Perceptions and their influences on approaches to learning

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Abstract

This paper aims to highlight the importance of considering students' perceptions of and approaches to undergraduate engineering education. Whilst considering techniques to maximise the retention of engineering students, it is also posited that understanding how students perceive their learning contexts at university is vital. It is also essential that we understand how these perceptions influence students' approaches to their studies.

This paper builds on existing research which takes a discipline focus to a discussion of the relationships linking quality of learning with generic research into approaches and perceptions of teaching and learning. It discusses an ongoing research project which is making use of a mixed methods research platform to investigate the complex nature of students' perceptions and approaches. It is presented as a valuable methodology for adoption by engineering education researchers.

The research is based on an exploratory sequential mixed methods design where the qualitative data is dominant. Initial analysis of the data collected during the pilot phase, supported by relevant literature, has been used to identify areas of the learning context which appear to influence students' approaches to the engineering modules involved in the study. Some of the emerging themes are discussed in this paper with consideration for the impact on the teaching of engineering.

Introduction

Engineering today is more than an academic or technical discipline. The engineering professions have to deal with 'scientific and technological matters, but increasingly also with economical and political matters as well as with ethical, societal and environmental aspects' (Maffioli and Augusti, 2003). Engineers today need to be able to work in ever-changing technological, social and working environments and therefore must be educated with this in mind. This overview of the engineering profession shows that a great mix of skills is required in the workplace and that the education of today's engineers must reflect this.

As indicated by Jesiek et al. (2009), 'engineering education research is a relatively new field of activity.' The engineering education research community, whilst consisting of a large number of practitioners in teaching engineering, is primarily concerned with the 'field of engineering education research, not the practice of educating engineers' (Borrego et al., 2009). However, as the primary focus of the research is to understand the engineering education process it therefore cannot be considered in isolation from the practice of teaching and learning and the students involved.

In engineering education research the concept of the *context of teaching and learning,* where context is defined as 'the circumstances that form the setting for an event, statement, or idea' (Oxford Dictionary, 2010), is one which must be addressed. The complex nature of education means that no aspect can be considered in isolation; investigations in engineering education must consider the whole context. Tessmer and Richey (1997) explain that 'context is not the additive influence of discrete entities but rather the simultaneous interaction of a number of mutually influential factors.' They discuss how contextual elements can be engineered to facilitate learning and performance and how in this sense 'context is an element that surrounds its members as a continuous presence.'

Aim of the research

This paper aims to highlight the importance of considering students' perceptions of and approaches to undergraduate mechanical engineering education. Whilst considering

course delivery techniques for engineering students, it is also posited that understanding how students perceive their learning contexts at university is vital. It is essential that we understand how these perceptions influence students' approaches to their studies. The paper builds on existing research which considers the relationships linking quality of learning with approaches to and perceptions of teaching and learning.

This paper discusses an ongoing research project which is making use of a *mixed methods* research methodology to investigate the complex nature of students' perceptions and approaches within engineering. It is presented here that mixed methods research is a valuable methodology for engineering education researchers to adopt.

Reasons for considering students' perception

This work examines student perceptions and approaches to learning at an intermediate stage of their course, an aspect which is reported far less than early stages of courses (for example, studies of perceptions at recruitment and their influence on early stage retention and learner identity).

Recruitment

Akam (2003) discusses the major decline, in most developed countries, of young people taking up science, engineering and technology subjects in later stages of education and refers to a public poll from some years ago which 'found Britain's best known 'engineer' was Kevin Webster, the car mechanic from *Coronation Street*'. With views like this it is not surprising that young people do not consider careers in engineering. More accurate public perceptions of engineering (including young people, teachers and parents) must be fostered and encouraged so that they 'match the reality of a multi-skilled, dynamic and challenging profession that is vital to the UK economy.'

The *Progress* project (2004) again recognises the importance of students' perception in recruiting to engineering: 'Given the image of engineering, particularly in Britain, it is hardly surprising that students' own expectations of their courses often differ significantly from reality.' The project confirmed that many people do view engineering as highly analytical and recognise the amount of hard work that is required, however they conclude that 'most people with this perception do not apply to study it.'

The issue of perception affecting recruitment is also significant in the US, where the need for engineering talent is said to be continuing to grow yet enrolment figures continue to decline (Loshbaugh and Claar, 2007). If we can understand how students perceive the teaching and learning environment and approach their studies then universities can consider making adjustments to encourage more students to enrol in engineering courses.

