

WAYS OF THINKING AND PRACTISING IN BIOLOGY AND HISTORY

Disciplinary Aspects of Teaching and Learning Environments

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INTRODUCTION

A question can be asked of every sector or level of education which seems both straightforward yet fundamental: what is it that the students learn as a result of their experiences? And in higher education, where participation is optional rather than compulsory and where there is not a set curriculum but a superabundance of subject areas and course combinations that transmute in countless ways from one university to another, the question becomes a particularly salient one. A common form of response to it has been to stay clear of the tricky waters of subject and course differences, making much broader reference to the role of higher education in instilling distinctive 'habits of mind', 'modes of thought', skill in reasoning and questioning, or perhaps most commonly of all, in the development of students' capacity for 'critical thinking' (see for example Trow, 1998; Olson and Torrance, 1996). Yet as Middendorf and Pace have recently observed, attempting to base efforts to enhance students' learning on such waymarkers are likely to be frustrated because of an inherent mismatch between the kinds of thinking which are actually called for in specific course and disciplinary settings and "generic formulas for encouraging higher-order thinking" (Middendorf and Pace, 2004, p. 1).

Viewed from that standpoint, an exception might need to be made for the 'conceptual genotypes' which have emerged from research into undergraduate student learning that has been grounded in students' everyday experiences of their academic studies. Two prominent examples of such constructs would be Perry's seminal analysis of undergraduate intellectual development as the gestation of 'contextual relativistic reasoning' (Perry, 1970, 1988), and even more influentially, in the depiction of a 'deep approach' to learning and studying in higher education as one that seeks actively to understand, to interrelate, and to weigh arguments against evidence (see for example, (Marton and Saljo, 1976, 1997; Entwistle and Ramsden, 1983). Yet while it seems appropriate to argue, as does Ramsden (2003), that a concept such as deep approach should be seen relationally, i.e. it takes on different guises in different disciplinary settings – and a similar case could be made for critical thinking – there are considerable limitations as well as advantages in seeking to capture high-quality undergraduate learning in a single, overarching concept, however elastic it may be. Chief among these is the prospect of diminishing returns in analytical sharpness: the further the students progress in their undergraduate studies, the less the complexity and challenge of what they are learning is likely to be precisely and searchingly delineated.

Our aim in this chapter is to discuss how we tried to traverse this potential drawback, by depicting what students learned, as they grew in their grasp of a body of subject-matter, in a form that could transcend the boundaries of a given discipline or subject area while at the same time capturing some distinctive features of that discipline at or close to graduate-level mastery. Drawing on data from course settings in history and biology, we suggest that the students learnt ways of thinking and practising characteristic of, and particular to, each of these subject areas. These ways of thinking and practising were not confined to knowledge and understanding, but could also take in subject-specific skills and know-how, an evolving familiarity with the values and conventions governing scholarly communication within the relevant disciplinary and professional community, and even a nascent meta-understanding of how new knowledge within the field was generated. The concept of ways of thinking and practising in a subject therefore

shares the many-sided but interwoven character of learning for the professions, which Lee Shulman has recently depicted as a synthesis of three apprenticeships:

A cognitive apprenticeship wherein one learns to think like a professional, a practical apprenticeship where one learns to perform like a professional, and a moral apprenticeship where one learns to think and act in a responsible and ethical manner that integrates across all three domains”
(Shulman, 2005, p. 3)

The research from which ways of thinking and practising sprang was undertaken as part of a project, funded by the Teaching and Learning Research Programme of the UK Economic and Social Research Council which aimed both to understand and to enhance the effectiveness of undergraduate courses as ‘teaching-learning environments’ (Hounsell et al. 2005). The predominant concern was with such environments as experienced and perceived not only by students, as has been characteristic of research into student learning (see for example Ramsden, 1997, 2003; Entwistle, 2003), but also by staff. The study also shared with much student learning research a concern with outcome as well as with process and context, and thus with what high-quality learning seemed to entail in the subject areas and settings surveyed, as well as how that was fostered and supported.

