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# Do different learning contexts, processes and environment affect perceptions, dispositions and approaches to learning?

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**Abstract:** *This paper is the initial report of an investigation into students' perception and approaches to learning as an extension to a Mixed Methods study. The initial study developed and applied a quantitative instrument within one institution, this study sought to deepen our knowledge through the deployment of the same instrument within a second institution delivering a mechanical engineering programme under similar circumstances.*

*The results obtained through this quantitative stage show that for many questions the institutional context did not impact upon the student views which gives engineering academics a clear indication of where opportunities for enhancement of practice exist in relation to approaches to learning and studying, module and classes, ways of learning, and assessment in addition to student responses to material aspects such as student perceptions of staff and university resources.*

*The paper details the methodology and quantitative instrument which will enable wider application in further contexts or the employment of the findings within a further and deeper qualitative investigation.*

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## Introduction

This paper reports an ongoing study into the perceptions, dispositions and approaches to learning of undergraduate mechanical engineering students within an English post '92 university which has been extended to investigate the influence of learning context by sampling within an English pre '92 university. Through exploring the relationship between student approaches to learning and the context of learning it is proposed that existing programmes and proposed interventions may be evaluated for potential impact.

The research study has been carried out to determine the approach students take to their learning and also to understand what students perceived to be important to both their learning and to their success in the programme. The initial research was also designed to investigate how students perceived the context which surrounded their learning including: specifics of the curriculum; relationships with staff; classroom environment; teaching delivery; and assessment (McDowell et. al. 2010).

Positive correlations between the quality of outcomes of students' learning and the approaches they take were identified by Svensson (1984) therefore at a time of significant change within Higher Education (HE) in the UK investigating the link between context and students' approaches will become

even more important. It is also reported that students' approaches to learning can change during a programme of study; they are influenced by students' perceptions of their learning environment (Bloxham and Boyd, 2007) and can also be affected by students' expectations within a programme (Harvey and Knight, 1996).

It is suggested that useful indications of effectiveness and quality of teaching, or programme innovations, can therefore be achieved through consideration of what students say they do in a particular context; both in terms of their approach towards their studies (engaging in surface or deep learning approaches) but also in their wider behaviours (motivation, interest, attendance etc.) at particular stages during a course. Therefore this study has extended the earlier work to include a second university, change of locational context, but also change of stage of learning. In this way we are moving towards a situation where the engineering educator may be able to design a task to stimulate the approach taken by our students (Booth 2004).

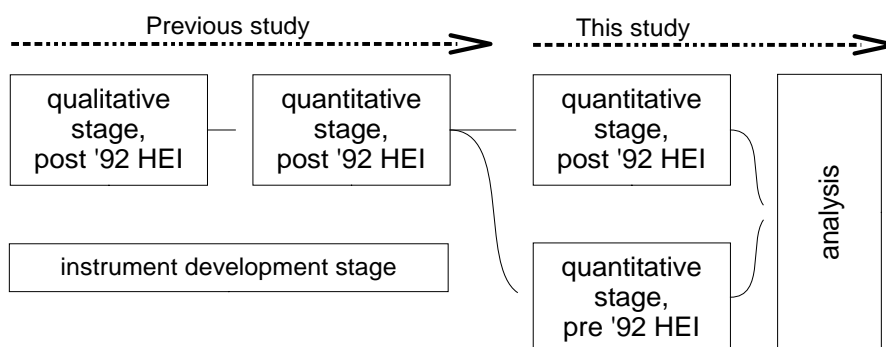
The study was structured to reduce the influence of as many variables as were possible within the control of the researchers. The student groups making up the sample were all studying in the same city on traditional Mechanical Engineering programmes accredited by the IMechE in cohorts which were of similar size. As one Higher Education Institution (HEI) encourages a year long placement in the third year of the programme the sample groups were level 4 and 5 students.

## Methodology

The previous study had established that the experience of mechanical engineering students is an under-researched area with engineering generally being considered at a broad discipline whereas this study sought a finer discrimination in outcome as anecdotal evidence from staff teaching across sub-disciplines suggests that students of the different engineering sub-disciplines approach their study differently. Therefore to allow themes to be identified which would allow the work to be explored within the existing framework of scholarly work in approaches and perspectives of learning the study adopted a Mixed Methods exploratory sequential design (Tudor et. al. 2012).

