‘In practice it doesn’t always work out like that.’ Undergraduate experiences in a research community of practice

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Available online: 11 Jun 2012
‘In practice it doesn’t always work out like that.’ Undergraduate experiences in a research community of practice

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(Received 21 October 2010; final version received 4 December 2011)

This paper examines the extent to which a structured undergraduate research intervention, UROP, permits undergraduate students early access to legitimate peripheral participation (LPP) in a research community of practice. Accounts of placement experiences suggest that UROP affords rich possibilities for engagement with research practice. Undergraduates tread a path of gaining access to mature practice while also building their own independence, participating in work that they see matters to the community and making gains in use of a shared research repertoire. Students place UROP experiences in a contrasting frame to research exercises experienced during degree programmes; their sense of the authenticity of the research experienced through UROP emerges as a key element of these accounts. The data generate the interesting question that the degree of engagement with mature practice may account for more of the gain from UROP than simply the quantity of contact other researchers.

Keywords: undergraduate research; linking teaching and research; community of practice; UROP; URE

Background

This paper examines the extent to which a structured undergraduate research intervention, the Undergraduate Research Opportunities Programme (UROP), permits undergraduate students early access to legitimate peripheral participation (LPP) in a research community of practice.

The UROP model (described in detail in Goodlad 1998) allows undergraduates to work alongside academics on university research through short-term placements. Common features of placements are that they usually last 6–10 weeks; offer a student bursary which has been made available by UROP funding schemes or research grants; take place mostly on university campuses, but may involve fieldwork in outside organisations such as
hospitals or schools; may have restrictions on the stage of study (e.g. only second-year undergraduates); and are competitive (some systems require applications from a supervisor–student pairing, others fund a supervisor who then selects a student through open competition). Historically most placements have taken place in STEM subjects, but this is changing in the UK. Undergraduate research opportunities in the UK are funded by a small number of universities (Imperial College London since 1981 and a handful of other universities since 2002), two charitable trusts (the Nuffield Foundation and Wellcome Trust) and two of the seven British research councils (BBSRC, EPSRC).

UROP sits within a broader movement to increase undergraduate engagement in research, which has been championed by the US-based Council on Undergraduate Research and the Boyer Commission (1999). While a growing literature has explored wider approaches for promoting undergraduate research within the curriculum (e.g. Brew 2006; Healey 2005; Healey and Jenkins 2009, 90; Jenkins, Healey, and Zetter 2007), research on UROP itself has also established a number of student benefits. First, UROP leads to perceived increases in undergraduate research skills (e.g. Kardash 2000; Lopatto 2004; Hunter, Laursen, and Seymour 2007; John and Creighton 2011). Secondly, UROP sustains or increases interest in postgraduate research and contributes to career clarification (e.g. Kardash 2000; Lopatto 2004; Hunter, Laursen, and Seymour 2007; John and Creighton 2011). Thirdly it may enhance retention patterns in some demographic groups (Nagda et al. 1998). Finally, a US study has suggested that UROP affords opportunities for situated learning in a community of practice, providing students with situated learning in their disciplinary academic community (Hunter, Laursen, and Seymour 2007).

This paper is the second stage of a two-phase national study into the impact of UROP on the undergraduate learning experience based on fieldwork undertaken between 2007 and 2009. The first-stage quantitative study explored the degree to which students felt these placements enhanced their research skills, based on a survey of 366 students at more than 50 British universities (John and Creighton 2011). The second-stage study, reported here, explored the qualitative nature of placement experiences through a series of 30 interviews.

**Results of the first-stage quantitative study**

Our conclusions from the first stage of analysis suggested that students across a wide range of disciplinary placements experienced certain broad benefits:

- UROP adds significantly to the research skills and capabilities of participating students, contributing experience in many stages of the
research process, including design, fieldwork, data collection, deciding on the next steps to take in a research project, understanding the limitations of certain research designs and needing to explain research to other people.

- Students reported an increase in confidence in their own research abilities, their ability to contribute to their subject area and their ability to discuss academic subjects.
- The study suggested that these benefits may accrue equally to students from the arts, humanities and social sciences as well as to the sciences, where funding is more readily accessible.
- UROP increased students’ awareness of the realities of research, including its negative aspects, providing students with a more realistic expectation of the daily life of a researcher. This ‘reality check’ meant that a small minority of the sample who began their placement with an intention to pursue postgraduate research had second thoughts – 48 of the 366 students sampled who started out with a firm intention to continue were less sure after their experience, though only four actively decided against.