The project worked with fifteen departments in a cross-section of subject areas that included economics and electrical engineering as well as history and biology. The focus was generally on a first- and a final-year course unit in each of the departments, which were surveyed using a combination of student questionnaires and interviews with groups of students and with key members of course teams (Entwistle et al., 2003). The analysis of data collected in the initial or ‘baseline’ year formed the basis for a joint review by the researchers and course coordinators of the effectiveness of the course unit, which could in turn lead into the introduction of agreed changes to the unit in a subsequent year. The impact of these changes was then investigated using the same blend of questionnaires and interviews. The present analysis of ways of thinking and practising in the two subject areas is based chiefly on the interview evidence. In biology, this comprised 42 interviews with 117 students, and 32 interviews with 32 teaching and support staff. In history, there were 47 interviews with 166 students, and several rounds of interviews, both formal and informal, with the staff teaching the modules.

WAYS OF THINKING AND PRACTISING IN FINAL-YEAR BIOSCIENCES

The Course Settings

The development of ways of thinking and practising in the biosciences could be most strikingly seen in the three final-year course units surveyed, and with respect to two prominent areas of activity: the students’ interactions with the primary literature in the discipline and with experimental data, and their efforts to communicate within the subject what they had learned (McCune and Hounsell, 2005). These two areas of activity were prevalent in all three course units, despite quite striking differences in how the three groups of students were taught and assessed. Opportunities within these units to engage with experimental data could arise in formal lectures, in group problem-solving of data-sets generated by guest lecturers active in research, or in the individual reading and private study associated with coursework assignments. And it was in the latter assignments, not surprisingly, that the greatest scope was to be found for the students to gain expertise in communicating what they had come to know and understand, and by what means. Such assignments could take the form of essays (in two of the units) or paired seminar presentations (in a third), and typically called for retrieval and review of relevant published material from the primary (usually journal) literature in the field. Moreover, a substantial number of the students had been on six-month or one-year placements in industrial or academic bioscience research institutes, where they had gained additional practice in gathering and interpreting data, and in presenting the emerging fruits of their work to peers.

Interacting with the primary literature and research data

In their interactions with the primary literature and with experimental data in the subject, the students were expected to be able to locate appropriate and up-to-date sources of information, to select what was relevant from within those sources, and to demonstrate what they had gleaned in their assigned work:

- S: If you're gonna become a scientist, you need to quote papers, you need to have proper up-to-date references. That's one thing they're really pushing you to do this year, they're trying to turn you into real scientists. So if you write essays, you're not gonna get a good mark – even in exams – if you don't use references.

However, it was much more than a matter of following well-established scientific and academic conventions in the subject, important thought that was. The students were also learning how to evaluate and come to a considered view on the weight of evidence for a given interpretation. They were doing so, moreover, in areas within the subject where knowledge did not have the cut-and-dried character it could appear to have in textbooks, but was in some instances fragile and contingent, and where there was contestation amongst experts that was as yet unresolved. The following interview extracts are illustrative of these observations:

- S: [The guest lecturers are] putting up their experiments [in the class]. Before they can actually give you the results and say “What does this mean?”, they'll go through “This is the sort of the experiment you would do to find out this sort of result, this is how you would do it, this is what the results would mean for different sorts of situations”. So they actually go through a series of experiments and tell you how they did it, what sort of things are involved, and then they'll give you the results and you'll have to work out the same sort of things that they did.

- S: You have to find various papers and understand them by reading them and then you have to summarise what they're saying, obviously whether you agreed with that or not. And [...] there's lot of disagreement, you know they're not all saying the same thing or coming from the same line of thought. So they have different opinions.

- S2: Yeah. So long as you've got evidence to back up your ideas with. As I say, it's not what it is just because it is, you've got to give evidence.

- S: Nothing is ever clear-cut. So I think that's one of the main things we've learned as well, that nothing really proves anything. Well, not one experiment ... you have to back everything up with several experiments.

- S1: [The placement] makes you think for yourself. 'Cos basically you're studying something that hardly anyone knows as much about as you do.

- S2: It has definitely taught me to think more like a scientist and it has also given me a lot more confidence working in the labs on experiments and the interpretation of results.

