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### Final year biosciences students' willingness to engage: teaching–learning environments, authentic learning experiences and identities

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**Final year biosciences students' willingness to engage:  
teaching-learning environments, authentic learning experiences and identities**

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**Abstract**

The research reported in this paper investigates what influences students' willingness to engage actively with their studies. The semi-structured interviews which form the basis of this analysis are a subset of the data from the Enhancing Teaching-Learning Environments in Undergraduate Courses (ETL) Project, a large-scale project funded by the UK Economic and Social Research Council. The findings from the analysis were drawn together in a multi-faceted conceptual model of the influences on the students' willingness to engage. This model describes the interplay between aspects of students' identities and facets of their learning contexts in university and on work placement. The notion of 'authentic learning experiences' is used to illuminate the students' perspectives on how key learning experiences influenced their identities and willingness to engage with their studies.

## **Final year biosciences students' willingness to engage:**

### **teaching-learning environments, authentic learning experiences and identities**

**Keywords:** student learning; higher education; biological sciences; identity; teaching-learning environment; authentic learning experiences.

#### **Introduction**

This paper focuses on how final year biosciences students account for their willingness to engage actively with their academic studies. In the context of this analysis, active engagement implies students working within the ways of thinking and practising (WTP) of the biosciences. The notion of 'ways of thinking and practising' in a subject area was developed within the Enhancing Teaching-Learning Environments in Undergraduate Courses (ETL) Project to describe the richness, depth and breadth of what students might learn through engagement with a given subject area in a specific context. This might include aspects which were explicitly taught, as well as more tacit norms and practices (McCune and Hounsell 2005). The analysis reported in this paper builds on earlier analyses of data from these students, which highlighted the different facets of ways of thinking and practicing relevant for these contexts and drew attention to the impact of teaching-learning environments on students' understandings of WTP (McCune and Hounsell 2005; Hounsell et al. 2008).

The interview transcripts which form the basis of this analysis originate from the ETL Project. The overall aim of the project was to understand and enhance

undergraduate courses as 'teaching-learning environments (TLEs)' and to investigate student and staff perspectives on how these environments impacted on the quality of the students' learning ([www.tla.ed.ac.uk/etl](http://www.tla.ed.ac.uk/etl)). The ways in which teaching-learning environments were understood in the ETL project drew heavily, although not exclusively, on a body of research focusing on students' perceptions and understandings of their day-to-day experiences in Higher Education settings (Biggs 2003; Marton, Hounsell and Entwistle 1997; Prosser and Trigwell 1999) The research focus in the ETL project was on course units or modules as teaching-learning environments; this being the case, the data collection concentrated more on students' perceptions of these units than on wider institutional, social or cultural influences. Figure 1 maps out the broad conceptualisation of a teaching-learning environment used in the project.

[Insert Figure 1 about here]

The work of the ETL project was influenced by constructivist perspectives on teaching-learning environments which emphasise the importance of involving students in active knowledge construction and co-operative learning in relation to authentic tasks, which are similar to the situations in which the knowledge will actually be used (Herrington and Herrington 1998; Tenebaum et al. 2001; Tynjälä 1997). Stein, Issacs and Andrews (2004) suggest that authentic learning opportunities are, 'personally meaningful and relevant to students, socially relevant to the field and in harmony with the nature of the discipline' (p. 254). Stein and colleagues' theoretical perspective on authentic learning experiences is valuable as it goes beyond simply suggesting that learning activities should mirror their 'real life'

counterparts. Rather these authors discuss the ways in which a given activity might help students to engage meaningfully and realistically with the practices of their subject area, without necessarily participating directly in the 'real life' setting. Authentic learning experiences, as described by Stein and colleagues seem particularly well suited to encouraging learners to engage actively with the WTP of their subject areas.

Recent work on the place of learners' identities in the learning process seems pertinent to understanding the extent to which students are willing to engage with their studies. Accounts of learner identities in the literature are diverse but often encompass certain key themes. Identities can be understood as encompassing: an individual's senses of who they are; their perceptions of their positions in networks of roles and relationships; their interpretations of their personal history; and their ideas about how they would like to be in the future (Bobbit-Nolen et al. 2005; Wenger 1998). The plural form 'identities' is used in this paper to acknowledge that an individual's understandings of who they are may be multifaceted, fluid and may encompass tension between different strands of identity (Hall 2004; Ivanic 1998).