Retention

Retention of both full-time and part-time students in science, applied technology, engineering and mathematical courses is lower than in other subjects (Committee of Public Accounts, 2008). Research has indicated that students are more likely to continue with higher education if they are engaged in their studies and have developed networks and relationships with their fellow students (Crosling et al., 2007). In aiming to increase student retention, being aware of students' perceptions could be crucial.

There is significant research evidence that learning and teaching environments are highly influential on student retention and success. Jones (2008) identified that finance is important to students, but that relations with staff can be much more influential in students' decisions to remain in higher education. If we can understand how students perceive issues such as relationships with staff then we can act to support them in continuing their education.

The reasons for students' non-completion of courses in all disciplines have been explored in the National Audit Office report (2007). Commonly cited reasons for withdrawal are reported to be: 'personal reasons, lack of integration, dissatisfaction with course/institution, lack of preparedness, wrong choice of course, financial reasons and to take up a more attractive opportunity'. University staff engagement with students and discussions regarding their perception of their learning contexts and experiences could provide crucial insight into students who feel that they may have reasons to withdraw. Early identification of issues such as perception of difficulty, isolation and incorrect choice of course can allow universities to act swiftly to support students with their continued study.

A key issue which affects retention and recruitment is that of inappropriate course choice. Hammoudeh (2003) reports that across all universities inappropriate course selection is one of the most commonly given causes for early student withdrawal. As Moore et al. (2007) identify 'First year engineering students often lack comprehensive knowledge of the engineering field. This makes it difficult for them to appreciate why learning fundamentals is required.' Understanding students' perceptions of engineering and their expectations of the course could help significantly with recruiting them to and helping them continue with engineering courses.

Identity

Students can benefit from developing an identity with a programme or a profession during their studies. Through students' construction of their professional identities they 'learn to situate their own knowledge, interests, and sense of self within the larger context of professional engineering' (Eliot et al., 2008). Construction of a professional identity can be a powerful influence upon student retention in engineering programmes, their learning and subsequent adjustment to the workplace. Understanding how students perceive themselves in terms of fitting into an engineering community and their learning within a professional context can allow universities to provide support to students in making the transition and developing professional identities.

Foor and others suggest that factors such as gender, ethnicity and socio-economic status can provide challenges for students' in seeing themselves as part of an engineering community (as cited in Eliot et al., 2008). Being aware of students' perceptions of identity, and the factors causing barriers to them developing professional engineering identities, should be investigated within higher education settings so that strategies can be employed to help develop their professional identities.

Learning

Ellis et al. (2008) explain that the activities undertaken by students which result in learning can be affected by pre-existing beliefs about the demands of a course's assessment regime, or the standards expected by a teacher, or by what students perceive it is possible to learn in a specific situation. Cronje and Coll (2008) explored student perceptions of engineering and science based subjects within higher education. It was found that students expressed a need for 'well organised and planned lectures', seemed to favour 'having a variety of teaching approaches' and preferred teachers who could 'relate theory to practice.' Some students also preferred 'to have most materials available online for ease of reference during assignments'.

Research has shown that students' approaches to learning are related to the quality of their learning outcomes (Ellis et al., 2008). Prosser and Trigwell (2001) suggest that students who adopt a surface approach to learning are more likely to achieve low quality learning outcomes in contrast to those who adopt deep approaches, who are likely to attain higher quality learning outcomes. In this research higher quality learning is considered through Entwistle's (2008) definition that 'high quality learning depends not just on pass or completion rates, but on the nature of the knowledge, skills and conceptual understanding that students have acquired during their degree course.' Laird et al., (2008) report that surface learning does tend to dominate in engineering.

Ellis et al. (2008) discuss the work of Goodyear et al. (2005) and Struyven et al. (2006) who also concluded that how students interpret and experience a course is more important than the course's underlying pedagogical intentions. If students sense that a course is badly implemented, that they are overloaded with work, that there are no clear goals or feedback is poor, then they are more likely to respond with surface rather than deep approaches irrespective of the pedagogy or the technology being deployed by the teacher. Entwistle (2008) carried out teaching and learning research in higher education level electrical engineering and concluded that 'it is not so much the teaching-learning environment we provide that affects the learning approaches of individual learners, as their perceptions of it.'

Figure 1 shows a theoretical framework for this research. The five areas identified under *context* appear in several sources of literature as factors (some of which are discussed above) which affect students' approaches to learning. As this research continues, a more detailed theoretical framework will be developed, showing specifically the issues relevant to the engineering students involved in this project.

Methodology

This research is influenced by the pragmatic paradigm in which knowledge claims arise out of 'actions, situations, and consequences' and where 'instead of methods being important, the problem is most important, and researchers use all approaches to understand the problem' (Creswell, 2003). Borrego et al. (2009) explain how they 'expect that quantitative, qualitative, and mixed approaches will be essential in the future' in engineering education research. Bailie and Bernhard (2009) agree that it is 'necessary in educational research and in engineering to use quantitative as well as qualitative approaches.'