The study raised the possibility that the qualitative differences between UROP placements could account for some of the variation in intentions to progress to postgraduate research. The first-stage conclusions suggest a picture of certain broad benefits in the context of a great deal of individual project variation. Placements vary according to many facets, including differing disciplinary cultures; whether students worked in their own subjects or faced the challenge of an interdisciplinary engagement; whether students worked on few or many stages of the research process; whether students connected with many other researchers or none; and whether the supervision relationship was distant or proximal, among other things.

Theoretical framework of the second-stage qualitative study
The aim of the second (qualitative) stage of the study was two-fold: first, to develop a finer-grained picture of the nature of students’ experiences of placements, including variation within that experience; second, to appraise the extent to which the placement facilitated entry into a research community of practice. Many of the findings elaborate on the results of the quantitative study, especially in relation to students’ increased confidence in their own research abilities and the realities of the research process.

Communities of practice
In Wenger’s framework, practice is embedded into communities which cohere through three mechanisms. The first is mutual engagement of
individuals, which involves being included in what matters. This does not presuppose that all encounters with a community will be positive; Wenger warns they may not only contain ‘counterproductive patterns, injustices, prejudices, racism, sexism and abuses of all kinds’ but also be ‘the very locus of such reproduction’ (1998, 132). Newcomers are engaged through ‘broad access to arenas of mature practice’ while facing lighter demands on time, effort and responsibility. This is known as legitimate peripheral participation (LPP) (Lave and Wenger 1991, 110). Second, communities cohere through working in a joint enterprise which is mutually accountable and collectively negotiated. The third mechanism is a shared repertoire of ‘routines, words, tools, ways of doing things, stories, gestures, symbols, genres, actions or concepts’ and possibly also the discourse of the community (Wenger 1998, 83). We take it as a given that researchers belong to multiple overlapping communities, which may be geographically dispersed or clustered in geographical proximity.

Unlike the course-based research a student may have experienced previously, UROP placement activities constitute the normal research practice of university academics. Entry into practice is therefore at the heart of the model; learning focuses on the acquisition of research practice rather than of abstract knowledge of research disengaged from practice (that is, UROP is learning to do research rather than learning about research, as described in Jenkins and Healey (2005). The experiences of students in this study ranged considerably in terms of their quantity of interaction with other people – from the organised, peopled environments of the laboratory or hospital, with their clear labour divisions and hierarchies, to the more solitary endeavours of the mathematician, computer scientist, classicist or linguist. Given that a community is not defined by interaction alone but by participation in mutually defined practice, this paper does not address the question of how much contact with other researchers took place, but rather how much engagement with mutually defined practice.

Methods
A total of 23 UROP students and seven placement supervisors were interviewed. The students were studying at five different universities and all undertook research placements between summer 2007 and autumn 2008. Supervisors were academic staff at two universities who had supervised placements with other students within the same period. The placements were funded through two sources: the Nuffield Foundation and the University of Reading. Of the interviews, 25 were conducted by an author of this paper (who was known by informants to be responsible for managing UROP at the University of Reading) and a further five were conducted by a freelance external interviewer. Invitations to interview were disseminated by a university scheme and the Nuffield Foundation to all students in their current
UROP cohort. As participation was voluntary by open invitation, the sample consists of those students who came forward to take part. No national data exists for demographic factors regarding UROP take-up so it is not possible to claim a proportionately representative sample but, while self-selecting, the sample included a range of ages and a range of ethnic and national backgrounds. Gender make-up came close to balance (of the volunteer students, 11 were male and 12 female; three of the supervisor informants were male and two were female). Five of the 23 students were mature and five were international students. Informants covered 15 disciplines: agriculture, archaeology, biology, biotechnology, classics, education, geography, geology, law, linguistics, maths, pharmacy, physics, psychology and systems engineering. One placement was situated entirely in an external organisation (a hospital).

Interview techniques borrowed from both ethnographic and semi-structured approaches. Ethnographers have argued that settings such as academic departments, hospitals, laboratories and museums constitute a culture of their own, having sets of ‘acquired knowledge that people use to interpret experience and generate social behaviour’ (Spradley 1979, 5) meaning ethnography is therefore an appropriate tool for studying them. After standard warm-up questions (the informants’ degree subject, how they became interested in their field) interviews moved to the topic of the placement by asking broadly what the research was about. The bulk of the interviews then proceeded with minimal structural direction from the interviewer. Some use was made of specific ethnographic interview techniques, such as re-stating the informant’s own words to elicit further comment (Spradley 1979) and pursue whichever avenue of discussion the informant had chosen. This technique was found to achieve variable effects, producing elaboration and continuation in some informants but inhibiting others because it disrupted the natural flow of conversational turn-taking. Spradley’s advised avoidance of translation proved problematic to achieve. Spradley discourages ethnographic researchers from paraphrasing informants’ responses into their own linguistic register, suggesting this causes interviewees to begin helpfully ‘translating’ their responses into the interviewer’s language themselves, for example from slang into formal talk (1979, 19). However, this proved difficult given that the informants’ research projects were in highly specialised fields which could only be discussed with non-specialist interviewers via some degree of simplification. Indeed, translation competence (i.e. learning to communicate the work to outsiders) may be an important element of research. At the end of interviews some limited use was made of structured questions about how the supervision relationship worked and challenges faced.