One of the ways in which learners' identities can be seen as relevant to their enthusiasm for their studies, is in how identities can frame what is meaningful or relevant for a student. Wenger (1998), for example, introduces the notion of 'learning trajectories' which form part of learners' identities. This notion of trajectories takes into account that identities can encompass both a sense of where an individual has been and a sense of where they are going in relation to particular communities of practice. Communities of practice are described as contexts within which individuals

work together toward a shared goal for long enough to allow for significant learning. Wenger contends that an individual's sense of where they are going in relation to such communities helps them to decide what matters to them and what does not, what they may incorporate in their developing identities and what will remain marginal for them. He notes that identities can be understood partly in terms of individuals experiencing a sense of familiarity and competence in certain social contexts but not in others. In Wenger's view, people partly define who they are by which communities feel familiar to them or in which they have a sense of unfamiliarity or lack of competence. One might imagine then that there would be interplay between students' sense of competence in academic settings and their choice of trajectories and engagement with their studies.

To summarise, the aim of the present study is to investigate the main themes in the students' accounts of what influences their enthusiasm for their studies in the biological sciences and their willingness to engage actively with the subject matter. The analysis presented here has parallels with Volet's (2001) theoretical review of the literature in which she presents a multi-level model of influences on students' motivation drawing together more cognitive perspectives on student learning with work from socio-cultural perspectives. The present paper is more modest in its ambitions focusing as it does on the experiences of specific groups of students in a small number of contexts.

## **Research contexts**

Three one-semester undergraduate honours level course units (1L, 2L and 3L) were surveyed across three institutions selected to be representative of the range of different types of higher education institutions common in the UK. The teaching in unit 1L combined lectures with tutorials. Unit 2L was taught in sessions which each began with a talk in which an active bioscience researcher would present on their own research area. A different researcher presented each week. In the second part of each session, the students were assigned questions arising from data linked to the guest lecturer's work, and they tackled these in small groups prior to plenary discussion. In unit 3L, the teaching took the form of seminars in which presentations were given by two of the students followed by questions and discussion. Almost all of the students on the 3L course unit had completed a year of placement work in professional research environments. Some of the 2L students had had similar placement experiences, whereas the 1L students typically would have had placement experiences after the data were collected.

## **Data gathering and participants**

In each of the course settings a sample of students volunteered to participate in semi-structured group interviews in the penultimate week of the unit. Table 1 summarises the interview samples from the three course units. The response rates varied from 25% to 93%. In the interviews the students were asked about their expectations for the course unit and their experiences of it. There were also questions about the extent to which they felt they had learned to think or act like a bioscientist. This was followed by a discussion of the students' plans for the future.

With particular relevance to the present analysis, the students were asked whether the course unit had made them more or less enthusiastic about the subject matter.

[insert Table 1 about here]

### **Data analysis**

The interviews were transcribed in full and were analysed using HyperRESEARCH (version 2.6.1 from Researchware, Inc.). The first step in the data analysis process was to select all of the data relating to students' accounts of what had affected their enthusiasm for and active engagement with the subject matter. Each extract was coded along with enough of the surrounding text to contextualise the students' comments. The next stage involved refining the broad themes and sub-themes initially identified. The importance of different facets of the data were weighed by considering: how many students mentioned a particular influence; whether a particular issue was represented across interviews and settings; and the strength of the students' expression of their comments. Part of the process here was to reduce the large number of sub-themes initially identified down to a set which provided a coherent overview of the influences identified by the students. The analysis also involved careful clarification of what exactly would be included within the meaning of a particular theme or sub-theme.

The final stage in the analysis involved checking the themes and sub themes back against the entire data set to identify any salient perspectives which had been missed in the initial analysis. The distribution of the findings on the themes across course units and interviews was also carefully logged so that the prevalence of



different findings could be reported. Less common findings were still presented but it seemed important to report their relative rarity in the data set. Counter-examples to the broad findings were sought and these are reported with the findings on the themes where they arose. The overall stance taken in relation to the present analysis bears similarities to that taken by Charmaz (2003) in the sense that the intention was to offer a thorough analysis of the meanings students attributed to their experiences which could be clearly justified in relation to the underlying data. Charmaz's constructivist perspective on qualitative data treads a line between postpositivist and postmodern perspectives and suggests the possibility of rigorous empirical analysis of perspectives and meanings without the assumption that this identifies objective universal truths unaffected by the perspectives of the researcher.

## **Findings**

Three broad themes were identified which seemed to encompass the main dimensions of these students' perspectives on their engagement with their studies. The themes and their related sub themes are summarised in Table 2. The first of these themes, *teaching-learning environments*, delineates what the students had to say about the impact of how they were taught and assessed on their enthusiasm and willingness to engage actively with their studies. The second theme focuses on the powerful accounts given by students of how they felt that *authentic learning experiences* had changed the nature of their engagement with their studies. In some instances accounts of these authentic learning experiences also contributed to the students' descriptions of their *developing identities*, which are considered here in so far as they seemed to relate to the students' sense of engagement with the subject matter.

