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Evoked prior experiences in first year university student learning

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Abstract

In this paper, we focus on three aspects of students' evoked prior experiences of learning: students' evoked conceptions of learning, evoked motivation and evoked self-efficacy. We show how, for a first year undergraduate population, these three aspects of evoked prior experience relate to students' approaches to learning and their perceptions of the learning environment as well as to their previous schooling, their gender and the broad discipline area in which they are studying. In doing so, we confirm that evoked prior experiences are distinct and measurable aspect of students' learning experience, which can be used, along with other aspects of evoked prior experience, to better understand the ways in which students experience learning in higher education.

Keywords: First Year Experience, Conceptions of Learning, Motivation, Self-Efficacy, Approaches to Learning

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Conceptualising evoked prior experiences

> If I had to reduce all of educational psychology to just one principle, I would say this: the most important single factor influencing learning is what the learner already knows. Ascertain this and teach him (sic) accordingly. (Ausubel *et al.*, 1978: 163)

This statement by David Ausubel is arguably one of the best known and widely accepted maxims in education. It is as relevant today as it was then, despite the contributions of a new generation of educational researchers. What the more recent research has contributed is an in-depth analysis of the notion of 'what the learner already knows'. At its most simplistic, knowing is the extent of the students' prior understanding of the subject matter being learned. Students' grades or marks attained in earlier cognate subjects are still the best single predictor of outcomes of learning. Science education research conducted at the time of Ausubel's statement focused on knowing as the way key scientific concepts were conceived. Misconceptions or alternate conceptions were considered to be less desirable ways of knowing, and an awareness of these ways of knowing was fundamental in teaching for conceptual change (West & Pines 1985).

In the 1990s, Crawford and colleagues described a series of studies in university mathematics in which they saw knowing mathematics as being about how the students conceived of the nature of mathematics. Some students saw mathematics as a coherent complex logical system

or as a way of thinking. Others saw it as being about numbers rules and formulae and their application (Crawford *et al.,* 1994). Subsequent quantitative research revealed systematic and logical relations between this prior experience of mathematics, approaches to learning adopted in the study of the subject and outcomes of learning in the form of grades achieved for the subject (Crawford *et al.,* 1998). This research was focused on trying to find out 'what the learner already knows', in order to teach accordingly. Recent thinking from the perspective of awareness (Marton & Booth 1997) suggests that 'what the learner already knows' are those elements of the students' prior experience that they bring to the fore of their awareness in the learning situation. We describe this knowing as 'evoked prior experience', and in this paper we argue that this knowing also needs to be ascertained in the search for what must be taught accordingly.

Evoked prior experience may include all or part of the detailed understanding of the subject matter, a way of conceiving of the key concepts and a way of conceiving of the nature of the subject itself, that has been the focus of previous research. In this paper we argue that there are at least three other elements of evoked prior experience that should be taken into consideration in deciding how to teach. The first is the students' evoked conception of learning, or how they conceive of learning in the specific context of their study. The second is evoked motivation, or those motivational aspects evoked by the context. The third is evoked self-efficacy, or the confidence students have in their ability to succeed in a specific situation. All three are likely to vary according to the learning situation, and in university student learning, these evoked prior experiences are likely to play a key role in how students perceive their learning context, the approaches they take to their learning and the quality of the outcomes of their learning.

There are two aspects of this relational perspective that are worthy of note. First, it suggests that conceptions of learning, motivation and self-efficacy are constituted in the relation between the student and their learning environment. Thus they are not stable mental properties of the student nor created by the learning environment but are rather generated by the student's understanding of the environment that they are in. Second, this implies that they will change when the student's perception of their learning environment changes.

A relational model or framework of student learning that has been use to position some of the empirical work mentioned above is shown in Figure 1. It uses the ideas of evoked-ness and awareness (Marton & Booth 1997; Prosser & Trigwell 1999) to hypothesise that in any particular learning and teaching context (the central boxes in the figure), an individual student will experience relations between their evoked prior experience, their perceptions of that context, their approaches to learning and the outcomes of that learning situation. Students are simultaneously aware of all four aspects, although in some contexts, one or more of these aspects may be more to the foreground of awareness, while other aspects may be more to the background. So, as found by Crawford, *et al.* (1998), when the experienced context evokes a prior experience of learning that is focused on acquiring rules and techniques, rather than a way of thinking, students may adopt a surface approach to learning with the result that the quality of their learning outcome is lower.