Interviews were recorded using a portable digital recorder, then transcribed and uploaded as text to qualitative research software (NVIVO 8.0) to facilitate analysis. Initial exploration of the data was open-ended and bottom-up with transcripts coded for emergent themes before analysis sharpened into the question of LPP. In the analysis below it was occasionally felt
important to draw out fine-grained textual meaning through selected use of discourse analysis.

**Findings**

Findings are explored in three sections: the legitimacy of the students’ participation in the community of practice and mutual engagement (‘being included in what matters’ – Wenger 1998, 74), joint enterprise and shared repertoire. The temporal limitation and the nature of participation through a scheme are taken as sufficient to determine the peripherality of students’ participation.

**Mutual engagement and legitimacy**

Perceptions of ‘legitimacy’ and ‘mutuality’ feature considerably in the interviews, particularly in the least structured sections where informants were free to dwell on any aspects of the placement that interested them. (These data rely on students’ own perceptions of legitimacy and mutuality which may, of course, be flawed.) Lave and Wenger see the importance of legitimacy as greater than the provision of formal teaching or training (1991, 92): in other words, accepting students’ participation in research practice as valid may matter more than providing formal training. Three sources of legitimacy and mutual engagement emerge from the data.

**Access to space and artefacts**

First, for some informants a sense of legitimacy arises in part through physical or spatial aspects of the experience. Five informants made unsolicited comments about the spatial environment or other physical objects (‘artefacts’) which indicated physical accoutrements of the community. For example, where workspace is decent, students are allocated a space of their own or where they have out-of-the-norm access to physical spaces usually barred to undergraduate students, this is perceived as validating. Examples of this theme include a lab student who noted being given her own work area (the word ‘own’ being repeated three times):

*I got my own lab as well, I had like not the whole lab, but yeah I had… my own [ultraviolet equipment] and things so I was working on my own. (Informant 8)*

A law student given access to office space in a prestigious and attractive building commented:

*So I was sort of sat up there in my little office on the second floor looking out over the lake thinking, ‘Oh I really like this, this is really good’. (Informant 7)*
A third student made unsolicited mention of physical artefacts (the keys of the building), which were tied to trust and a sense of equality with existing community members:

Whereas it’s slightly different when you’re just studying and you talk to the staff members, to when you’re actually working with them. I mean, it was really nice to be given keys for the different parts of the building as well. ‘Cos usually as a student, you don’t get keys to different parts of the buildings. So it’s nice to be trusted and treated as an equal. (Informant 9)

The supervisor (Informant 29) of a fourth student also commented on the sense of novelty at being the only person working in a large building during the quiet summer period. Conversely, poor physical environments had an adverse effect on legitimacy. The need to negotiate access to shared space normally reserved for existing members of the community was a cause of tension for newcomers:

Some people are more welcoming than others. In some cases I felt like, because I’m a student doing a placement, I obviously don’t have a set area that I can work in, so I had to use other people’s offices and take up their space. And I felt that some people didn’t really appreciate that, because it’s like their space is being taken over. (Informant 9)

Taken together, these five sources may collectively indicate that at least some of the indexing of inclusion or exclusion in a community arises through access to its spatial or physical aspects.

**Authenticity of the research**

A second source of legitimacy appears to arise from whether students see their placement as authentic research. While competition for UROP placements should act as a filter excluding non-research placements, the texts suggest that students play at least a partial role in judging the authenticity of their research activities and hence the legitimacy of their participation in the community.