[insert Table 2 about here]

### ***Teaching-learning environments and learner engagement***

In the present analysis, five dimensions of the teaching-learning environment were described by the students as particularly salient for understanding their willingness to engage actively with their studies. The value of certain *affective dimensions of teaching* was raised by students across all of the sites. Some of the students spoke of how their perceptions of staff enthusiasm for the subject area were important for their own enthusiasm. For others, the quality of their relationships with staff members was described as important. The student quoted below claimed that improved relations with staff made a difference to his interest in science:

At my old university [...] I'd become slightly disinterested in science actually. [...] I think it seems to be a lot more friendly environment [here] and, when you feel it's actually a better environment, then you actually pay more attention and you start to enjoy the course. [...]

Across all of the course settings, the students spoke about how *teaching processes* affected their willingness to engage with the subject matter.<sup>1</sup> The students mentioned quite a wide range of aspects of the teaching process as being influential, one of the more commonly discussed issues was the quality of the explanations given by teachers, for example:

[Another course unit has] not been as interesting as [2L] because [in 2L] everything is explained to us afterwards [...] they make sure we understand it before we leave.

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<sup>1</sup> This sub-theme includes comments from students on course unit 3L speaking about other students' presentations.

Several mentions were also given to the impact of teachers' presenting styles.

Students across all three course units spoke about how assessment could influence their willingness to engage. For example, *assessment processes* which involved students in giving presentations led the students to speak of the effects of an imagined audience on their engagement:

If you read through a paper [...] you'll read though it and think - Yeah, fine, I understand that, but when you [...] have to come back to explain it to someone else the way you look at it is a lot more critical and I think it improves your understanding a lot more.

A quite different example of this sub-theme is provided by students' comments on how assessment processes which allowed them to focus in on one topic could enhance their enthusiasm for their studies:

I've enjoyed [my dissertation] the most because when I start researching into something I want to know everything about it [...].

While *assessment pressures* were clearly seen as relevant in all three course settings, there was considerable variation in the extent to which individual students spoke as if such pressures were significant for their learning. Students spoke of how their willingness to engage with a topic was influenced by: their perceptions of assessment criteria; their awareness of how much an assessment counted toward their overall grade; or simply whether a topic was assessed at all.

[The course coordinator said that students] gave a better representation of the data than [at] the original conference. Because we're being assessed on it, there is kind of that little bit of extra pressure to get it right [...]

In both 1L and 3L several students spoke about how *time pressure* could have a negative impact on their enthusiasm for their studies. Perceiving that it was not possible to complete coursework well in the time available and feelings of tiredness were both mentioned.

### ***Authentic learning experiences and learner engagement***

Some of the most forceful comments made by the students about how they had come to feel more engaged with their studies related to their accounts of authentic learning experiences. These tasks were depicted as authentic by the students in the sense that they were perceived to be realistic experiences of how scientists work. These accounts were often, but not exclusively, set in the context of work placements. This being the case most of the data came from the 2L and 3L settings. Some students described these experiences as having very marked effects on their willingness to engage with their studies.

From the accounts available in the data it seems that certain dimensions of these authentic learning experiences may have been particularly important. Students in one of the groups in setting 2L and several groups from 3L indicated that tackling *open ended research questions* made a difference for them:

I: Why [is placement] more interesting?

S: Real science isn't really about learning [...] it's about trial and error, discovery sort of thing. Whereas being at university is about learning, it's not really about trial and error. [...] It could be any other number of things so then you've got to try and identify which one it is.

This was sometimes contrasted with less favourable experiences of more controlled university laboratory classes. Other comments suggested, however, that it was possible for the students to perceive their university laboratory work as meaningful and as necessary preparation for their placements. Nor were all placement experiences described as enhancing the students' engagement, even when they were perceived as authentic:

On placement you do come to realise that although science seems really interesting from the outside, when you're working in it it takes such [a long time] [...] If you've done the same thing for three weeks and it hasn't worked, you want to throw everything on the floor [...]

In a few of the interviews the authentic learning experiences were described as bringing to the fore the possibility of *contradictory findings and contested interpretations*. This in turn could be related to students' willingness to engage critically with the subject matter:

I remember the first time we did [the problem solving part of the class] there were three problems. And the first one, has to have one conclusion, the second one as

well, same conclusion, and then the third one just said that the other two were wrong. So, this makes us think of all the alternative experiments that one should do [...] It's not just like do one experiment - ah, yeah, this is our answer.