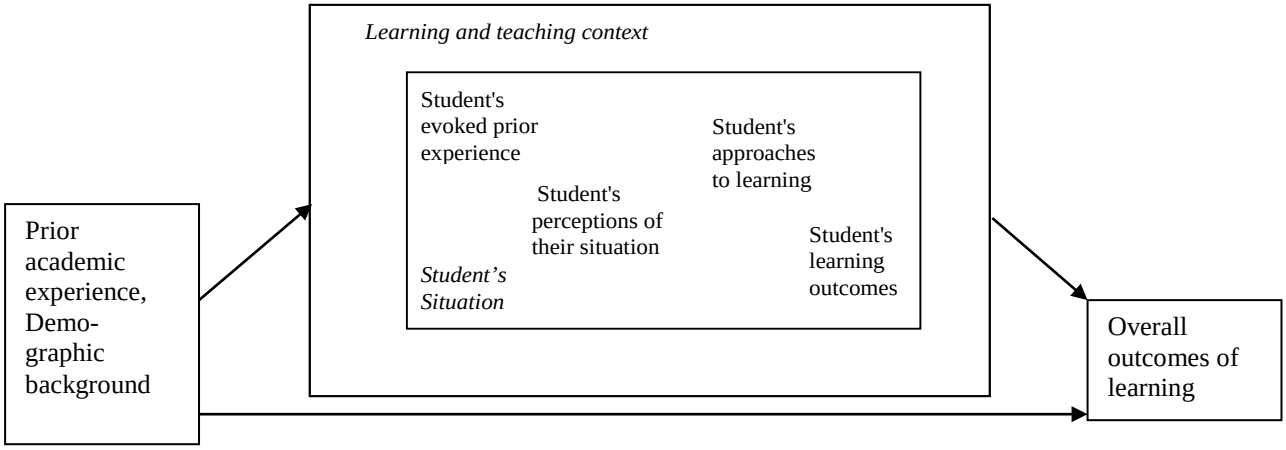

Figure 1: A relational model of student learning (after Prosser & Trigwell 1999)

While the relations between prior academic experience/demographic background and outcomes of learning shown by the connecting line at the bottom of Figure 1 are strong (and illustrative of Ausubel's maxim), evaluating the value added by a university education, and finding ways to improve the value added requires a focus on the central part of the model. The study reported in this paper had three aims. The first was to explore the three new elements of the evoked prior experience of university students in their first year out of secondary school. The second was to look at the relations between evoked prior experience and students' approaches to learning and perceptions of the learning environment. The third was to assess how evoked prior experience varied by prior schooling, by broad disciplinary area, and by gender.

Evoked conceptions of learning

The ways in which students' conceptualise their learning in higher education has been investigated from a number of different perspectives. From a phenomenographic perspective, Marton & Säljö (1997) describe qualitatively different ways of conceiving of learning; Perry (1999) describes qualitatively different conceptions of knowledge; Roach *et al.* (2001)

describe differences as being adaptive (more open) or adoptive (more regulated). In all of these studies there is a contrast between seeing learning in terms of gaining knowledge or techniques that can be applied to particular tasks or forms of assessment and seeing learning in terms of developing new ways of thinking, conceptualising or understanding (Trigwell & Ashwin 2006).

The reason for such interest in this topic is the belief that how students understand learning in higher education will play a major role in shaping their understanding of the purposes of the academic tasks that they are asked to engage in during their studies. It is conceivable that these views will be related to their approaches to learning and to the quality of their learning outcomes, as numerous studies have shown relations between approaches to learning and outcomes of learning (for a summary see Prosser &Trigwell, 1999).

From the relational perspective outlined above, and as Säljö (1982) argues, part of the meaning that someone ascribes to learning comes from their understanding of the particular setting they are in (see also Lonka & Lindblom-Ylänne 1996). Thus rather than generic conceptions of learning being of primary concern, it is the conceptions of learning that are evoked within particular teaching and learning contexts that are likely to be related to the approaches to learning that students take in those contexts. It is for this reason that we focus on evoked conceptions of learning in this study.

Evoked motivation, and evoked self-efficacy.