A *mixed methods* approach to data collection and analysis is being used in this project to enable data to be gathered on the current contexts surrounding student learning experiences, and to determine what factors students perceive as being important to them. The core assumption which forms the basis of the mixed methods research approach to enquiry is defined by Creswell and Garrett (2008): 'When researchers bring together both quantitative and qualitative research, the strengths of both approaches are combined, leading, it can be assumed, to a better understanding of research problems than either approach alone.' The theoretical framework in Figure 1 shows the varied aspects of students' learning experiences which affect their perceptions and approaches to learning. The methodology has therefore been developed to allow the different elements of those factors affecting students to be fully explored. The use of this methodology will be evaluated once all data has been collected and analysed.

The research involves two phases of data collection, using an exploratory sequential mixed method strategy with data analysis between stages. Figure 2 shows the mixed methods notation of an exploratory sequential design. The notation of 'QUAL' is used to represent the dominant qualitative source and 'quan' to show the less dominant quantitative source used for validation purposes. The method chosen first allows qualitative data to be gathered from a select sample on the current contexts surrounding student learning experiences, and then a quantitative data to be gathered from a larger sample to validate the results. This practice of using unequal sample sizes, where one sample has a greater weighting placed upon it, is normal within mixed method studies (Morse, 1991).

The research data is drawn from a Mechanical Engineering BEng (Hons) degree programme at a post-92 university. The study involves data collection over two academic years, using student volunteers in their second year of study. The reason for collecting qualitative data initially is that there is little known about students' perceptions of mechanical engineering. The initial qualitative stage therefore allows for data to be gathered, analysed and then used to produce a taxonomy which can be

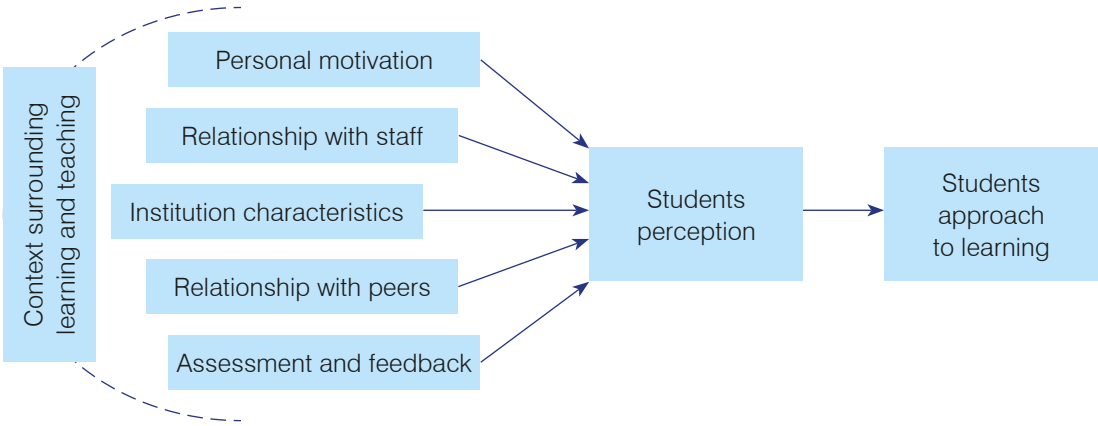

Figure 1. Theoretical framework for considering students' perceptions and approaches to learning

Figure 2. Exploratory sequential design (overview) (Creswell, 2003)

investigated further within the larger quantitative aspect of the study. Data is gathered through observations, semi-structured interviews and questionnaires. Both stages of the research will follow the process demonstrated in Figure 3.

Data collection

Sampling for the interviews makes use of stratified sampling to ensure that data is collected from part-time and full-time students and is representative of the population (Creswell and Clark, 2008). Samples for the quantitative data collection, and for qualitative data in observations, will involve all those students from the second year cohort who opt to be involved. The sample sizes when interviewing will therefore be a different size to the other data collection methods used in this project. This method follows the Creswell et al. (2008) example of sampling within mixed methods where unequal sample sizes are used 'in the quantitative and qualitative strands of a study for the purpose of providing a full picture of the situation.' The purpose of the observations was to act as an observer and a non-participant in classes in order to understand how students were behaving in classrooms and to understand the context of the classes to aid discussion in the interview process.