The experience of *social integration into a research community* also seemed to contribute to the impact of the authentic learning experiences on some students' willingness to engage. In a few interviews across 2L and 3L the students spoke of how discussing ongoing research in context contributed to their capacity to approach the subject area in a questioning manner:

You know all those people who have slightly different opinions will be looking to pick holes [in it] so you have to learn to be able to defend what you're doing, or if there is something wrong with it you need to accept it, perhaps explain it [...]

Being part of these communities also seemed to influence the students' willingness to engage with the subject area more generally. Sometimes students spoke as if a change in engagement had come about through taking on some of the values of a particular community. In the extract below, the sense of integration the student experienced on placement seems to have affected their connection with the university environment:

Yeah, I think the major thing is that it has made [me] more confident in [...] integrating myself into groups of scientists [...] [Before my placement] I had like one friend on my course and that was it. I just went to uni and just left it behind me. [...] After last year it's like you're talking to lots of different scientists and it's more beneficial if you get involved and it has just given me much more confidence than I had.

The *independence and responsibility* that students were given within some of these authentic learning experiences were also mentioned – in three interviews from two different contexts – as a catalyst for greater enthusiasm or commitment to their studies:

S1<sup>2</sup>: [Placement] gives you a lot of confidence [...] you have your own projects [...] you have some input into where your project goes as well [...]

S2: [...] They have actually given me decent projects, my own projects, to do rather than just treating me like someone who can do your washing up for you. [...]

I: Do you feel as a result of this, you're more committed to Biology, or less, or the same?

S3/4: More.

S1: More.

These experiences of being given greater responsibility were linked by some students to accounts of their growing confidence in their academic abilities, an issue which is considered in the next section, in relation to the theme of developing identities and learner engagement.

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<sup>2</sup> In extracts involving an interchange between several students, the first student who speaks in each extract is labelled as 'S1', the second student who speaks is labelled as 'S2' and so on. 'I' designates the interviewer.

### ***Developing identities and learner engagement***

This theme encompasses those aspects of students' developing identities that seemed to be related directly to their willingness to engage actively with their studies. There was evidence of an association between the students' identification with the role of 'scientist' and their preparedness to engage with research findings in a questioning manner. The ways in which the students' attributed meaning and value to the subject matter are also included within this theme, as they can be seen as part of a student's sense of self in relation to their learning trajectories.

Students across all of the course settings made the connection between *feeling like a scientist* (or not) and feeling able and willing to engage with data in a questioning manner. In some of the most powerful extracts, students linked their growing confidence in their capacity to conduct research or evaluate data explicitly to shifts in their identities. These more marked changes were rare in the data but where they occurred seemed to have a significant impact on students' willingness to engage deeply. An extended extract is presented below to illustrate the strength of some of the students' comments and to show the link between the *authentic learning experiences* described earlier and the students' developing identities:

I: You were saying you thought you've become more committed to the subject - I just wondered what makes you?

S1: [...] I think it was the work placement [...] [Before the placement] it was a bit of a farce! [...] I didn't go to as many lectures, and this year I've been to everything. And I can actually see the difference between people who did work placements and people



who didn't do a work placement [...] the others are still committed, but I don't think they are really that, I don't know how to put it -

S2: - motivated I think. [...] 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 [...]

S1: [Placement] is the best thing I could have done. [Without it] I wouldn't have known anything really about the whole background of science. I'd be like, "Oh, here are the facts that we've been given", but I wouldn't have a clue about how people went around doing it [...] You've gone up a level, you're not a student anymore. [...]

S2: I feel more like a scientist than a student. [...]

S1: [In the year of study before my placement] I just felt like I was a student again and it didn't make me feel as committed, but now I do actually think that I'm a scientist now because I was given the freedom last year to do anything I wanted on this project that I was doing, and it's like you have the respect of everyone in the labs [...]

Conversely, some of the participants in each setting spoke about still feeling like students and linked this with concerns about their ability to interpret research findings; for example:

It's difficult to question things that you read in journals sometimes I think because we're just undergraduates.

Beyond the specific issue of the interplay between feeling like a scientist and having confidence to critically evaluate research findings, there was a more general link in all three course settings between students' *academic self-confidence* and their willingness to engage actively with their studies. While some students spoke of engaging less with tasks or content which seemed overly difficult others seemed to feel confident enough to work with challenging material.

As explained in the introduction, how an individual *attributes value and meaning to course content* can be conceptualised as important dimensions of their identities. In the present study, how the students valued the subject matter was often linked in their comments to their willingness to engage with course content. While some students spoke of disinterest in their studies, many more spoke of their intrinsic interest in the subject matter, which extended for some to descriptions of real fascination:

The fact that something as small as that can mean so much to the whole [...] it's just amazing, it's fantastically amazing. [...] It's phenomenal, it screws your noodle a bit, but it's brilliant.