Learning to communicate what had been learned

As the bioscience students progressed in their studies, so also did their burgeoning grasp of modes and ground-rules for communicating within the subject and the challenges which these posed — what Monroe (2002) calls “the discursive frames, conventions, and constraints that shape the writing fields [...] each discipline necessarily cultivates” (p. 5). One such challenge was in coming to terms with different communicative genres (oral presentations, experimental reports, analytical essays) as well as with the forms of language expected in formal and informal modes of communication:

- S1: And for me, okay, the hardest part is going to be we cannot use any lab slang. So, we cannot say, “Well, we put to the proteins to centrifuge”, we have to say, like “we

pelleted the protein”, but I mean for everything.[...] So, it’s really technical, and it’s really a good command of the language.

An equally significant challenge came in having to communicate what they had learned and understood not only to their lecturers and tutors, but to their student peers and, when on placement, to a much wider pool of colleagues and fellow-research workers. In consequence, the students developed expertise in meeting the needs of a range of audiences, as indicated in the following two illustrative comments:

You expect the people reading [what you’ve written] are going to have that basic understanding so you don’t need to explain the basics [...] I suppose not to be too afraid of being overly scientific about it, because, if it’s going to be read by peers, they’ll be able to critically assess it that way and understand it easier too.

For the group meetings [that we had when I was on placement], we would just be sitting around the table having a chat, it wouldn’t be a formal presentation or ‘polished’ results. You would just say, “This is the preliminary result I got from such and such an experiment, what do you think of this, is there something I could improve in my experiment?”. Just a general chat. Whereas if you move up to sort of department meetings it would be ‘polished’ data that you’re presenting in a formal manner, so you would have to sort of be able to say, “These are the experiments that were done and these are my results. I had a chat with people in my group, they suggested that I should do this, so that’s what I did and here are my ‘polished’ results”. [...] You would have to give them a lot more background information than necessarily you would with people who work on the same thing as you.

In the interviews with staff, their concerns to foster various key facets of bioscience ways of thinking and practising were equally evident:

L: Well I guess it’s the critical appreciation which ideally I would most like them to have, and that is to develop the skills of not merely accepting what the abstract of a paper tells you. It’s being able to look at the data in a paper and then to say or to make your own conclusions as to whether that, whether those conclusions are consistent with the data presented or are they the only conclusions, etc.

L: There’s nothing [in the module] which would be key knowledge for someone who wants to be a molecular and cellular biologist, because there are various options. What we’re trying to do is make them get to grips with a specific topic and analyse the problems associated with that topic, and be able to have a grasp of what’s going on, what the research problems are, how you approach finding out more about that topic. [...] I just think it’s a way of learning to think in particular ways, I suppose, developing their own skills in analysis in that area.

The second comment above reflects a view expressed by several members of staff, namely that what students learned through tackling a particular body of subject-matter could be considered less important than the wider expertise they were acquiring as potential bioscientists-in-the-making. Some staff went further and saw a wider vocational relevance:

L: These seminar units reflect the interests of staff members at supposedly the highest level of non-experimental work that is available to undergraduates. The encouragement is to go out and look at the original literature. And so it leads an undergraduate into the type of scholarship that they will have to do if they go into science as a career. Certainly if they go into it for a higher degree, which most of our students do. But even if they

go into it in industry or even in a related subject like patent law, this is one of the experiences that we hope will be useful to them. The necessity, the absolute necessity to consult the scientific literature outside of mainstream textbooks. The second but just as important is the ability to present these results to their peers.

WAYS OF THINKING AND PRACTISING IN FIRST-YEAR BIOSCIENCES

The learning goals of staff responsible for first-year biosciences course units were somewhat more modest. This does not however seem surprising. Firstly, unlike their final-year counterparts, first-year students have not yet committed themselves to biosciences as a major or main subject, and many will either not pursue it beyond the first year or take it as a minor or subsidiary subject. Secondly, incoming first-year students are typically much more varied in their prior knowledge of biology, and a core aim of such first-year units is to ensure that the students acquire an appropriately secure grasp of the foundations of the subject and an initial acquaintance with the breadth of sub-areas and interests represented within it. And thirdly, in course units with relatively large and diverse enrolments (in the case of these three units, ranging from a little under one hundred to over 600), teaching-learning activities tend to follow the well-established pattern of a combination of lectures, laboratory-based practical work and small-group activities.