The individual semi-structured interviews took place with students at the start of semester 2 with the aim of exploring their experiences of semester one and informing the design of the quantitative and qualitative questionnaire which was administered at the end of semester 2. The interviews were semi-structured so that a core of questions could be addressed whilst still allowing for flexibility to respond to, and explore further, issues arising during the interview. To date, 16 students have been interviewed, with interviews lasting between 25 and 40 minutes in order to try and keep the time commitment from them to a minimum. The topics addressed in the student interviews were opinions of the modules, approaches towards learning, and institutional factors affecting learning, subject content and assessment.

Before the interviews took place, two informal meetings were held with students (eight part-time and three full-time) during which there was general discussion about experiences of the module. This data was used to inform interview questions, along with the already piloted *shortened experiences of teaching and learning questionnaire* (SETLQ) (ETL-Project, 2005).

Questionnaires with a mix of closed Likert scale questions and open questions were given to the whole student cohort asking them to self-report on which subject areas they find easiest/hardest, to discover which delivery and assessment strategies students felt helped them to understand the material and which factors they felt prevented or hindered their learning. The questions were again informed by the *shortened experiences of teaching and learning questionnaire* (ETL Project, 2005) in addition to the detailed information collected from the student interviews.

Results

The following section outlines some of the findings from the study and introduces some more general questions arising from the student interviews which the writers feel deserve further exploration and should be of interest to engineering education researchers and the wider higher education community. The findings discussed here are relevant to evaluating perceptions of teaching and learning and represent the range of information gained through a mixed methods approach.

Initial analysis of the data collected, supported by relevant literature, has been used to identify the areas of context which appear to influence student learning. The contextual factors which appear to have most heavily influenced student experiences are summarised in Figure 4, which shows that (in addition to those factors outlined in the theoretical framework) the students involved in this project were also influenced by issues such as the 'demands of the subject' and the value placed on 'problem solving' activities. The following section gives more detail of the specific issues that students felt were influencing their learning in this context.

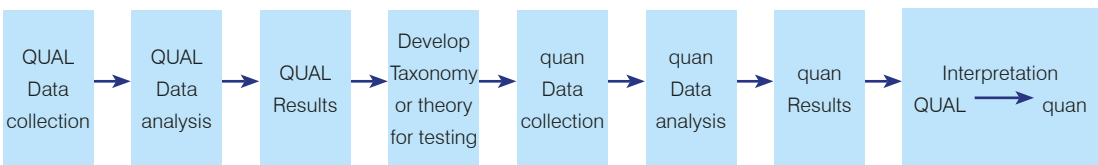

Figure 3. Exploratory sequential design (Creswell and Plano-Clark, 2007)