A few students went beyond this general interest to suggest a stronger identification with some aspect of the subject matter:

If you are very good at one subject then you have a special way of thinking about that subject, [...] I'll always be thinking from a micro-biological point of view [...] So that it can help me direct my interest.

Wenger (1998) suggests that individuals' intended trajectories – their sense of where they are going in relation to particular communities – form important facets of their identities. The majority of the students interviewed saw themselves going on to further study in the sciences or to work in scientific research of some kind. The link between students' intended trajectories and their willingness to engage with their studies could be seen in the comments made by students in every setting about how seeing the future relevance or applicability of their studies was important to their willingness to engage.

While most of the comments the students made about the vocational relevance of course content suggested an intrinsic interest in their studies, there were a few comments which suggested a more instrumental motivation. Further, it was clear that a sense of vocational relevance was not always necessary for students to be willing to engage with course content:

I always liked the enzymology lectures in the past [...] it's not, probably not what I'm going to go into, but, it's just something that interests me.

## **Discussion**

Overall, the ways in which these final year biosciences students accounted for their willingness to engage with their studies describes an interplay between aspects of their identities and facets of their learning contexts in university and on work placement. The students' accounts suggest that no single influence is sufficient in itself to explain the extent of their engagement but, for some students, developing confidence to identify with the role of 'scientist' seemed particularly important. The students' accounts of authentic learning experiences described some of the ways in

which they were given opportunities to develop their identities in the direction of greater confidence and greater identification with the scientist role. How the students were taught and assessed also formed part of their accounts of influences on their enthusiasm for the subject. In this section of the paper, these themes are drawn together to offer a conceptual framework to integrate the findings.

Figure 2 presents a conceptual framework which draws on the literature and the present analysis to suggest one way in which the interplay between students-as-learners and the contexts within which they learn can be understood in relation to the students' willingness to engage actively with the ways of thinking and practising of their subject areas. Further research using, for example, individual interviews will be required to fully validate the connections made in this model. The group interview data underpinning the present analysis do not allow the full set of connections to be traced for particular individuals.

[insert Figure 2 about here]

In this Figure, the themes from the present analysis are used as examples of wider constructs such as 'university teaching learning environments' or 'research communities of practice'. This representation acknowledges that different facets of these constructs might well come to the fore in future research. The interaction between what the students bring to their learning and the immediate task environment is seen as mediated through the social practices of the relevant communities, as described in sociocultural perspectives on learning. Following Volet (2001) the model presented here invokes the possibility that there may or may not be

a good 'fit' between a student's current position and the demands placed on them by a particular task. There may be 'constructive friction' (Vermunt and Verloop 1999) where the demands placed on the student are sufficient to stretch them and encourage development but there may also be 'destructive friction' where the demands placed on the student are excessive or conversely where too much control is taken away from a student who is capable of managing their own learning in a given context.

The model suggests that where there is a good 'fit' between the student and the environment, and where the affordances of the immediate task environment are conducive, then there is a greater potential for authentic learning experiences. The authentic learning experiences described by some of the students in this study fit well with Stein, Isaacs and Andrews (2004) perspective, which sees authentic experiences as personally meaningful for students and as situated within social contexts which allow students to engage actively with the practices of the subject area. In the present study while university teaching-learning environments provided some experiences of authenticity, work placement experiences were particularly powerful in this regard. It is worth bearing in mind, however, that few of the students interviewed had begun their final year projects, which might be expected to provide opportunities for more authentic research experiences within the university context.

Wenger (1998) discusses the importance of participants in learning communities having some control over the development of meanings within that community. He suggests that when an individual cannot contribute in a manner that is recognised as competence they come to identify themselves as non-participants,

which inhibits their ability to learn. Making a related point, Baxter-Magolda (1999) emphasises the importance of involving students in processes of knowledge construction and recognising their contributions as worthwhile in order to facilitate the capacity for 'self-authorship'. These perspectives, on the importance of involving learners in processes of knowledge construction, offer possible explanations for the power of the students' accounts of how the authentic learning experiences affected their identities and engagement. These authentic experiences seemed to offer particularly rich opportunities for students to feel they were really making a contribution to knowledge construction and thus to begin to see themselves as valid members of the community of practice.

A more fine grained account of the dimensions of authentic learning experiences is offered by Herrington and Herrington (1998, 309) in relation to authentic assessment. These authors suggest that authentic learning activities: take place in a context which parallels the context in which what is learned would be used; requires students to perform effectively using what they have learned; and involves 'complex, ill-structured challenges'. The authentic learning experiences described by the biosciences students in the present study – which involved open ended questions and contradictory or contestable findings – show close parallels with Herrington and Herrington's theorisation.