The outcomes of the qualitative stage of this work identified factors which influenced students' perceptions which allowed a quantitative instrument to be developed and applied within the post '92 institution with a total of 91 questions. The questions used a 5 point likert-type scale to explore the following themes; expectation of HE, approaches to learning and studying as well as personal feelings of experience of classes, assessments, structure and staff.

The outcome of the analysis of the first quantitative survey in the post '92 institution highlighted interesting linkage between the approaches students take and their perception of the learning and teaching environment (Tudor et.al. 2010). It is from this position that the current study was undertaken to explore approaches to learning and teaching within two different contexts, Figure 1.



**Figure 1, relationship with previous study**

For this study the questionnaire from the previous study was reviewed to ensure equal suitability for both HEIs, ensuring terminology etc. were either neutral or matched to context and cohort stage. At this time the opportunity was also taken to reduce the overall question count to 82 (appendix 1).

The questionnaire was deployed to 322 student mechanical engineers at levels 4 and 5 from the two universities, one pre '92 (N=153) one post '92 (N=169), with responses received from very similar proportions of each cohort.

Both programmes follow a traditional structure for mechanical engineering programmes based upon the delivery of a body of knowledge founded in mathematics and engineering science which is contextualised through application in design which incorporates materials, manufacture, business and management. Delivery mechanisms and contact hours although broadly similar are marginally higher in the pre '92 institution and ranged from large lectures through design classes to smaller group laboratory classes, with the assessment strategy of both programmes is based upon examinations for knowledge based content supported by project work for skills development.

The first round of data collection took place two-thirds of the way through the academic year and the second round saw the questionnaire being deployed early in the following academic year. Therefore the level 4 progressing students were sampled again early in their level 5 studies. The results therefore only identified a change in views for the collective cohort in each instance rather than any transition of views for individuals. The questionnaires were deployed as a paper based format to those who had agreed to participate (average of about 65% of the cohorts involved) at the end of a taught lecture session. Data obtained was analysed descriptively using SPSS which allowed the examination of both mean and modal scores by question and by cohort.

## Results

An initial overview of the results obtained interestingly suggest that for the majority of questions there was no significant difference between the responses obtained at each institution, the small number of questions which showed significant differences are discussed later. All results, similarities and differences, give a clear focus of the themes which may be followed up by a further qualitative investigation. The results which may inform engineering educators at this stage of the research are those where a clear and uniform response to aligned questions were obtained. These are summarised within themes below:

For the questions, *I hope the things I learn will help me to develop as a person and broaden my horizons* and *I want to learn things which might let me help people, and/or make a difference in the world* under the heading what do you expect to get from the experience of higher education obtained uniform agreement in all cohorts regardless of stage. The clear purpose of study shown in these responses is also reflected in the uniform agreement with the questions, *in making sense of new ideas, I have often related them to practical or real life contexts* and *it has been important for me to see the reasons behind things* that was shown within the theme approaches to learning and studying.

Within the theme module and classes all cohorts were uniformly in agreement that *you have to really understand the subjects to get good marks* but were uniformly in slight agreement with *in some modules I am unsure what I've actually learned* and only in slight agreement with *it was made clear to me what I was supposed to learn in most modules*.

A result within module and classes which may well have been sensitive to context yet received uniform levels of agreement were *space and comfort in lectures affects how much attention I pay in classes* and *I put more effort into modules that seem to be well organised*.

The researchers were interested to explore the peer relationships of the cohort; this was integrated within the ways of learning theme, and did show a small difference between the two HEIs. The question *throughout the year I have chosen to work with others on several occasions* obtained slightly more agreement in all cohorts at one HEI than the other, the same groups were in slightly more disagreement with the question *to protect my marks I am careful how much knowledge I share with and how much I help other students*.

Assessment and particularly feedback has been an area of enquiry within engineering education in recent years due to the evidence that it is an area of discipline based poor performance (Webb and Willis 2010) therefore it was interesting to see when one HEI's cohorts were uniformly uncertain that *the feedback given on assessed work helped me to improve my learning and studying* they were also the most uncertain in responding to the question *it was clear what was expected in the assessed work for the degree course*. Regardless of this contextual difference there was no clear contextual difference in that all students were uncertain in their response to the question *I am unsure of how much I have really learned this year*.