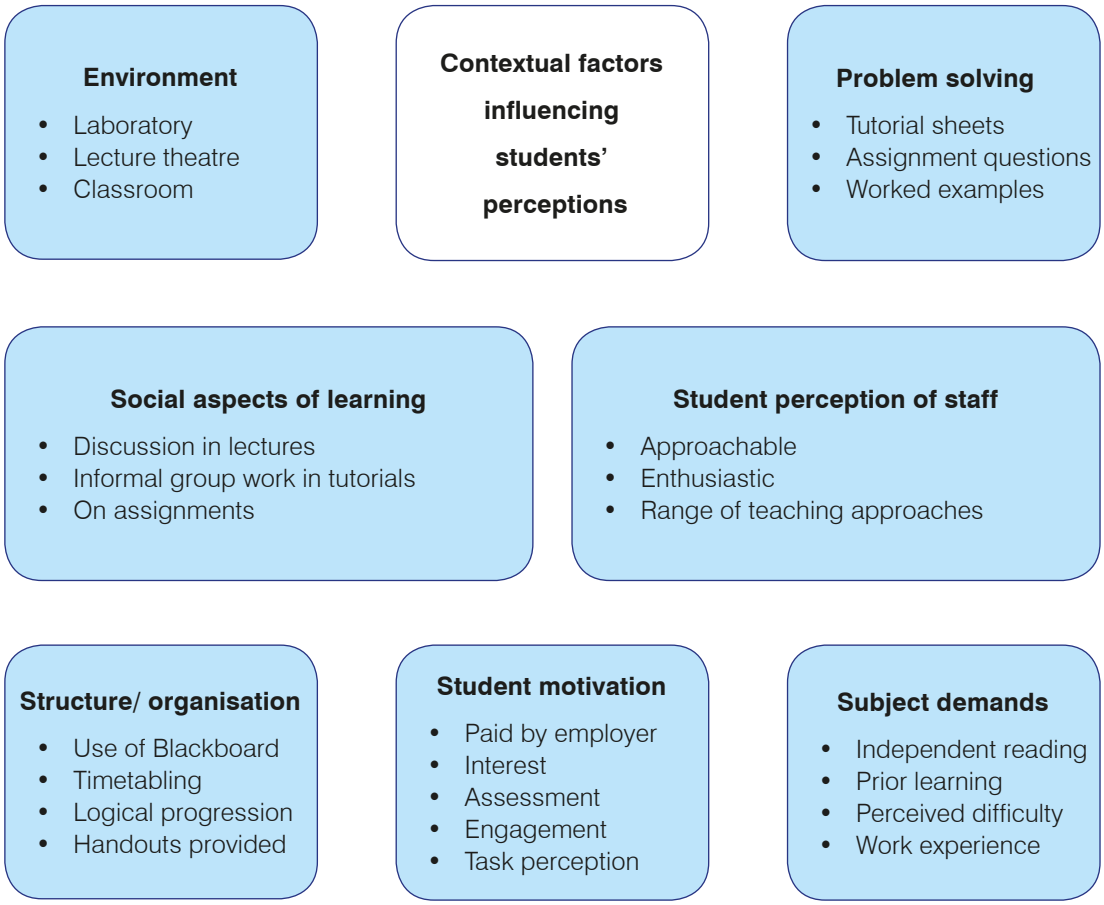

Figure 4. Summary of contextual factors influencing students' perceptions

Use of contact time

A clear theme emerging from the interviews was that students have very specific expectations of what staff should do and how they should use their contact time with students. One student was quoted as saying that one member of staff was the only one who *'actually uses the seminars properly.'* Students value seminars, stating that *'the good point of some of it was the seminars, being able to go in and have a one to one.'*

Students were asked to rank the factors relating to staff use of contact time which they felt have most helped their learning. They ranked having the opportunity to complete worked examples as most helpful, followed by lectures and then being given handouts and lab sessions equally.

Students discussed a module that they were 'happy' with, saying that the lecturer was vital in helping their learning: *'I think L is definitely helping, it helps having a good lecturer. Definitely.'* Another student stated: *'I do think the lecturer makes a big difference and the way he approaches the subject',* giving an example from one module: *'L is just so enthusiastic and I think it's great […] he's got a passion for the subject that's passed on to us.'*

Importance of a subject

In the classroom observations, and confirmed through the questionnaire, it was found that about 90% of the cohort regularly attended the sessions in Energy Studies. In exploring this during interviews it was found that students regard the subject as important, for example: *'it's so much of the bread and butter of what we want to do as mechanical engineers'* and *'that's because it's an important subject and also because the delivery is a lot better than other modules.'*

Students did acknowledge that subjects do, however, have to have personal relevance to them to be considered important: *'So it's a case of relevance to that person, what they might be doing in the future.'* Several students felt that the core subjects were important and defined these as being Energy, Mechanics and Maths, and as one student explained: *'to become an engineer you have to prove you can do this* [set of subjects]' and the other subjects studied are *'to make you a better engineer.'*

All agreed that they wanted to do well in the core subjects: *'The subjects I'm going to pay most attention to again are the core subjects* […] *I want to do well* [in the core ones] *just mainly because if I can get through them, then I know I'll certainly be able to get through the others.'*

Lecturer support

Students did however acknowledge that there were sometimes difficulties in getting individual support from staff, stating that *'some of the lecturers didn't reply to emails.'* This is interesting to consider: in a world where most students are technically proficient and choose email as a convenient and preferred form of contact, we may need to consider how *staff* view its use. Should there be standards or systems set up to ensure all students receive prompt responses? Part-time students found it difficult to see staff in person and they felt further use of email would help them receive help when they were back in their workplace: '[some lecturers would say] *"Look, if you've got a problem then you need to come and see us" and it was kind of around dinnertime and you're having a full day of work and you need a break or you just don't concentrate in the afternoon. I found that a bit difficult as well. It would have been nice to just get a bit of feedback over the emails or internet or somewhere.'*

Other students valued staff that were able to respond to them despite what they acknowledged to be busy working conditions, giving the example of one member of staff: *'I'm sure* [the lecturer] *had people bombarding them with questions and* [the lecturer] *actioned it* […] [the lecturer] *didn't forget to do something that they promised to do, which I think has more of an impact, you know, there's reliability.'*

Assessments

In the semi-structured interviews, students discussed their experience of both closed and open book class tests and how they did not find the class tests as useful as coursework style assignments in terms of helping them learn. Students admitted that in their first year they had crammed and just aimed to pass the class tests, whereas the completion of assignments in the second year had forced them to try to understand the material. On a positive note, one student extolled the benefits of the feedback he received following a lab assignment :*'Actually, the first feedback I got from* [the lecturer], *and I used it for the rest of them, and I ended up getting 95% for the rest of them, so I would say it did me good.'*