Informant 15 suggests legitimacy through the perceived high stakes of his work, which he places in a different frame to coursework (‘This isn’t like it’s a piece of my coursework, if something goes wrong this is his research project’). Elsewhere, an informant working on a pharmaceutical placement used the word ‘proper’ to describe their experience nine times, again contrasting it with on-course research (emphasis added):

I haven’t done any kind of research like this, like [a] proper placement. This was a proper placement research, isn’t it? So I did like practicals I do in my chemistry which are compulsory for me to do [but] not as a job I haven’t done any research as a job. (Informant 8)
The separate framing of UROP research against activities undertaken during programmes is continued by Informant 18, who contrasted research undertaken on undergraduate courses which were ‘done and then put on the shelf’ with UROP research where ‘people were actually taking it seriously and asking what are you finding at the moment, which was quite special’. The contrast is echoed by Informant 15: ‘I thought it was great when I was sitting there just doing hour-long practicals once a week as part of a second year module, but when you actually start getting down to the nitty gritty and starting from scratch with all this stuff it’s like oh my god’. Finally, Informant 23 (emphasis added) sums up the centrality of access to real research practice as the most important gain: ‘but the biggest thing I took away from it was the experience of doing the research, because that’s what made me want to do a PhD’.

The data also appear to indicate that some informants place UROP activities in an employment or professional frame as a source of legitimacy, rather than a research one. An informant working in physical geography (Informant 15) placed academia and research into a separate frame from ‘work’ and anchored his activities towards the work frame. The placement was consistently tied to its possible employability benefits and whether it would lead to work in the commercial sector using the techniques and technologies of the placement. Informant 12 also tied her psychological research to the need to accrue sufficient experience to pursue a clinical path, framed as ‘work’.

For these students, the placements provided legitimate access to useful experience, but research was not the most important measure. In contrast to the two students who were more concerned about employability, a computer scientist (Informant 10) who had already talked at length about his placement research (which was framed by both interviewer and informant as research) turned to discussing his freelance work for large corporations. The interviewer, over the course of three questions about collaboration in research and in corporate work, was placing the student’s commercial work outside the frame of research and into a ‘work’ frame. Line 6 of Discourse Extract 1 shows the student firmly correcting the interviewer’s mistake and pulling his private work also into the frame of research.

**Discourse extract 1**

1. *int:* and can-|| | I suppose what I’m asking is | in your work for them
2. *inf:* can you collaborate *within* the corporation
3. *inf:* no | I’m working by myself:
4. *int:* ==just yourself\`
5. >so it’s a very individual journey< | whereas with *research* you=
6. *inf:* =>it is still research< | it it is still research | it is heavily based research |
Part of the construction of legitimacy, the very preliminary consideration of what counts as research, is therefore partially judged by the students themselves through their own framing of research, though for a few the research frame and its legitimacy may be discarded as of less personal relevance.

**Social and professional relationships**
A third source of legitimacy is the formation of working and social relationships. The most important relationship formed is with the supervisor, but relationships also include the other academics encountered – there are 33 references (from 16 informants) to working with academics other than the supervisor. Evidence of a strong contribution by the students to these working relationships – such as the feeling that staff and students are at times working things out together, or that the student is teaching something new to the supervisor – is a clear source of legitimacy. Evidence of the legitimising component of this includes comments such as ‘I felt like I was quite important’ (Informant 1) and supervisors acknowledging the bi-directionality of leadership: ‘Well, at the start of the project, I was telling [her] what we were going to do, and by the end of the project [she] was telling me’ (Informant 29).

Legitimacy may be conferred particularly strongly in those cases where asymmetries of power between staff and students are bridged during the placement. Research communities of practice are likely to be visibly hierarchical, and some placement experiences appear to cross such asymmetries while others are sites for their reinforcement and reproduction. In Extract 2, Informant 1 introduces the notion that he was permitted access to the social space of senior academics on a tolerably equal footing. A finer-grained reading of the text suggests that the idea of crossing the divide may not have been trivial for the informant.

**Discourse extract 2**

```plaintext
1  || erm || on the first week I was doing || er || on the Friday one of
2    the members of staff leaving || that actually lectured me | at one
3  Inf: point || and I was invited to a kind of coffee and doughnuts (0.2)
4    session type thing || on erm the Friday=
5  Int:                      [mmm]
6  Inf:                      [=of the first week] ||
7    to say goodbye to this person~~||
8    so I was sitting in a room full of | all the like departmental staff,
9  Int:                      mmm
10  Inf:         and I knew some of em from like || being lectured to || but it was
11    quite nice to sit there and || chat to them on a more || kind of ||
12    not equal || but yeah like || level type thing
13    || >on the same sort of level<||
```
In line 2 the informant mentions that the person leaving had ‘actually’ lectured him in the past. Linguists argue that in propositional terms ‘actually’ reinforces the truth or reality of an utterance and used pre-verbally it strengthens the intensity of the verb (Lenk 1998); stressing that the academic ‘actually lectured’ him may be the speaker’s way of highlighting the former hierarchical distance between them which has been bridged by the social encounter. Throughout the remainder of the extract the speaker softens or minimises the notion of equality in a number of ways: in line 3 ‘kind of’ downplays the coffee and doughnuts social event, ‘session’ humorously lightens it (line 4), and ‘kind of’ (line 11), ‘not equal,’ ‘type thing’ (both line 12) and ‘sort of’ (line 13) all again soften the assertion that this was a meeting on a footing of relative equality. This extract suggests first that the student himself perceived an asymmetry to have been crossed, and second that he attached some importance to this. Similarly, after the interviewer asked what the social exchanges ‘were like’, the student continued that ‘it was quite nice to talk to them as people’ rather than talking ‘only about the work’. The crossing of asymmetries and its sense of significance is echoed by the informant below describing taking breaks from work at a nearby coffee shop ‘I didn’t feel sort of lower than the lecturers, you know’ (Informant 23). Other informants echoed these sentiments – Informant 15 described the staff ‘treating me like one of them’ and informant 7 talked about having a ‘lovely chat’ over coffee with academics from the department.