The theme university structure and staff has results of interest for their uniformity and contextual difference. All cohorts were in uniform agreement in response to the questions, *interactions with most staff have been beneficial to my learning* and *unprofessional staff (e.g. poor timekeeping) affect how seriously I work towards a module*. Regarding the question *the workload has been too heavy at times*

for me to really learn one HEI's cohorts were unsure whereas the other HEI's agreed responses which were reflected in the disagreement of the first group with the question *the timetable has made it easy for me to do my own studying around lectures*, whilst those who were unsure about workload felt more confident about working around their timetable.

The final questions were grouped around the theme of personal factors where the clarity of outcome is less clear for many questions yet all agree to the question *second year requires you to be more responsible for your own success than first year* and near uniform agreement with *I am more motivated than in the first year because this year counts towards my final mark*.

A selection of questions where the modal score differs by more than two scale points are shown in Figure 2 without reference to the institution at this stage as the authors consider these to be preliminary results which need to be further explored by qualitative methods.

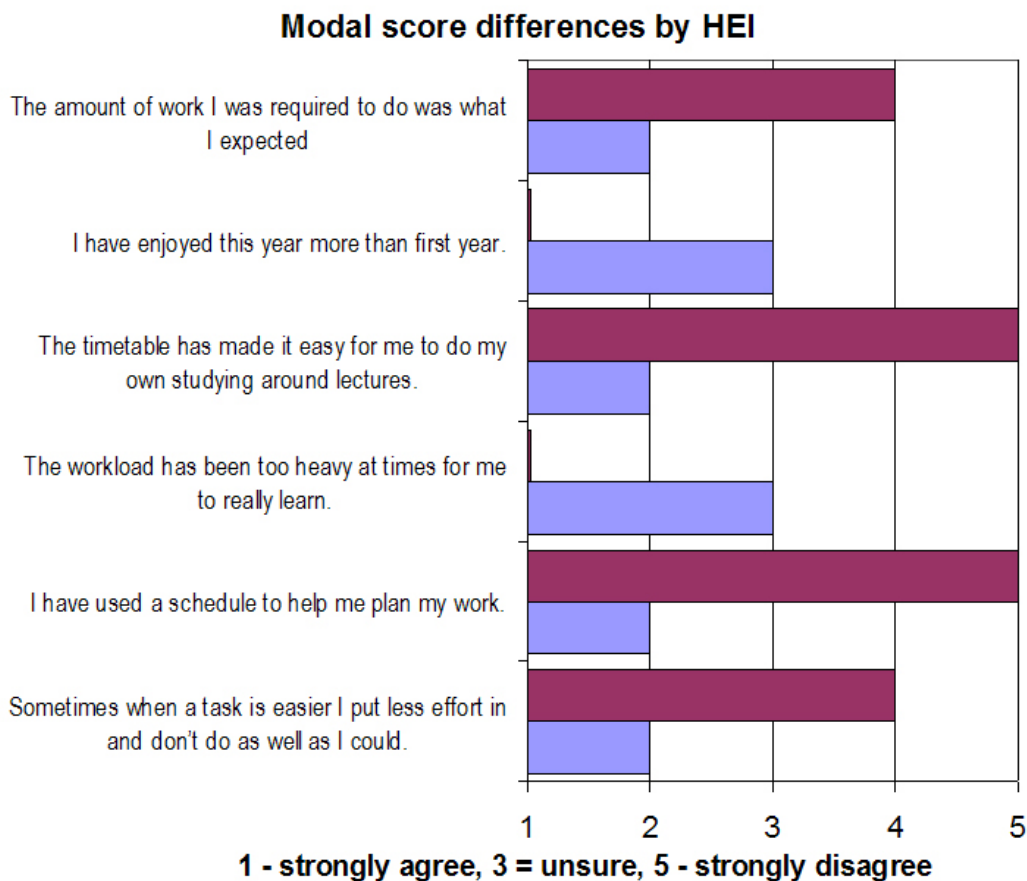


Figure 2. selected question modal scores

## Discussion

This study has reported some outcomes of an ongoing study into the perceptions, dispositions and approaches to learning of undergraduate mechanical engineering students within a post '92 university which has been extended to investigate the influence of learning context by sampling within a pre '92 university. As the record of a quantitative stage in a Mixed Methods study it presents these results as a preliminary record of the work and therefore takes care in the conclusions drawn. To derive the fullest insight possible with this methodology a further qualitative stage of the investigation will be undertaken to explore the student views obtained in more depth. The results reported here are at a preliminary stage but it is still possible to make some preliminary observations which show both strengths and causes for concern within engineering education.