Structure

That modules had clear teaching and assessment structures seemed to be important to most students, and in cases where the structure wasn't clear students acknowledged that they did not see the point in the module. In one case students were given a multiple choice test which they viewed to be 'too easy' and explained that the *'multiple choice ones we did* […] *I didn't particularly like them because it just seemed a bit pointless really.'* In another case, students were unclear about weekly assessed work they were completing: *'he gives us an assignment every week as well. So he gives us two or three questions a week that we've got to do and hand in and then he marks them. And apparently that's going to the grades.'* Students do, however, acknowledge that while lessons can be 'good' and 'fun' it doesn't mean they understand the reasons for learning that subject: *'It was fun and I liked it but I didn't see the point in it* […] *and then it wasn't really that organised as much as, say* [other subject] [...] *It was just basic, that's about it, and I didn't really see the point in it to be honest.'* The comment that a topic or subject was 'basic' was made by several students, showing how important it can be to teach at the appropriate level and to manage expectations by explaining why certain material is being covered in a particular way.

It would be interesting to further explore the effect of unclear structure. For example, it would be fascinating to see what approach to learning was taken in the module where a student commented that: *'I don't know how the assessment worked. I think you winged it really.'* One student, who had industrial experience, recognised the need for structure and questioned in one case why there wasn't quality control to ensure all classes were structured. Again, communicating and discussing structure with students could be important in cases such as this.

Staff consistency, reliability and professionalism

Students have expectations about how staff should behave and act. One student felt that *'lecturers, have to have a sort of higher standard, professional attitude which is fair enough because other people are here to try and get a career.'*

Students indicated that they didn't mind arrangements changing as long as they could see the benefit to themselves and that changes were done in advance: *'I think originally we had one one-hour lecture on a Wednesday, which was, I think it was 11 until 12 or something, which seemed a bit pointless'. 'I think that was shoved onto the Friday morning or something, which worked out a lot better, having the whole day off.'* Students were unhappy when things were changed with little notice: *'I remember coming in a few times and no one being there and stuff like that and them being cancelled, or you got an email in the morning saying it was cancelled, but then you don't sometimes check your emails in the morning.'*

Students had all used the electronic learning platform (eLP) at some point throughout their first year, although not all used it regularly. One student felt quite strongly that staff should adhere to the minimum standards set out by the institution, saying *'I don't like the lecturers that don't put anything on it because I just feel that you should do really. At least then it's there.'* Several students explained that although they were happy to use the eLP they did not feel that it was appropriate to be referred to lecturers' personal web pages. They seemed to prefer the professionalism and formality of the eLP (even after acknowledgement that the eLP had difficulties of its own, such as negotiation) rather than personal web pages where hobbies or holidays etc may be discussed alongside pages discussing engineering theory. One student gave an example of this: *'He put links to his own family web pages on there.* [Laughter]. *And that was completely pointless, a waste of my time; although I looked at it, which is even worse!'*

Benefit of peer learning

During the interviews the theme of how students approach their work (in terms of assessed work, individual study and completion of tutorial problem sheets) was discussed. There is an expectation amongst many teaching staff that students will carry out independent study in addition to completing classroom tasks and assessed work. For example, this is often assumed to be done through directed reading or encouraged through the completion of a tutorial sheet which is generally a series of questions related to specific topics of study. These tutorial sheets can then be discussed in tutorial sessions and students can obtain feedback on their progress in a topic or identify any areas causing them difficulty. This line of questioning revealed that students appear to have established informal peer groups for studying in their own time, for example, one student confirmed: *'I had ad-hoc study groups that were in the course, a few of us in our spare time would go and do some questions before a seminar'* and another student said: *'we worked in a big group.'*

Within engineering degrees, small peer groups are often established in fundamental engineering subjects for lab work but not necessarily established for seminar work or assignments. Assessed work in these subjects is usually of an individual nature, so under normal course circumstances teaching staff would be unaware of this informal peer work taking place outside of the class time.

Observations in the class also saw that peer networks were present in the classroom, with small groups of two, three or four occasionally discussing problems during the session, but more often during breaks in teaching. Students also explained that when they have been busy they use technology to allow them to work with their peers: *'But sometimes when I've been busy, I just do it from home and it's text messaging, mobile, you know, scanning bits of work in* […] *So it's done in various ways. But there's generally a shared kind of ethic there, I suppose; we share everything. I certainly wouldn't have managed to do things if that wasn't an option. It's definitely a better way of working.'*

Discussion

It can be seen from the literature discussed here that students' perceptions contribute widely to their experiences in higher education.