It is possible to go too far with this analysis and attribute to the placements an egalitarianism which is not present. Informant 19, whose placement was in a busy hospital, was asked about the supervision relationship by the interviewer, who enquired ‘Were you feeling like you were an equal?’ The informant resists the proposition of equality with care, replacing it with a frame of respect:

I still have the utmost respect for them I think. Like, they definitely know what they’re doing, they’re great nurses and they’re really lovely and I really enjoyed working with them. And we did make a good little team, we had our different strengths. (Informant 19)

The same informant’s interview suggested a more rigidly hierarchical environment in general. Where most students used first names for their supervisors, she stuck to a ‘Professor’ plus surname form. The only two sections in her interview coded under ‘supervision’ related to her supervisor being busy and rarely present. This interview suggests an example of the asymmetries of power between students and academics being observed and reproduced in the placement, while not necessarily detracting from learning or participation in practice. In interpreting comments on social participation, we take care to distinguish between students being granted relatively egalitarian access to
the social arena in which practice takes place and student access to the practice itself. (A scenario in which students were treated with social distance but given high-stake work to do would exemplify this distinction.) The subsequent section explores access to practice (as distinct from social access within the CoP) in more detail.

To summate, three broad tags have been used to gauge the legitimacy of participation: access to physical/spatial territories of the community, the informants’ own framing of the authenticity of their activities and the working and social relationships formed on the placement. Overall, other coding of unsolicited comments related to confidence (14), pride in their achievement (2) and general praise for the scheme (23) support a view that most students perceived legitimacy in their participation.

**Joint enterprise**

Do students on UROP placements come together to produce research in joint enterprise with existing members of the community of practice? As mentioned above, part of the variation of placements pertains to the quantity of contact between students and other people in the community (supervisors, other academic staff, postgraduates, lab technicians, and so on). However, what may concern the question of joint enterprise, more than quantity of contact with other people, is the qualitative nature of the contact with practice. Certain placements involved a large degree of solitude while others reported more contact, but at both ends of the spectrum variable accounts of learning emerged, from the very strong to the more moderate. A better lens may be that, working mainly alone or mainly in company, students/apprentices need regular contact with mature practice (Lave and Wenger 1991, 100).

**Independent negotiations with mature practice**

Consistent with this proposition, a picture emerges from the data of placement journeys which are a mixture of developing independence and the exposure to/consultation of mature practice (consultation involving the active seeking out of information about practice, e.g. by checking the literature, as opposed to simply being immersed in it). As well as contact with mature practice, informants importantly also reported a process of coming to their own independent negotiation with that practice (such as finding their own ways of performing certain negotiated procedures, their own ways of recording, problem-solving alone before seeking help and suggesting their own input to shared practice).

In a bottom-up process, 77 excerpts (23 informants) were coded under the label ‘supervision’. Of these, 65 excerpts reference some consultation of mature practice and 33 reference an exercise of independence in the broader
context of supervision. A separate coding for independence also captured 35 other references.

Other codes in the data (‘setbacks’, ‘seeing what research was like’) reflected the theme of contact with mature practice, and also its inherent pragmatism. For instance, while Informant 5, faced with reading a complex research article recounting the previous work of her group, took the opportunity to have it explained by the most senior academic in the department, Informant 15 was pleased to find in a staff journal discussion that academic staff, like him, might also skip the parts they do not understand.

