any formal recognition for their participation in them.

“Well that’s all very well, but how are the employers going to know we’ve done it and are they going to care because you’re like, oh I went to an hour long course, or a 4 hour long course 3 years ago on people management for instance? They’ll be like, so, that doesn’t prove anything to us?” (PGR Yr 2)

One of the drivers for the focus on developing transferable skills amongst doctoral students was to ensure a quality of postgraduate education (Gilbert 2004). From a learning perspective, a question still remains for us; can we [as providers of skills training sessions] ensure any enhancement in a student’s learning of these skills if the only measure we have is attendance? In other words, what quality can we assign to these sessions in support of the students’ transferable skills?

Discussion

A study by Pole (2000) based on interviews with doctoral students about what they learn in their PhD identified four broad themes: substantive knowledge (discipline specific knowledge), technical knowledge, craft knowledge and personal/social skills. The skills essential to the completion of the PhD identified by participants in this study broadly map to these themes with one notable exception. In our study, students focused on the last

three aspects: technical knowledge, craft knowledge and personal/social skills. This is probably a result of the focus of our study being transferable skills rather than the actual PhD itself. In the Engineering and Physical Sciences Research Council (EPSRC) study (cited in Gilbert et al 2004) students rated which skills they considered important in a PhD: presentation skills, research methodology, planning and control, academic writing, time management, innovation and creativity, initiative and flexibility, job applications and CVs, network and career planning and interview techniques. Clearly, there is a great deal of overlap between this list and those skills identified by our subjects, however, notably career planning as a theme did not emerge in our study.

Cryer (1998) highlights that students are poor at recognising their skills and thus find it difficult to build on them and see them as transferable outside their PhD context or to recognise that some of their skills they are developing within the PhD as transferable. This is reflected in our own study for instance, when asked “What sort of skills do you want to develop during your PhD?”, one student responded:

“Research skills. To know what to do next or where to go because I don’t. I say to my supervisor what should I do now. I’ve done all this, but I don’t know where to take it next? And she’s like oh we could look at this and we could look at this and I don’t know that because that’s just not something I’ve learned yet. I don’t know the field well enough. But that’s not a transferable skill that an employer’s going to look for, that’s a research skill. It’s different”. (PGR Yr 2)

Lessons learnt and subsequent changes to provision

The PSGS has responded to the findings from this study by altering elements of its provision. Here, we would like to offer an analysis of what we, as training providers, have learned that might be applicable to others involved in this important, and relatively new, area of academic development.

An over-riding issue that came through the study was the need to provide obvious progression in the training provision throughout the PhD duration. This was revealing since, while the organisers had planned such progression, this is clearly not obvious to the students. Consistently, the students stated that, at the start of the PhD process when they may be feeling overwhelmed, only the essential information required for induction be provided. In response to this issue changes made to provision in the PSGS includes;

- The faculty induction session has been stripped down to provide only what needs to be known at that stage
- The other training that will be provided over the 3 years will be presented so the students are aware of the programme they will experience.

The progression will be made more explicit both at the faculty induction and via the PSGS training web-site. We are aware that it has not been possible to show new students the new programme in its entirety since it has been necessary to introduce new training in a staged manner to allow students and staff to adjust to additional training. Now that the programme has been developed, it is

essential that it goes through a process of ‘bedding in’ to the academic culture before further enhancement is attempted.

Evidenced progression will take the form of students presenting to their peers, an evaluation of an area of research (1st year, Frontiers in Physical Sciences). In the 2nd year PGRs will present their own work via a poster presentation to their peers and academic staff from the faculty. In 3rd year a focus of training is in preparation of the viva.

In addition to the above three-stage progression, departments have been provided with digital camcorders, specifically for use in training PGRs in preparing for presentations. This is in addition to the implicit training provided by supervisors and others in research groups/department that provide students with constructive criticism.

We also believe it is essential to be responsive to areas that our respondents identified as being under-supported and therefore a number of new elements have been added to the training portfolio including .