From the quotes provided it can be seen that students' perceptions are linked closely with their expectations. It may be that, with respect to encouraging students' engagement with their learning in favour of deep approaches to learning, we should be discussing students' expectations more. Being better aware of students expectations throughout a programme may help us better understand their perceptions and subsequent approaches to learning.

In discussing with students the aspects of the teaching and learning context which have influenced them the following topics were raised:

- assessments
- structured delivery
- organisation of timetables and lecturer
- staff use of contact time
- interactions with staff
- personal relevance and importance of a subject
- peer learning.

The issues raised by the research are ones which are generally considered when addressing the student experience. Considering these same issues now with respect to students' expectations/perceptions and their approaches to learning may provide data far richer in quality and lead to a more useful understanding of the student experience in terms of 'learning and teaching'. Consideration of students' perceptions and approaches could be integrated with work focusing on improving the student experience. As research by Entwistle (2008) shows, students' perception of context affects the approaches they take to learning and therefore the subsequent quality of the learning achieved (Ellis et al., 2008). It is suggested that the contextual factors which score low on instruments such as the National Student Survey should be considered in terms of 'teaching and learning'. These factors should be addressed in a way which will enable students to perceive their learning contexts in a more positive manner, therefore improving their experience and simultaneously encouraging deep approaches to learning.

As the study progresses further there will be another round of interviews before the quantitative instrument is developed. During this time the following points from the research data will be explored:

Importance

- Does students' 'importance ranking' of a subject change throughout a year of study? Does this affect the approach towards learning in that subject?
- Why do students perceive the Energy Studies module as an important subject? How do students determine the importance of a subject? Is it connected to personal relevance or implicit information passed on through institutional structures such as timetabling and modularisation?
- Does the delivery style of a module (e.g. traditional lectures, informal group work) affect students' perception of the importance of a module?

Assessment

- What impact have different forms of assessment had on students' approach to learning? Staff should make an effort to explore the effect that different assessment methods have on their students, looking not just at the marks obtained but actually how different students have responded to their assessments (time spent, approach taken, etc.) and how they have perceived them in terms of developing their own learning.

Contact time/staff support

- Students value contact with staff but, as this is currently under pressure, other delivery modes are being used throughout higher education institutions which may not provide the same learning experiences as face-to-face contact. For the newer technologies and alternative delivery modes to be used effectively they need to be thoroughly supported. The difficulty is that these new delivery methods need academic development time to ensure they are implemented in a structured way from which students will see real benefit. This creates a large time overhead and becomes difficult for academics to initiate and there is therefore a risk that much valued contact hours are being replaced by poorly implemented technology for which academics are ill-prepared, leading to the eventual dissatisfaction of students. It would be interesting to explore what would happen if these technologies were removed and their associated cost saved so that more time could be given to student/staff dialogue. This could allow academics further opportunity to be aware of, and respond to, students' expectations and perceptions.

Peer learning

- It would seem reasonable for further investigation to take place to identify the scale on which these informal study groups exist and the influence they have on students' approaches to their learning. It may also be interesting to consider the place of these small study groups within the formal system of a university. Some emerging questions are: whether participation in informal study groups should be acknowledged on submitted work; should participation be encouraged for informal tutorial work, and are those who do not work within a study group

disadvantaged in any way? Boud (1981) acknowledges that 'students can learn as much, or even more, from their peers as from their teachers, but the help students can give to each other is a severely under-utilised resource in higher education.'

Conclusion

The research presented here has outlined why we need to better understand our students' perceptions. We have observed the strength of perception in guiding how students approach their learning. We have also observed that perception has a much wider role, influencing the complex nature of the student experience and, in this case, the students' perception of what subjects and behaviours are important to becoming an engineer. It is evident that they have clear expectations and we therefore need to encourage communication between staff and students to allow expectations to be discussed. Through dialogue it will be possible to explore expectations, to discuss how realistic these may be and how they can be met. Communication will also allow any limitations which may render a student's expectations unachievable to be acknowledged.

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References

Akam, N. (2003) Engineering? No thanks! I want to do something creative! *Progress 3 Conference: Strategies For Student Achievement In Engineering.* 25 to 26 September 2003, Hull, UK.

Bailie, C. and Bernhard, J. (2009) Educational research impacting engineering education. *European Journal of Engineering Education,* **34** (4). 291–294.

Borrego, M., Douglas, E. P. and Amelink, C, T. (2009) Quantitative, qualitative and mixed research methods in engineering education research. *Journal of Engineering Education,* **98** (1), 53-66.