In this study, we have used the concepts of motivation and self-efficacy as described by Pintrich (Pintrich *et al.*, 1991). In doing so, we have reinterpreted ideas of motivation and self-efficacy from a relational perspective. From this perspective it is possible that not all of a

student's motivation and feelings of confidence will be evoked by a given situation. Rather, what aspects of their motivation and confidence are evoked will be related to their perception of the situation they are in. This means that, from this perspective, motivation is an integral part of a learner's awareness, and an awareness that changes according to their relation to the situation, rather than a comparatively stable mental characteristic that is relatively separated from action. A similar argument is being used for self-efficacy. This is the reason for our drawing mainly on the work of Pintrich and colleagues. This research acknowledges a relational element in that motivation, task value, and self-efficacy are seen to change according to the context. For example, Pintrich & Zusho (2000) argue that motivational beliefs and self regulatory activities are mediators between personal and contextual characteristics on the one hand, and actual achievement or performance on the other.

The current study

The current study sought to examine the relations between first year students' evoked prior experiences, in terms of their evoked conception of learning, evoked motivation and their evoked self-efficacy, and their perceptions of the learning environment. The context in which the study took place was first year students' learning in the University of Oxford. This context is an interesting one for three reasons. First, it is a higher education context in which retention is not a significant issue. This is in marked contrast to other studies of the first year experience (Harvey *et al.*, 2006). Second, it is a context in which students have relatively homogenous entry qualifications, in terms of having the top grades in their previous qualifications. This makes it an interesting context in which to examine evoked prior experiences because it allows for the exploration of the assumption that similar students can experience the same context in different ways depending on the aspects of their prior experiences that are evoked within that context.

Third, whilst students at the University of Oxford are relatively homogenous in terms of their entry qualifications, there were some aspects of difference that we were interested in examining in relation to prior evoked experience: these were gender, previous schooling and the broad disciplines of students' degrees. We chose to examine the relationship between students' scores on the evoked prior experience scales and their gender because a gap has been identified between the examination results of men and women at Oxford (Davies & Harré 1989, McCrum 1994, 1996, 1998; Spear 1997; Mellanby *et al.*, 2000). We wanted to examine whether the scales appeared to show that there were any differences in the evoked prior experience of men and women within the learning environment at the University of Oxford. Equally, there is some evidence (McCrum 1998; Mellanby *et al.*, 2009) that state school students are over selected during admission to the University of Oxford compared to students who went to private schools and, as a result, they appear to do better once they enter into the system. Again, we wanted to examine whether there were any differences in the evoked prior experience of these two groups of students. Finally, there is a range of literature that claims that the way that learning is thought about varies between the disciplines (Neumann 2001; Neumann ,*et al.*, 2002; Brint, *et al.*, 2008; Nelson Laird, *et al.*, 2008; Kreber, 2009), and we wanted to examine whether evoked prior experiences are different for different disciplines within the University of Oxford.

Method

As part of a larger study, a questionnaire was mailed to undergraduate students at 17 participating colleges (about half) of the University of Oxford. A total of 831 first year students (49%) in their second term of study returned the completed questionnaire. At the request of student representatives, no follow-up contact to improve return rates was conducted. The data were analysed using SPSS. The sample appeared representative of the

general first year population in terms of the general subjects studied, the gender and the previous schooling of those who completed the questionnaire. The questionnaire has been developed from a pilot study (see Trigwell & Ashwin 2006). In addition to the items relating to evoked prior experiences, it also contained standard items on approaches to learning (Richardson, 1990), and perceptions of the learning environment (Prosser &Trigwell, 1999).

The evoked conception of learning scale

If one takes the relational and evoked approach to conceptions of learning outlined in Section 1.1 seriously, then it has clear implications for the way in which one tries to capture students' conceptions of learning in research studies. This means that rather than attempting to investigate students' generic conceptions of learning, the focus should be on the conceptions of learning that are evoked by the particular teaching and learning environments in which students find themselves.