Looking at the broader findings on the students' perceptions of their teaching-learning environments draws attention to aspects beyond the authenticity of the learning experience which might be relevant to understanding students' willingness to engage. These findings echo several themes from the existing literature. For

example, Entwistle's (1998) review discusses how good explanations, enthusiasm and empathy in teaching all support students' active engagement with their studies. The literature also suggests that students' perceptions of assessment requirements are of considerable importance in influencing how they engage with their learning (Prosser and Trigwell 1999). Thus it was not surprising to find some of the students in this study commenting on how their engagement was in part assessment-driven, although it is important to note that other students spoke as if they were not primarily influenced by the pressures of assessment.

The data from the present study provide some support for Wenger's (1998) emphasis on mutual engagement in a shared social enterprise as a vehicle for students' learning and development. It is important to bear in mind, however, that a relatively small number of accounts of engagements in placement communities were available within the data set for this study. Further, this and other studies also signal the value of learning experiences of different kinds. The university course units as investigated in this paper and in previous work, seem to have been perceived very positively by students and were supportive of high quality learning (McCune and Hounsell 2005). This despite these units not closely mirroring the activities of research communities of practice. Further, the students acknowledged in their interviews the value of their university experiences as preparation for their placements.

The dimensions of students' identities which particularly came to the fore in trying to understand their willingness to engage actively with their studies were: their confidence in themselves as learners; their level of identification with the role of

scientist; and their trajectories (Wenger 1998). In the present analysis, the interplay between students' identities and their willingness to fully engage with the ways of thinking and practising of biosciences communities came through most strongly in the connections made between 'feeling like a scientist' and being prepared to take a critical and questioning approach to research findings. The findings from these biosciences students accounts of their developing identities resonate with Bobbitt-Nolen et al.'s (2005) suggestion that when an individual can imagine themselves as part of a particular world they are more likely to engage with the activities valued in that context.

### **Conclusions and implications**

The findings from this study, in combination with the wider literature, suggest that there may be considerable potential in exploring further how higher education learning experiences can best be designed to offer students authentic engagement with the practices of their subject areas. It may be helpful here to think of the *extent* to which a given learning environment could provide such opportunities, rather than expecting that it will often be possible or desirable for students to engage fully with communities of practice beyond the university setting. Such authentic learning experiences would have the following characteristics:

- personal relevance for students, with respect to their developing identities
- situated within social contexts which mirror as far as possible how the practices of the subject area are employed in 'real life' settings



- providing students with sufficient independence and responsibility to support them to become more autonomous learners
- scaffolding students' developing understanding of the WTP of their subject area such that students become more able to critically engage with the subject area
- make use of complex, ill-structured and open-ended problems
- treat students as valid participants in the construction of knowledge

Supporting such learning experiences does not necessarily imply dramatic changes to university courses. In many university teaching-learning environments students are interacting with active practitioners of the discipline, thus blurring the boundaries between university environments and wider communities of practice. Hence the overlap illustrated in Figure 2. Examples of teaching-learning environments which include elements of authentic learning or similarities with communities of practice are already available in the literature (Herrington and Herrington 1998; Hounsell and Anderson in press; Stein, Isaacs and Andrews 2004). This kind of work does not even need to wait until the later years of study; it seems possible, for example, to have students engaging actively with contested findings and open ended tasks in the first year of university study in a manner which they perceive as authentic (Hounsell and Anderson in press).

Wenger suggests that teaching-learning environments which lack the characteristics of communities of practice may lead to learning being perceived as boring or meaningless. The students in the present study, however, generally seemed to have positive and engaged experiences of learning on their university course units, despite the fact that none of these units would have met all of Wenger's criteria for a learning community. Wenger's writings do, however, draw attention to the importance of learner identities and to the value of learners engaging with more experienced practitioners in shared enterprises, both dimensions which did seem important for the students' engagement. Overall, however, the findings from the present study chime well with Vosniadou and Vamvakoussi's (2006) emphasis on the need to strike a balance in designing learning environments between opportunities for situated cognitive apprenticeship and other kinds of learning experiences which might better support the development of a conceptual knowledge base which can transfer between settings.

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[6997 words]

Table 1 Samples and response rates for the interviews

	<b>1L (2002-03)</b>	<b>1L (2003-04)</b>	<b>2L (2002-03)</b>	<b>3L (2002-03)</b>	<b>3L (2003-04)</b>
no. of students	<b>44</b>	<b>32</b>	<b>25</b>	<b>14</b>	<b>15</b>
group interviews	<b>5</b>	<b>4</b>	<b>4</b>	<b>3</b>	<b>3</b>
students interviewed	<b>13</b>	<b>8</b>	<b>12</b>	<b>13</b>	<b>13</b>

Note - In two of the settings, 1L and 3L were surveyed twice in consecutive years. This repeat sampling procedure was necessary for the overall design of the ETL project but is not relevant to the present paper, except in that it increases the number of interviews available for analysis. The research design of the ETL project is discussed in detail elsewhere ([www.ed.ac.uk/etl](http://www.ed.ac.uk/etl)).