The expectation of broadening perspectives and making a difference in the World are positive indicators of the engagement of all the students with engineering as a profession. This was also supported by students seeking deeper meaning and real-life contexts for their learning. Although this may appear at face value to be a strength within engineering education it may also form a barrier to

attracting students with less clear expectations onto engineering programmes or it may be that this aspect of engineering education is not well exhibited to potential applicants as it is known that engineering programmes are more likely to address their gender imbalance when social and environmental aspects are more explicitly studied (Beder 1989).

This level of interest in wishing to see purpose in the learning activities which are delivered supports the use of authenticity within the classroom an aspect which requires further investigation through qualitative means but does support the level of commitment seen when students undertake design-make-test style exercises. This further investigation could not only explore mechanisms for authenticity but also how the industrial context may be integrated into the delivery of fundamental engineering science at an introductory level as an aid to retention through greater meaning in early parts of the programme.

Within the assessment theme, although the outcome needs further investigation, there was a clear agreement in questions relating to students' taking a strategic approach to their work, *I often use formulas without trying to understand the theory and during the year my independent study mostly focussed on what was assessed*. These statements when taken with the concerns raised about effective feedback mechanisms and knowing what has been learned suggest that further work needs to be done in developing practice in the design of assessment, (McDowell 2008) in formative assessment and assessment for learning (Havnes and McDowell 2008).

An important aspect of both learning and assessment are the peer interactions that take place within the cohort both formally and informally. This research suggests that students' are becoming more aware of their own approaches to learning, individually and as a cohort agreeing to the question *I have made a conscious decision about the type of student I am and I like to be taught in small steps building up to a bigger picture*. This awareness within the cohort may be constructively developed with the observations above regarding formative assessment and integrating it with individual and peer learning styles (Marshall and Case 2005) when considered as part of a greater programme of change in the nature of mechanical engineering programmes (Royal Academy of Engineering 2012).

Whilst investigating students' approaches to learning the institutions' approaches to teaching are laid open to consideration of effectiveness, such as; the negative impact of staff seen as disorganised, timetables and heavy workloads limiting opportunities for peer working and the comfort and availability of learning spaces. With the current transition of funding, from state to student the need to understand student expectations and their perceptions of their experience will be the subject of much discussion and staff development activity.

## Conclusions

This study has initiated an investigation into the influence of context, process and environment within two mechanical engineering degree programmes, a further qualitative stage is expected to yield how the overall themes, context, process and environment have individually or in combination led to the outcomes presented here. The authors recognise that broad agreement expressed after this quantitative stage may have been derived from a differing combination of these themes, this may be particularly the case where larger modal score differences occur, hence the reservation of identifying pre or post '92 institutions in these results.

Following a final qualitative stage and consideration of the results further work may be considered, as this is a study of perceptions, dispositions and approaches to learning in combination their individual influences upon the students' learning have not been considered. For the outcome of engineering education to be most beneficial to students and employers dispositions and approaches to learning may be of greater value than the perceptions of learning which are measured by satisfaction surveys and should therefore be more fully explored to support innovation in academic practice.

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## Appendix 1

### What do you expect to get from the experience of higher education?

- 1 I hope the things I learn will help me to develop as a person and broaden my horizons.
- 2 I'm focused on the opportunities here for an active social life and/or sport.
- 3 I want to learn things which might let me help people, and/or make a difference in the world.
- 4 I want to study mechanical engineering in depth by being involved in a range of interesting modules.
- 5 I mainly need an engineering degree to enable me to get the job I want.
- 6 When I look back, I sometimes wonder why I ever decided to come here.

### Approaches to learning and studying

- 7 I have generally put a lot of effort into my studying.
- 8 Much of what I've learned seems no more than lots of unrelated bits and pieces in my mind.
- 9 In making sense of new ideas, I have often related them to practical or real life contexts.
- 10 On the whole, I've been quite systematic and organised in my studying.
- 11 It has been important for me to see the reasons behind things.
- 12 I've tended to take what we've been taught at face value without questioning it much.
- 13 Concentration has not usually been a problem for me, unless I've been really tired.
- 14 I've just been going through the motions of studying without seeing where I'm going.
- 15 If I've not understood things well enough when studying, I've tried a different approach.