Within such constraints, however, it was nonetheless possible for staff to begin sowing seeds for the development of ways of thinking and practising:

- L: I think the concept that nobody knows what's right in everything is definitely what we're trying to put across. The idea that we don't have all the solutions yet, to challenge things, to question things, 'Can both these people be right?'. I think that's very important at an early stage, a good healthy dose of cynicism I think will make you a better scientist [...] In the end of the day it's you and your data, and you make up your mind what you think, keep your mind very open in case new data comes in [...] Not that we're training them all to be research scientists, but I think that's good training for being a human being.

And despite large class sizes, opportunities to nudge students in this direction could be found in lectures or, as in the two following examples, in practicals and other group-based activities:

- L1: I guess, in the 'Animal Behaviour' lab, the maggots don't always behave in the way that you would want them to. So I guess that's a kind of biological thing, you know, the students predict what's going to happen, and the maggots will either do it or not do it. And you say, 'Well, try to think why they do it, you know, do you always do what you're expected to do? .. No'. That kind of thing, the unpredictability of biology, maybe comes out in the Animal Behaviour lab.
- L2: 'They realise that there quite often aren't answers, direct answers.'
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- L3: We give them information, they have a relatively short period of time in which to assimilate the relevant facts, and somebody in that group has to present it to a larger group . . . And I think it combines skills of combining information, something that they're not familiar with, they probably haven't seen before, and discussing various aspects of an issue - something like cloning a sheep. They looked at it from the scientific side, how it was actually done, [and] from the ethical side, the problems associated with it.

However, there were also many indications in the student interviews that this was not merely an aspiration on the part of staff. As the following comments make manifest, the students saw themselves as beginning to adopt a more questioning and active approach to their learning of the subject:

S: They do quite often remind you that, you know, you are a biologist or you are a scientist, you are researching this, you are looking into this. So they are always reminding you of that fact which, you do get into that frame of mind, and when you're sitting doing these experiments or investigations, it is quite good. You do think of yourself as researching it or doing it scientifically as opposed to just sitting there doing it as schoolwork or classwork.

S: Well the lab we had today, we were kind of expecting certain results. We were expecting to go a certain way, but towards the end the [lab supervisor] explained that it may not necessarily have been because of what we were perceiving it to be. Which makes you think, well, if that's the case everything could be a bit like that – there could be more than one answer for everything. [...] So yeah, I think they're trying to make us think more about what we're doing, and I think that's probably the most important thing that they're trying to get us to do, is to make us investigate, think for ourselves, don't take things at face value.

S: [My tutor] seems very interested in getting us to think a certain way, so the assignments that he sets are more about researching and learning how to read scientific papers, things that really are quite useful skills.

WAYS OF THINKING AND PRACTISING IN HISTORY COURSES

The diversity of historical knowledge

Ways of thinking and practising in history need to be viewed against the enormous range and diversity of concerns of history as a discipline. Not only does it range over different periods and geographical regions, but it also addresses very different aspects of the human past: political, social, economic, intellectual, cultural, gender-relations, imperial, etc. As writers such as Jordonova (2000) have observed history also does not possess a single agreed, foundational theoretical framework. One consequence for the design of undergraduate curricula of this diversity in focus and concerns is that there is no specific body of foundational knowledge that all history students can, or should be, expected to acquire. This broad disciplinary ambit is reflected in the lack of a standard university history curriculum or degree structure; and surveying the UK scene as a whole, one is struck by the presence at all stages of a degree programme of very different kinds of history, structured in different ways.

Another aspect of the diversity of historical knowledge is that within particular domains of historical study there typically are competing narratives and explanations. In engaging with these competing accounts, students need to be alert to authorial stance and the way in which this stance may be related to the historian's political, social and cultural positioning. The fact that historical knowledge is marked by quite high levels of controversy would seem to have important implications for undergraduate learning and teaching, given that there may be more scope for students to exercise personal interpretation and judgement than may be the case in disciplines where the undergraduate curriculum contains much settled territory.