Table 2. Summary of themes and sub-themes from the analysis

<p><b><i>Teaching-learning environments and learner engagement -</i></b></p> <ul style="list-style-type: none"><li>- <i>affective dimensions of teaching</i></li><li>- <i>teaching processes</i></li><li>- <i>assessment processes</i></li><li>- <i>assessment pressure</i></li><li>- <i>time pressure</i></li></ul>
<p><b><i>Authentic learning experiences and learner engagement -</i></b></p> <ul style="list-style-type: none"><li>- <i>open ended research questions</i></li><li>- <i>contradictory findings and contested interpretations</i></li><li>- <i>social integration into a research community</i></li><li>- <i>independence and responsibility</i></li></ul>
<p><b><i>Developing identities and learner engagement -</i></b></p> <ul style="list-style-type: none"><li>- <i>feeling like a scientist</i></li><li>- <i>academic self-confidence</i></li><li>- <i>attributing value and meaning to course content</i></li></ul>

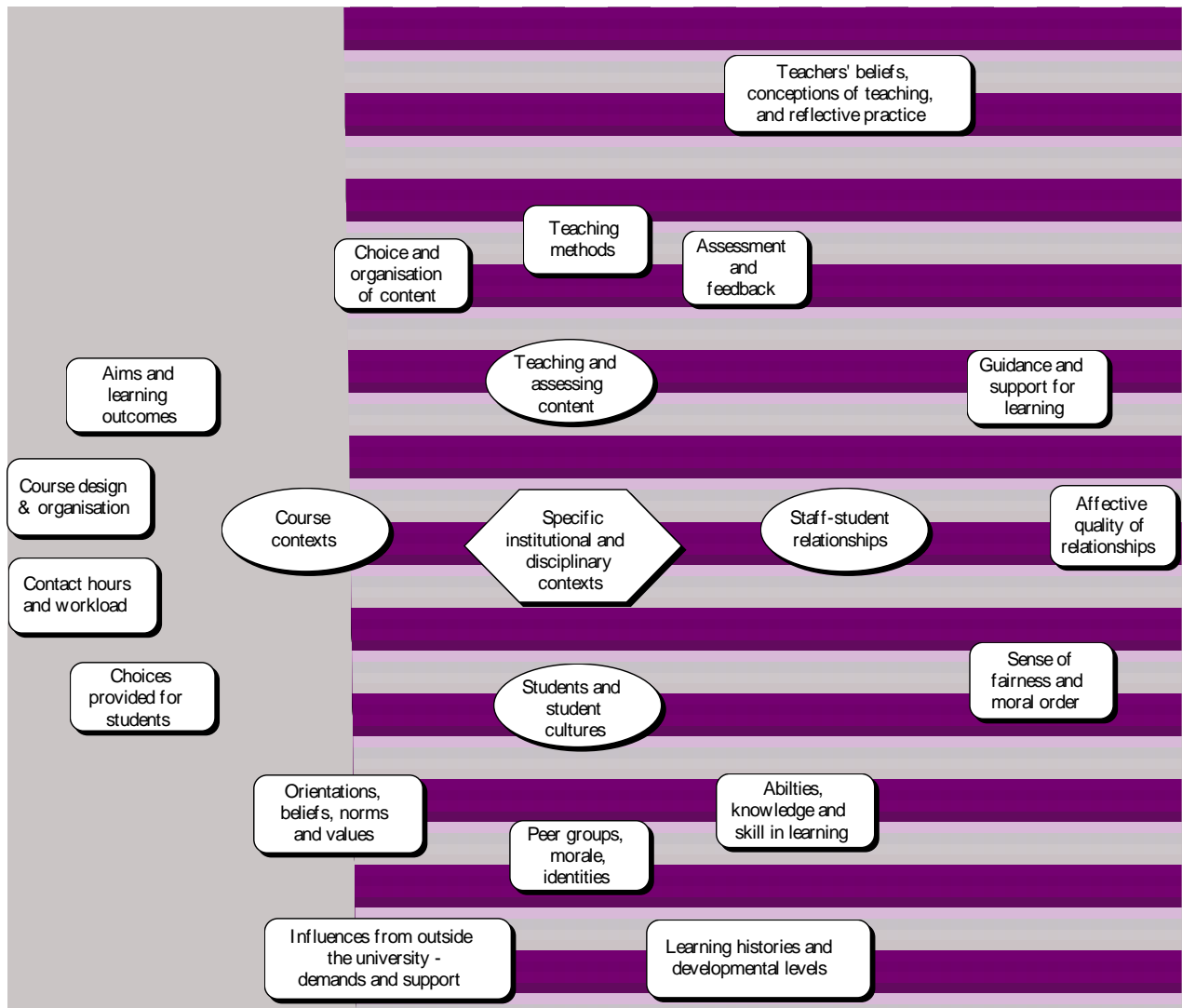


Figure 1: Conceptual map of the “inner” teaching-learning environment

From Entwistle, McCune and Hounsell (2003)



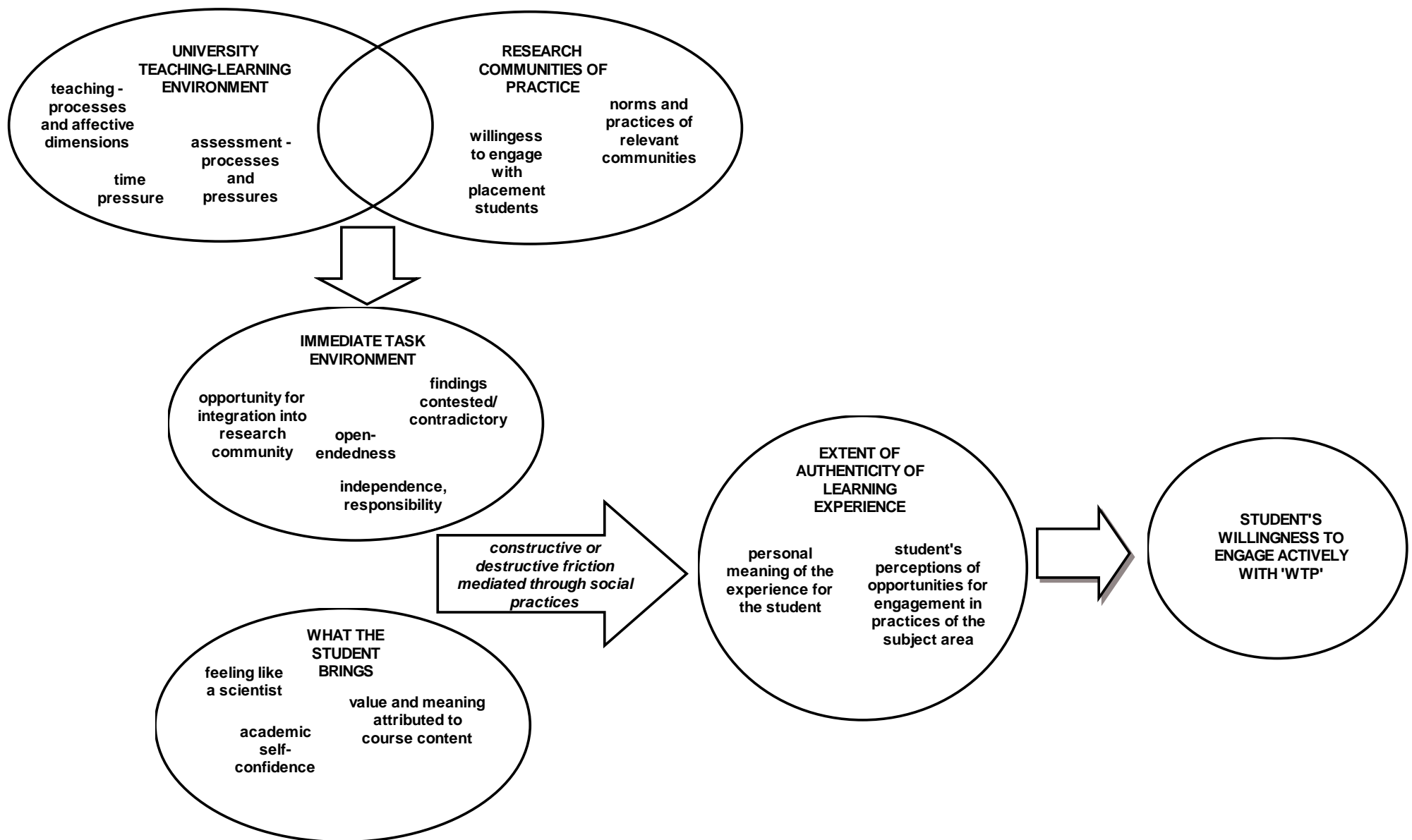


Figure 2 A conceptual framework for influences on the students' willingness to engage