Witnessing pragmatism is also reflected in Informant 21’s account of sizing up geological samples with some subjectivity (‘it’s almost non-scientific’) and Informant 3’s account of frustration on finding that textbook logic does not always produce expected results in the lab:

... when you have a theory on paper and all your procedures seem watertight you know nothing could go wrong with this, it makes perfect sense, it’s logical. But in practice it doesn’t always work out like that. (Informant 3)

As stressed above, communities of practice should not be romanticised and the reality of research may vary from the idealised views students have at the outset. This must be seen as an inevitable and important part of the process of seeing what real practice is like. Access to mature practice can therefore be expected to strip away some layers of the romanticisation of academic life. The 61 references coded under the theme of ‘setbacks’ also reveal such a process at work.

At the most peopled end of the spectrum were the placements that took place in busy laboratories or hospitals (informants 5, 3, 8, 20, 21, 23) and involved contact with many academics, non-academics (nurses, technicians) and postgraduate researchers. It may arguably be that these are the easiest settings within which to consult mature practice as it is being acted out by professionals all around one. In the middle ground, some placements had less contact with researchers but a great deal of contact with human participants in the research (informants 12, 14, 19, 23). These placements generated a variable degree of engagement with mature practice, considerable for some but moderate for others.

At the solitary end of the spectrum, consultations with mature practice include the following: informant 11, a classicist whose main contact was only with her supervisor, consulted in detail the practice of her supervisor and the tiny handful of specialists who had worked on the translation and interpretation of certain kinds of Latin inscriptions. These specialists were temporally and geographically remote, existing in different countries and spaced over several centuries. Nonetheless, her engagement in practice was rooted in the collective learning of this small community. She also participated in the mutual definition of that practice, finding that canonical prac-
tices may not withstand renewed critique and finding better ways to do things herself. Informants 16 (a computer scientist) and 13 (a linguist) likewise spent most of their placements alone, but consulted the mature practice of their supervisor with regularity. Finally, Informant 10 had little face-to-face contact with other academics but reported in-depth his consultation of the practice of other researchers in different countries, including a quantum physicist who had won the Nobel prize, and physics PhD students in two countries.

Informant 17 met no-one other than her supervisor and also worked remotely from home, with reliance on email supervision (‘I haven’t even met [him] that many times to be honest’). Her consultations with mature practice were limited entirely to her supervisor and this communication was mainly at a distance. Of these more solitary placements, all barring Informants 13 and 17 presented the placement overall as a high impact learning experience; Informants 13 and 17 (whose engagement with mature practice was more moderate) were positive about the experience, but less intensely so.

In sum, students both consult mature practice (though levels of access to practice differ) and develop independence; they contribute to and negotiate the nature of practice to differing degrees. Both solitary and highly peopled placement experiences appear to offer opportunities for engagement with arenas of mature practice, and the accounts of learning were stronger in those placements where that access was considerable.

The study is not a form of factorial analysis and no causality can be ascribed here; however, the data generate the interesting suggestion that the degree of engagement with mature practice may account for more gain from UROP than simply the quantity of contact with other researchers. Placement accounts which do not strongly feature accounts of crossing social asymmetries may still involve close contact with mature practice, suggesting that these two aspects need to be viewed separately.

**Shared repertoire**

Finally, analysis considered the extent to which placement accounts showed evidence of students acquiring the shared repertoires or tools-of-the-trade of a research community of practice (its procedures, equipment, methods) and may be thought of in terms of the various stages of research.

**Activities clustered on the middle stages of research**

The earliest and lattermost stages of the research process, such as project design and dissemination, featured little in the interviews, with design mentioned by a single student. The absence of engagement with research design is consistent with peripheral participation, given that novices’ tasks are normally low risk.
Rather than design, most students begin their placements by reading the relevant literature (20 references, 16 informants), which shows them that published papers may be imperfect and that authors do not always explain how they have gone about things. Similarly, only a small number of students engaged with the dissemination end of the research process: a few commented on writing (four students mentioned elements of the writing process, such as adjusting their style; five shared authorship), and six students discussed departmental presentations (14 references).

Most students engaged with the shared repertoires of gathering, generating and analysing data. This may have taken the form of recruiting human participants to studies (19 references covering five informants), use of specialist procedures or equipment (16 references, 10 informants), data analysis (eight references, six informants) and overall ‘hands on’ experience of research (13 references, eight informants).

There is considerable mention of procedures, equipment or machinery that undergraduates are not often exposed to in the course of their degrees, such as software (Matlab, Superlab, Transcriber), use of remote sensing in geography, classroom observations in specialist schools for psychologists, computer scientists using supercomputers and the culturing of cancer cells by pharmacy students. Basic skills which have been covered quickly on undergraduate courses may also be reinforced by real-world use, such as the fast and accurate use of a pipette (‘It sounds like it’s nothing but, it really is; you have to be skilled to do it fast’, Informant 5) or taking blood pressure readings (Informant 19).