The Frontiers in Physical Sciences residential course which takes place in October each year and is attended by every 1st year PGR, has been modified in response to student feedback. Students indicated that, while they appreciated the opportunity to prepare a presentation in a group of three and then make the presentation in a safe academic environment, they would have appreciated receiving feedback on their presentation. In subsequent years the presentations have been filmed and students receive feedback, in their groups, from LTC staff once the students have returned to campus.

Training in poster design and production, followed by a Faculty-wide poster conference was instigated in session 06/07. This was provided to give all 2nd year PGRs the opportunity to discuss their research with other physical scientists since all staff and PGR in the Faculty are invited to the conference.

A DVD designed to support undertaking the PhD viva is currently being produced and will be made available to all faculties for use in discursive training sessions. The aim of this DVD is to demystify the viva but also to improve communication skills by encouraging PhD candidates to discuss their work in an enthusiastic and considered manner.

The Careers Service now offers a course on ‘Marketing Yourself’ dealing with different planned trajectories e.g. academic or industrial careers. This was provided in response to a request from PSGS.

A series of workshops on voice projection and commanding an audience was provided for the first time this year by a commercial company. This will become a routine part of the training provision. Management training is now being provided for post-doctoral staff.

Some of the PDRAs requested that they be involved in providing training and perhaps in officially mentoring PhD students. To this end departments have been encouraged to involve their PDRAs in training provision, for instance, the course on poster design that is provided by a PDRA.

Conclusions

Students in our study demonstrated strong beliefs regarding the areas of skills development they consider important to support them during their PhD and for their next career move. Cooper and Juniper (2002) show how transferable skills programs can be successful if they reflect student priorities and are pedagogically appropriate. Borthwick and Wissler (2003) highlight the need for programs to be suited to students and to get supervisors involved in promoting generic skills training activities. It is difficult to say to what extent this occurs in our case and wonder how this works in other institutions. Skills that were identified as key in this study were technical, communication and management skills but, the focus on each of these areas of skills development evolved throughout the process of the PhD. Pole (2000) identified four areas PhD students described skills, substantive knowledge (discipline specific knowledge), technical knowledge, craft knowledge and personal/social skills. Our study found similarities with the last three of these categories but as we did not explore the content of the PhD itself the substantive knowledge category did not arise. Our skills training provision has been adapted in response to this feedback and from the, frequently expressed view from the online questionnaires and the focus groups, that there is a seeming lack of perceived relevance of some of provision in terms of successfully completing a PhD.

It is clear that the relevance of transferable skills to future career has to be made more explicit. Similarly, training needs of PGRs, as perceived by the students themselves, change with time and stage of the process and, if they are to remain relevant, it is essential that Graduate schools are

responsive to these changes. We would encourage all providers of Roberts' training to take the view that provision should be in response to these needs and be flexible and adapt to change as the PGRs progress; without such responsiveness providers run the risk of disengaging the students their provision is aimed at.

The students in our study also identify clearly where they perceive they are developing such transferable skills and training sessions are not seen as the sole or even major source; the research group itself would appear to play a major role. The research group is an under explored area in the literature. As an entity, it may represent one of the few truly authentic 'communities of practice' in Higher Education (Wenger et al., 1999) and, as such, may abrogate the need for transferable skills training; this requires further investigation.

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Appendix 1 Online questionnaire (Format amended for publication)

Questionnaire for 1st year PhD students

The Graduate School and the Learning and Teaching Centre is carrying out a thorough evaluation of the transferable skills training it provides. You can help in this evaluation by completing the questionnaire below.

Your help will be invaluable in shaping the training that you and subsequent PhD students will receive. Your comments and participation in this is anonymous.

If you have any difficulties filling out this form please contact [Jane Pritchard](#).

1. What department are you in?

Chemistry, Geographical and Earth Sciences ,
Physics and Astronomy

2. What transferable skills do you consider important for

a) Carrying out your PhD studies

b) Your future (post PhD) life

3. List as many skills that you think are important to develop during each year of your PhD. (please complete for all years even though you are in 1st or 2nd year)

1st year

2nd year

3rd year

4. Where will/have you develop(ed) these skills? Tick as many as apply.

Training sessions

Supervisor

Research group

Other PhD students

Other, please indicate in the box below

5. Please identify elements of your PhD research that have been effective in developing transferable skills

Question 6 deals with the individual training sessions you have/may have attended.