Central ways of thinking and practising in history

In addition to the diversity of historical content and distinct differences in curricular structure and organisation that have been highlighted in the preceding paragraphs, one needs to be alert to differences

between historians in epistemological and ontological stance and the influence of particular traditions of scholarship. At the same time it is important that this alertness to variety does not obscure important commonalities in historical practice. Our interviews, probing historians' aspirations for students, were conducted with lecturers who had a spread of specialist subject interests and were located in contrasting settings. A very strong commonality emerged in these lecturers' accounts of how they wished students to conceptualise historical work and the habits of mind that they wished students to develop. Feedback from a series of presentations we have given to different groups of historians, numerous informal discussions with historian colleagues and a close reading of the literature have allowed us to have some confidence that the ways of thinking and practising identified in our interviews with historians have wider currency within the profession as a key 'common denominator' in history. These ways of thinking and practising were viewed as both intrinsic to the discipline and as valued outcomes of historical study. Such habits of mind shaped the aspirations that staff had for their students and can be seen to underpin the various means by which they sought to develop undergraduates' historical capabilities and understanding. To achieve a high quality of engagement with historical topics, students were seen as needing to develop their conceptions of the nature of historical knowledge and evidence and their capacity to interact with that knowledge along the dimensions summarised in Table 1.

Table 1
Ways of thinking and practising in history

- appreciation of history as socially constructed and contested
 - skilled interpretation / synthesis / evaluation of historical evidence, topics
 - placing particular events / topics within broader contexts
 - alertness to interconnections among phenomena
 - sensitivity to the 'strangeness of the past'
 - ability to view events and issues from different perspectives
 - readiness to separate out one's own preconceptions
 - communicating representations of subject matter in appropriate forms of expression and argument
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It is not claimed that the listing above is a definitive statement of the historical purposes and practices pursued in undergraduate courses; and individual historians or departments may place greater emphasis on some elements than others. The listing, however, does give a clear sense of what lies at the heart of history's distinctiveness. These ways of thinking and practising appear to constitute the terms in which the enterprise of reading, researching and writing history is framed.

As we will illustrate, the ways of thinking and practising listed above centrally guided teaching efforts and students' engagement with history within the courses examined in our study. However, it is important not to view the operation of these ways of thinking and practising in terms of straightforward transmission and reproduction. In discussing how disciplinary practices inform students' experience and understanding, Anderson and Day (2005) have noted that it is important not to reify these practices or to treat them as 'free-standing' elements, independent of the agents who deploy them in specific situations. They are mediated by a lecturer's personal interpretation of these practices, teaching approach (Prosser and Trigwell, 1999) and craft knowledge concerning how a subject should be taught (van Driel et al., 1997). In turn students will appropriate ways of thinking and practising, in different ways and to different degrees, through processes of individual interpretation and participation. Students' engagement with ways of thinking and practising will be shaped by their background, circumstances, existing knowledge and experience and orientations towards university study. Their involvement with a subject's purposes and activities will also be enabled or constrained by the organisational and curricular structure, level of resourcing and ethos of a specific university context.

Thus ways of thinking and practising are not viewed as static objects to be passed on to students. The focus rather is on the performance of ways of thinking and practising – a performance that involves dynamic processes of interpretation and construction by lecturers and students within the affordances and constraints of a particular academic environment.

Guiding Students' Participation in Historical Ways of Thinking and Practising

Tailoring to students and contexts

The ways of thinking and practising in history identified in the preceding section strongly informed teaching efforts in the courses we studied, very often in ways that were congruent (McCune and Hounsell, 2005) with students' own background, concerns and experience. Even within the limited number of history courses examined, differing means were being used in different modules to engage students in historical ways of thinking and practising. The interaction of institutional-level and module-level factors had a strong bearing on what teaching strategies and activities made sense within a given context. In addition conditions were rarely settled, and there were examples of the need to accommodate to changing circumstances, sometimes at short notice. (Among the adjustments made were those required in response to institutional re-organisation, semesterisation, staff changes, etc.) Thus it can be argued from these experiences that rather than seeking to identify an ideal type set of teaching actions that can be applied across all university history departments, development activities are best directed at considering how teaching activities can be carefully crafted to pursue disciplinary practices in ways that are well-tailored to the situation of specific groups of students and what can be achieved in a local setting.