Boud, D. (Ed.) (1981) *Developing student autonomy in learning.* London: Kogan Page.

Committee of Public Accounts (2008) *Staying the course: the retention of students on higher education courses. Tenth Report of Session 2007–08.* House of Commons report.

Creswell, J. and Garrett, A. (2008) The 'movement' of mixed methods research and the role of educators. *South African Journal of Education,* **28**, 321-333.

Creswell, J. and Plano-Clark, V. (2007) *Designing and conducting mixed methods research.* Thousand Oaks, CA: Sage.

Creswell, J. W. (2003) *Research design : qualitative, quantitative, and mixed methods approaches.* 2nd edition. Thousand Oaks, CA: Sage.

Creswell, J. W. and Clark, V. L. P. (2008) *The mixed methods reader.* Thousand Oaks, CA: Sage.

Cronje, T. and Coll, R. K. (2008) Student perceptions of higher education science and engineering learning communitites. *Research in Science and Technological Education,* **26** (3), 295-309.

Crosling, G., Thomas, L. and Heagney, M (2007) *Improving student retention in higher education: the role of teaching and learning.* Oxon: Routledge.

Eliot, M., Turns, J. and Xu, K. (2008) Engineering students' external and internal frames of reference for the construction of professional identity. *Research in Engineering Education Symposium,* 7–10 July 2008, Davos, Switzerland.

Ellis, R., Goodyear, P., Calvo, R. and Prosser, M. (2008) Engineering students' conceptions of and approaches to learning through discussions in face-to-face and online contexts. *Learning and Instruction,* **18** (3), 267-282.

Entwistle, N. (2008) Taking stock: teaching and learning research in higher education. *International symposium on 'Teaching and Learning Research in Higher Education',* 25-26 April 2008, Guelph, Ontario.

ETL-Project (2005) *Shortened experiences of teaching and learning questionnaire.* Available from http://www.tla.ed.ac.uk/etl/docs/SETLQ.pdf [accessed 23 September 2010].

Hammoudeh, A. (2003) Tackling student retention - strategic and tactical interventions. *Progress 3 Conference: Strategies for Student Achievement In Engineering.* 25-26 September 2003, Hull, UK.

Jesiek, B., Borrego, M. and Beddoes, K. (2008) Expanding global engineering education research collaboration. *Proceedings of the 2008 SEFI Annual Conference,* 2-5 July 2008, Aalborg, Denmark.

Jones, R. (2008) *Widening participation/student retention and success.* Available from http://www.heacademy.ac.uk/assets/York/documents/ourwork/EvidenceNet/Syntheses/wp_retention_synthesis.pdf [accessed 23 September 2010].

Laird, T. F. N., Shoup, R., Kuh, G.D. and Schwarz, M.J. (2008) The effects of discipline on deep approaches to student learning and college outcomes. *Research in Higher Education,* **49**, 469-494.

Lindbolm-Ylanne, S., Trigwell, K., Nevgi, A. and Ashwin, P. (2006) How approaches to teaching are affected by discipline and teaching context. *Studies in Higher Education,* **31** (3), 285-298.

Loshbaugh. H. G. and Claar, B. A. (2007) Geeks are chic: cultural identity and engineering students' pathways to the profession. *American Society for Engineering Education Conference,* 24-27 June 2007, Honolulu, Hawaii.

Maffioli, F. and Augusti, G. (2003) Tuning engineering education into the European Higher Education Orchestra. *European Journal of Engineering Education,* **28** (3), 251–273.

Moore, T., Diefes-Dux, H. and Imbrie, P.K. (2007) Developing first-year students' perceptions of the engineering profession through realistic, client-driven problems. *35th ASEE/IEEE Frontiers in Education Conference,* 19–22 October 2005, Indianapolis, USA.

Morse, J. (1991) Approaches to qualitative-quantitative methodological triangulation. *Nursing Research,* **40** (2), 120-123.

National Audit Office (2007) *Staying the course: the retention of students in higher education.* House of Commons report.

Oxford University Press (2010) *Oxford Dictionary.*

PROGRESS Project (2004) *Methodologies for improving student progression in engineering.* Available from www.engsc.ac.uk/downloads/progress/methodology.pdf [accessed 23 September 2010].

Prosser, M. and Trigwell, K. (2001) *Understanding learning and teaching: the experience in higher Education.* Buckingham: Society for Research into Higher Education.

Tessmer, M. and Richey, R. C. (1997) The role of context in learning and instructional design. *Educational Technology Research and Development,* **45** (2), 85-115.

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