There is also engagement with the pragmatic realities of dealing with human situations which had previously been approached only through ‘textbook’ learning. Two notable examples of this are quoted below. Extract A features a pharmacy student planning to pursue a medical career experiencing sustained patient contact for the first time. The informant recruited 40 patients with ME for research and found, through confronting difficult emotional terrain, that practice involved dealing not only with the theoretical knowledge about the causes and presentations of ME, but also with patients’ emotions.

A: It was direct patient contact. It was talking to people and ME was a disease that I didn’t know very much about and you can read the textbooks … but hearing people’s stories and hear people say, ‘Oh, I’ve had it for twenty years and I’ve taken this medication, I’ve done that, that doesn’t work, I’ve changed my diet, I’ve done…’ And some people got really upset later on, I had people in tears, I had like really like … I dunno, I got people like really did just open up and I got people’s raw emotion and their raw experience of illness, which was the thing I feel I learned the most about.’ (Informant 19)

In Extract B a psychology student who worked with autistic pupils discussed developing the practice of talk, as distinct from furthering her cognitive knowledge of the condition.
B: I was talking to him and saying ‘oh, what do you like about music, do you enjoy singing or do you enjoy this?’ you know as long as you go straight to the point, he was quite willing to answer the questions, he might start singing cos he enjoys singing, but you can bring him back if you’d say ‘you can sing in a minute if you’d just answer these questions’. So that was, I think that was the most interesting day for me because it was a mix of performance and education and autism and actually getting to know the students rather than just sitting back and watching. (Informant 18)

These accounts are consistent with the view that learning how to talk may be as much part of the repertoire of practice as other practical actions (discourse as practice – Lave and Wenger 1991, Wenger 1998). Informant 19 described placement training as being shown by nurses ‘how to talk’ to patients. These engagements with the negotiated, pragmatic nature of the shared repertoire (particularly where it departs from theoretical knowledge) can probably only occur through access to the authentic research practice of the community.

Some students question whether the shared repertoire of the research community of practice is culturally specific in ways which mean they have further to travel to reach legitimate practice. These students, for reasons situated in their own personal background, may initially lack knowledge or skills possessed by other students. Three students mentioned their international status, making unsolicited comments framing themselves as outside of the body of knowledge of how to do research in a British context.

A: Yes, I’m studying here but I’m not English, so still some of the knowledge necessary in order to make research, where to look, what to look at, is still out there for me. (Italian student)

B: The way people conduct research in Russia for example, is slightly different to how it’s done in England. I think English universities, particularly in the psychology field, are very advanced, and you rely on investigating so many things yourself, being more independent. Whereas in Russia it’s probably more hand-held, a kind of showing more, you are explained more to, explicit details why this and why not that. Whereas here you’re given something and you are expected to go and investigate, be more independent. It’s created anxiety. (Russian student)

C: ... but the thing is in Pakistan we don’t really use computers for research. The teachers don’t really promote you to use computers and, you know, use Google. What we used to do was reading books, that’s all. (Pakistani student)

The same exclusion from core cultural knowledge applied to British students from backgrounds with little experience of higher education. The informant below discussed her perception of research careers following the placement and her prior lack of understanding of the basic structure of research degrees resulting from her personal background:
... when I was photocopying all the MAs I photocopied a few PhDs as well. And [my supervisor] was like, ‘No, no you’re just doing the MAs’ and I said ‘Are they not the same thing?’ and she was like ‘No,’ and I was like, ‘Okay so it goes Masters and then PhD?’ and she’s like ‘Yeah,’ and I was like ‘And so when you’ve got PhD are you a doctor?’ and she’s like ‘Well you’ve got to do a doctorate’ and there’s you know, it’s just stuff that like... My family aren’t a university family and none of my family are students...

These comments suggest a sense of yet greater peripherality due to personal background, with a greater distance to travel towards full participation.

The explorations above require some caution. First, it can be assumed that learning on UROP placements is underpinned not only by engagement with practice but also by prior learning on the undergraduate programme, some of which may have been didactic. We therefore make no claims dismissing the role of learning which has not been situated in practice. Second, the data mentioned here reflect the issues students happened to wish to bring up in interviews and are not an overall quantitative mapping of the numbers achieving various kinds of participation – these considerations are better served in our previous paper (John and Creighton 2011). Third, it is worth reiterating that data generated through qualitative interviews are not generalisable. Rather than these accounts of placements being considered a typical picture of all UROP placements, they may rather be considered telling (Mitchell 1984, 239) of the rich possibilities for engagement with research practice that UROP affords.