6a. Faculty Induction

a) Did you attend this session? Yes/ No Don't know

If yes please answer the following questions. If no or don't know please move on to question 7

b) What skills did you learn/further develop?

c) Describe the appropriateness of the timing of this course in relation to your PhD studies

6b. Introduction to PhD research

a) Did you attend this session? Yes/ No/ Don't know

If yes please answer the following questions. If no or don't know please move on to question 7

b) What skills did you learn/further develop?

c) Describe the appropriateness of the timing of this course in relation to your PhD studies

6c. PhD then what?

a) Did you attend this session? Yes/ No/ Don't know

If yes please answer the following questions. If no or don't know please move on to question 7

b) What skills did you learn/further develop?

c) Describe the appropriateness of the timing of this course in relation to your PhD studies

6d. Time Management

a) Did you attend this session? Yes/ No/ Don't know

If yes please answer the following questions. If no or don't know please move on to question 7

b) What skills did you learn/further develop?

c) Describe the appropriateness of the timing of this course in relation to your PhD studies

6e. First Aid Training

a) Did you attend this session? Yes/ No/ Don't know

If yes please answer the following questions. If no or don't know please move on to question 7

b) What skills did you learn/further develop?

c) Describe the appropriateness of the timing of this course in relation to your PhD studies

6f. Radiation Protection

a) Did you attend this session? Yes/ No/ Don't know

If yes please answer the following questions. If no or don't know please move on to question 7

b) What skills did you learn/further develop?

c) Describe the appropriateness of the timing of this course in relation to your PhD studies

6g. Lab Demonstrating I (Statutory Training provided by the Learning and Teaching Centre)

a) Did you attend this session? Yes/ No/ Don't know

If yes please answer the following questions. If no or don't know please move on to question 8

b) What skills did you learn/further develop?

c) Describe the appropriateness of the timing of this course in relation to your PhD studies

6h. Lab Demonstrating II (provided by Department)

a) Did you attend this session? Yes/ No/ Don't know

If yes please answer the following questions. If no or don't know please move on to question 8

b) What skills did you learn/further develop?

c) Describe the appropriateness of the timing of this course in relation to your PhD studies

6i. Library Training

a) Did you attend this session? Yes/ No/ Don't know

If yes please answer the following questions. If no or don't know please move on to question 8

b) What skills did you learn/further develop?

c) Describe the appropriateness of the timing of this course in relation to your PhD studies

6j. Communication Skills

a) Did you attend this session? Yes/ No/ Don't know

If yes please answer the following questions. If no or don't know please move on to question 8

b) What skills did you learn/further develop?

c) Describe the appropriateness of the timing of this course in relation to your PhD studies

6k. Frontiers in Physical Sciences

a) Did you attend this session? Yes/ No/Don't know

If yes please answer the following questions. If no or don't know please move on to question 8

b) What skills did you learn/further develop?

c) Describe the appropriateness of the timing of this course in relation to your PhD studies

6l. Data Analysis

a) Did you attend this session? Yes/No/ Don't know

If yes please answer the following questions. If no or don't know please move on to question 8

b) What skills did you learn/further develop?

c) Describe the appropriateness of the timing of this course in relation to your PhD studies

7. What training would you like to see in place that is not currently available? (Please indicate timing of session, e.g. 1st, 2nd or 3rd year)

8. In what ways do/don't these training sessions link to your PhD research?

9. In what ways do/don't these training sessions link to your own personal and professional development?

Thank you very much for your time.

Appendix 2 Focus group interview themes

- What transferable skills do you consider important for carrying out your PhD studies
- What transferable skills do you consider important for life after your PhD
- When during the PhD process do you think you should develop these skills
- Where have and will you develop these skills
- For each component of the training provision – what skills did you learn from the session and was the session at an appropriate time
- What training would you like to see in place that is not currently available? (Please indicate timing of session, e.g. 1st, 2nd or 3rd year)
- In what ways do/don't these training sessions link to your PhD research?
- In what ways do/don't these training sessions link to your own personal and professional development?