Modelling and scaffolding of historical reasoning

At the same time certain of the general features of course design and teaching approach that were evident in these modules are likely to foster historical ways of thinking and practising across all history settings. One of these general features was a theme which ran through the design initiatives we pursued with departmental partners of explicitly communicating expectations concerning the pursuit of historical study. One thrust of the explicit communication of expectations involved giving clear guidance, tailored to a course's participants, on how to think about as well as how to go about required historical tasks. Students whom we interviewed also pointed up the helpful impact of staff directly modelling historical reasoning. This included in one setting the clear and repeated demonstration in lectures of the interrelations of evidence and argument. Appropriate scaffolding of students' own historical reasoning was also provided, for example, by the support given within one course to students' analysis within seminars of the features of contrasting historiographical approaches. These processes of clear communication, modelling and scaffolding also acted to give students a language within which to talk about history and thus provided the means by which dialogue between staff and students, and between students themselves concerning historical topics could proceed.

Aligning course activities with historical ways of thinking and practising

Students' engagement with history was also advanced when the design of teaching, learning and assessment activities was carefully and coherently crafted to draw them into participating in historical ways of thinking and acting. An important focus of our development activities in the history settings involved departmental partners working to strengthen the alignment of general historical practices and specific course objectives with the nature and sequence of teaching, learning activities and assignments. This entailed actions such as refocusing written assignments to encourage students to reflect more on their own learning and history as a discipline. In addition it was productive to make the rationales underlying the particular design features of a course more explicit and accessible. Understanding the reasoning behind the structuring of content, organisation of activities and assessment of a module had benefits for students, particularly if explanations were explicitly related to key features of historical study. Gaining a stronger sense of overall module purposes in relation to fostering historical ways of thinking and practising and the function of particular activities in taking ahead these purposes also increased the effectiveness of course teams.

Encouraging students' active participation in historical ways of thinking and practising

Staff in these courses not only 'took out' to students a clear representation of historical purposes and practices, but also acted to draw students into participating in historical debates and displaying historical ways of thinking. For example, in one first year module, explicit communication of disciplinary practices was accompanied by a very dialogic introduction to the course's content and concerns that, in the words of one student, provided "the space to handle these different interpretations." Thus on this and other modules students were given scope and encouragement to display their own agency in interpretation. This agency in formulating their own historical arguments and positions was assisted by a sense of staff approachability and the creation of learning climates where students felt free to ask questions of one another and of historical materials. Students also observed that their own affective engagement with history was energised when staff actively displayed passion for the subject.

Students' engagement with historical ways of thinking and practising in first year

The preceding paragraphs have highlighted the general features of teaching approach and curriculum design that provided the history students with a guided route into the discipline (Northedge, 2003) and fostered their active participation in its practices. Encouragingly even in the first year interviews across the various sites, most student groups were able to give a fairly fluent account of historical purposes and practices. There was a minority of first-year students who showed some resistance to engaging with the expectations associated with historical study (see Anderson and Day, 2005) but the students whom we interviewed predominantly accepted the need to follow the discipline's (sometimes challenging) ways of thinking and acting.

They recognised the need to take an analytical approach to historical study, accepted responsibility for active interpretation and emphasised the importance of an openness to considering different perspectives / interpretations. In the words of one student, they saw the need for "an enquiring mind and an ability to analyse different points of view." Allied to this concern with personal interpretation was a recognition of the importance of adopting a questioning, analytical approach to evidence, which could require not only independent thought but also quite wide research. Fulfilling the responsibility of coming up with your own interpretation of historical topics was seen to involve looking at connections between events and themes. Aside from establishing personal connections, some students talked of how their first-year experiences in undergraduate history had enabled them to develop more of a felt sense of the interconnectedness of historical phenomena. Related to this developing sense of the interconnectedness of historical events, some students displayed an implicit grasp of the need to contextualise their approach to a specific topic by framing their understanding of that topic within a wider context and / or time-frame of events.