### Modules & Classes



- 16 In some modules I am unsure what I've actually learned.
- 17 I have done less independent study for some modules than others.
- 18 I choose carefully which time-tabled sessions to attend based upon what I expect to get out of them.
- 19 Some modules are more difficult than others.
- 20 It was clear to me what I was supposed to learn in most modules.
- 21 You have to really understand the subjects to get good marks.
- 22 Space and comfort in lectures affects how much attention I pay to classes.
- 23 Lectures and tutorials are taught and organised in line with my expectations.
- 24 I would need to have a significant problem that was affecting my learning before I would ask a question in a lecture.
- 25 I do not think it is appropriate to take up time in lectures asking questions
- 26 I put more effort in to modules that seem to be organised well.
- 27 Without handouts and/or worked examples it is difficult to understand what I'm learning.
- 28 The lectures we were given helped me to understand the subjects.

### **Ways of Learning**

- 29 I like to be taught subjects in small steps building up to a bigger picture.
- 30 I do less independent study for modules that aren't important to me.
- 31 Throughout this year I have chosen to work with others on several occasions.
- 32 To protect my marks I am careful how much knowledge I share with and how much I help other students.
- 33 I've put more hours into my weekly studying than I expected before coming to university
- 34 Before coming to university I needed to ask my friends more about how to tackle work.
- 35 Sometimes when a task is easier I put less effort in and don't do as well as I could.
- 36 If I am finding something difficult in classes my first response is to ask other students.
- 37 I need time working on my own to really learn something.
- 38 I have done more independent study for some modules than other modules.
- 39 Talking with other students helped develop my understanding.

### **Assessments**

- 40 During the year my independent study mostly focussed on what was assessed.
- 41 I often use formulas without trying to understand the theory.
- 42 At least once this year I have left work until near the deadline and had to ask other students for help.
- 43 I have used a schedule to help me plan my work.
- 44 My marks so far are reflecting my effort and my learning.
- 45 For tests I like to prepare on my own.
- 46 I often discuss work with others who are at a similar academic level as me.
- 47 I plan to concentrate mostly on one or two modules for the exams.
- 48 The class material has been enough to help me do most assessed work.
- 49 I am leaving tutorial/homework problems until the end of the year so I can use them for revision.
- 50 It was clear what was expected in the assessed work for the degree course.
- 51 The feedback given on assessed work helped me to improve my learning and studying.
- 52 There are some modules that I'm aiming to just pass rather than really understand.
- 53 I am unsure of how much I have really learned this year.
- 54 I am going to be tactical in choosing what to prepare for some exams.

### **University Structure and Staff**

- 55 I put less effort into modules when I don't think the lecturer teaches well.

- 56 Unprofessional staff (e.g. poor timekeeping) affect how seriously I work towards a module.  
57 Interactions with most staff have been beneficial to my learning.  
58 I have needed the same or less direction from staff than in my previous study.  
59 I find it difficult to find time to ask staff all the questions I have.  
60 The workload has been too heavy at times for me to really learn.  
61 The timetable has made it easy for me to do my own studying around lectures.  
62 Access to rooms and resources has helped me learn.  
63 It hinders my learning when staff refer me to a book instead of giving me the answer.  
64 The quality of some teaching hasn't been what I expected.  
65 If teaching isn't ideal I ensure I understand the material by doing independent study.

### **Personal**

- 66 University requires you to be more responsible for your own success than my previous study.  
67 I have made a conscious decision about the type of student I am.  
68 I am more confident in my own ability than before university.  
69 I have enjoyed this year.  
70 I enjoy high workloads and difficult tasks as a chance to prove myself.  
71 When I feel like I've learned a lot it doesn't always show in my marks.  
72 I will be more motivated when my marks count towards my final degree.  
73 Personal factors have had more negative affects on my learning than anything at University.  
74 If there are small things I am unsure of I wait until I revise for exams to try and understand them.  
75 I think some modules are more important than others.  
76 I am motivated by a fear of failing.  
77 I have found it difficult to maintain a constant motivation & effort through the year.  
78 The subject material is much more difficult than I expected before university.  
79 I often write extra notes during classes to help me learn.  
80 I am rarely satisfied that my work is as good as it could be.  
81 The amount of work I was required to do was what I expected.  
82 I have found most of what I learned in this degree course really interesting.

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