Conclusions

This paper has sought to gauge the possibilities for legitimate peripheral participation in a research community of practice through UROP.

First, and most importantly, the accounts explored demonstrate that UROP provides an excellent opportunity for rich engagement with a research community of practice. Undergraduates tread a path of gaining access to mature practice while also building their own independence. The data suggest that students participate in work that they see matters to the community, through which they gain a sense of making a legitimate contribution. In addition they appear to make significant gains in use of the shared repertoire of the community, albeit slightly clustered around restricted stages of the research process (data collection, generation and initial analysis).

Second, the interviews suggest that students place research exercises undertaken during their degree programme in a contrasting frame to their contribution to staff research projects through placements; their sense of the authenticity of the research experienced through UROP emerges as a key element of these accounts. UROP students are immersed in the everyday research practice of the department for the duration of the placement in a symbiotic relationship with academics, both contributing to and learning from
departmental research. Access to the social and physical space of the community, where this is perceived as markedly beyond the normal bounds of an undergraduate, adds to the perception of participation of authenticity. We have not studied on-programme research experiences delivered as part of the curriculum and we make no claim that UROP is the only structure that permits engagement with research communities. But what this study does demonstrate is that granting access to what is perceived (by researchers and students alike) as ‘real’ research appears to have some marked advantages.

A related point is that students make their own judgements about the legitimacy of their work and about their reception in the community of practice; accounts demonstrate a notable sensitivity to whether or not more senior members accord legitimacy to their participation. The prevailing attitudes of academics to the appropriateness of undergraduate participation in research is therefore of some importance – a point underlined by Lave and Wenger’s greater stress on legitimacy than formal teaching (1991). We take care to distinguish participation in the social world of the community from participation in the practice of the community. While social participation cannot replace participation in practice, accounts suggest that social inclusion in the CoP strongly contributes to apprentices’ perception of their legitimacy.

Finally, we suggest that these accounts bring into sharp relief the importance of good placement design and supervision; the interviews provide accounts of high-impact experiences in which students work on authentic research, gain access to the mature practice of the community, have room to develop their own judgement and independence and develop in use of the shared repertoires of research. Conversely, in other placements students may consult somewhat less with the mature practice of the community, may pursue work which is less ‘authentically’ research or may feel excluded from the social or physical space of the community. As a consideration of social inclusion it is also necessary for supervisors to be aware of the greater challenges faced by students from some backgrounds in gaining a feeling of legitimate participation. While careful design is important, it may be the case that UROP should not be over-designed. Most schemes have minimal scaffolding; inductions, where they are offered, are generally in the form of informal meetings with supervisors, UROP has no learning materials or separate resources and some placement students report an initial period of worry while they take stock of the level of work that is required of them. Structuring the placement schemes more, however, might rob them of the real sense of independence and authenticity that emerges from students initially feeling alone but learning to negotiate their own interpretation of practice, including pragmatic aspects which cannot be found in textbooks or papers.

The authors’ earlier quantitative study (John and Creighton 2011) established that UROP leads to certain broad learning gains in experiencing and
understanding research while also producing a reality-check effect. Through a different lens, this qualitative analysis has added depth to the picture of how placements are experienced by students and the nature of their encounter with research, mapping some of the variation within placements and making possible further exploration of some of the mechanisms (e.g. access to mature practice, legitimacy) which open up participation in the research community. The study echoes previous findings by Hunter et al. (2007) that UROP placements involve socialisation into the research CoP; their view that UROP provides a cognitive apprenticeship links strongly with the idea presented above that placements provide access to mature practice.

The current study supports and adds to this understanding by proposing a path that travels between consulting the practice of others in the community and developing one’s own independent negotiation of practice. Previous findings (John and Creighton 2011) that UROP adds to research exposure at certain stages of the process and contributes to the ‘reality-check effect’ are further supported. The study adds to understanding of how UROP students frame and perceive legitimacy in their research participation while generating a suggestion to be addressed in future research: that the degree of engagement with mature practice may account for more of the gain from UROP than simply the quantity of contact with other researchers.

Acknowledgements
Our thanks for collaboration from Elaine Seymour and Anne-Barrie Hunter at the Center to Advance Research and Teaching in the Social Sciences, University of Colorado; Anthony Tomei, Sharmila Metcalf and Sarah Saunders at the Nuffield Foundation; and Eliada Pampoulou for conducting five of the 30 interviews in our dataset. For early comments we thank Mike Neary at the University of Lincoln and Glynis Cousins at the University of Wolverhampton. This work was supported by funding from the Higher Education Funding Council for England.

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