CONCLUSIONS

In this paper, we have explored findings which have resulted from a perspective on undergraduate learning that is rooted within particular subject areas and starts from within specific course and institutional settings. From that eye-view, a fundamental feature of what these students seemed to learn from their undergraduate studies could be summarised as characteristic ways of thinking and practising in the subject, and we have drawn on interviews with the students and staff concerned to explore what forms these ways of thinking and practising took in the history and bioscience settings studied. However, it should be emphasised that ways of thinking and practising in a subject should be viewed just as they are learned, i.e. as integral wholes rather than as disaggregated parts.

Some disclaimers and caveats are also necessary. First, we are not suggesting that every student necessarily masters every aspect of these ways of thinking and practising, or to the same extent. Our focus has been on what the students collectively learned, rather than to pinpoint individual differences.

Second, while the metaphor of apprenticeship clearly has some resonance in relation to the learning of ways of thinking and practising, it would be misleading to see these students as fully-fledged initiates with a common and binding vocation. They were learning to think like bioscientists, or like historians, and to go about the subject like established practitioners within it, but had no need for any formal commitment to the subject beyond graduation. Third, our aim has been to pick out some salient features of ways of thinking and practising in the two subjects which emerged from the course settings surveyed. We would not claim to have identified all or most of the quintessential attributes of each subject; that would be a very much larger, and probably more elusive undertaking. And fourthly, we are not suggesting that our ‘from-within’, grounded research approach should have dominion in the study of the disciplinary dimensions to learning, but rather that it has an important complementary role to play alongside panoptic, typology-focused approaches of the kind most influentially represented in the work of Janet Donald (2002). As Shulman (2002) observes in advocating a similarly twin-track strategy for examining disciplinary distinctiveness in the scholarship of learning and teaching, the challenge lies in interaction and engagement between generalised and particularised approaches.

Indeed, our own attempt to build particularised ‘neighbourhoods of understanding’ (to use Shulman’s apt phrase) about the development of ways of thinking and practising in history and biology has implications not only for research, but also for teaching and assessment in higher education. In the biosciences, where teaching-learning and assessment strategies could take very different forms, the development of ways of thinking and practising was most clearly evident in situations in which students were pursuing active rather than passive learning tasks – for example, in undertaking experimental work on placements, participating in problem-solving discussions, and presenting orally and in writing (McCune and Hounsell, 2005). In history, it could be fostered through explicit communication of expectations, and support for students through modelling and scaffolding, allied to encouragement of students’ own interpretive voice. In both subjects, there seemed further scope for dialogue between students and staff about disciplinary purposes and conventions.

But happily, this is territory which others have already begun to map. The notion of ‘academic discourse’ (Hounsell, 1988) has been reinvigorated by new developments which give emphasis to learning not simply as acquisition but also as participation (Sfard, 1998) in a specialist discourse community of the kind represented by a discipline. One perspective, drawing on sociolinguistic insights, focuses on the need to develop students’ grasp of the academic literacies associated with different subject areas (Lea and Street, 2000; Lillis, 2001). Another, as articulated by Northedge [see elsewhere in this volume] rests on the central position of the teacher “as a speaker of the discourse and member of the knowledge community” (Northedge, 2003, p. 172). Three teaching roles are highlighted: assisting students in framing specialist meaning, guiding students into less familiar discursive terrain, and coaching students in writing and speaking appropriately within the discourse conventions of the subject.

A different but equally promising line of approach draws on the ‘wisdom of practice’ and the work of subject teachers. One notable example is van Heerden’s account (2005) of how her interactions with students had led her to try to surface ways in which a subject expert like herself had learned how to “think like a chemist”, and she goes on to describe how she has sought to develop these capacities in her students through carefully designed teaching-learning and assessment activities (van Heerden, 2005). Finally, and even more ambitiously, there is Pace and Middendorf’s attempt (2004) to articulate and exemplify strategies for ‘decoding the disciplines’. This presents a seven-step model which can help teachers in “introducing students to the culture of thinking in a specific discipline” (Middendorf and Pace, 2004), while also bringing together reports of how the model has underpinned undergraduate teaching initiatives across a broad span of subject areas.

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