An eight-item scale was developed that focused on items that asked students to talk about the purposes of their degree or about particular teaching and learning interactions. The idea was that this would provide access to what 'learning' meant to students within the context of their degree course rather than their more general views of learning. The eight items were drawn either from Ashwin's (2005) study about the way in which students thought about the purposes of tutorials and the role of students and tutors within tutorial, or from Roach, *et al.*'s (2001) view of the way in which students think about the purposes of their degrees. The scale works on the basis of the division between learning in terms of gaining knowledge or techniques that can be applied to particular tasks or forms of assessment (a lower score on the scale) with conceptions of learning that see learning as developing new ways of thinking, conceptualising or understanding (a higher score on the scale). In a pilot study a six item

version of the evoked conception of learning scale had been developed (see Trigwell & Ashwin 2006). In the current study this was increased to 8 items. Two items seeking to examine students' perceptions on the presentation of their degrees were added:

40. On balance, I think my degree is presented as being more about synthesis and conceptualisation than about facts, rules and laws
53. On balance, I think my degree is presented as being more about techniques and procedures than arguments and reasoning

The full list of items, as well as the item number and scoring of the item for the evoked conceptions of learning scale is shown in Table 1. In scoring, half of the items were reversed. The scale reliability co-efficient (alpha) for the eight items making up the evoked conception of learning scale was found to be 0.76. The best alpha for a seven-item scale was 0.75. Responses (on the 1-5 point scale – strongly disagree, disagree, neutral, agree, strongly agree) for the 8-item scale fell within a range of 1.50-4.75 with a mean of 3.31 and a standard deviation of 0.58.

Table 1: Item, questionnaire item number, and scoring (if reversed) for the eight items in the questionnaire making up the evoked conception of learning scale.

Number	Item	Scoring Direction	Item
16	scl1	Reversed	Tutorials are more about me testing my knowledge than exploring my personal understanding of the subject
25	scl2	Normal	In my degree I feel it is more important to find new ways of thinking than it is to gain specific knowledge about the subject areas
32	scl3	Normal	I see my role in tutorials as being more about discussing ideas than about answering my tutor's questions
40	scl4	Normal	On balance, I think my degree is presented as being more about synthesis and conceptualisation than about facts, rules and laws
45	scl5	Reversed	Tutorials are more about me showing my tutors how much I have learned in this subject than developing my understanding
52	scl6	Reversed	I see the tutor's role in tutorials as more about explaining ideas than about initiating a discussion of them
53	scl7	Reversed	On balance, I think my degree is presented as being more about techniques and procedures than arguments and reasoning
66	scl8	Normal	In my degree I feel it is more important to find new ways of thinking than it is to learn to apply knowledge

The evoked motivation scale

The evoked motivation scale was made up of eight items (sm1 – 8) that examine the extent to which students' valued and were stimulated by their current academic activities. The value element was a slightly adapted version of the Task Value scale of Pintrich, et al.'s (1991) Motivated Strategies for Learning Questionnaire (MSLQ). This includes three interest items (e.g., I am very interested in the content (subject matter) of my degree), two utility items (e.g., I think that what I am learning in this course will be useful when I graduate), and one importance item (i.e., Understanding the subject matter of my degree is very important to me). In addition, we added two items to the scale that were focused on the extent to which students were intellectually stimulated by their studies (e.g., My degree course is intellectually stimulating). The scale reliability co-efficient (alpha) for the eight items making

up the evoked motivation scale was found to be 0.84 and is comparable to that of Pintrich, *et al.* (1991). The full scale can be seen in Table 2.

Table 2: Item, item number, and scoring direction for the eight items in the questionnaire making up the evoked motivation scale.

Number	Item	Scoring Direction	Item
1	sm1	Normal	My degree course is intellectually stimulating
7	sm2	Normal	I think that what I am learning in this course will be useful when I graduate
12	sm3	Normal	The course has stimulated my interest in the field of study
19	sm4	Normal	I am very interested in the content (subject matter) of my degree
23	sm5	Normal	I like the subject matter of my degree
29	sm6	Normal	I think the content of this degree course is useful for me to learn
51	sm7	Normal	Understanding the subject matter of my degree is very important to me
61	sm8	Normal	My course stimulates my enthusiasm for further learning

The evoked self-efficacy scale

The evoked self-efficacy scale used in the present study was an adaptation of Pintrich, *et al.*'s (1991) self-efficacy inventory. It included four items (sse1-4), which give an indication of students' confidence in their ability to achieve desired outcomes in the context of their studies at Oxford (e.g., I'm certain I can understand the most difficult material in my reading lists). Two of the original items from Pintrich, *et al.*'s (1991) original scale were removed because they were not appropriate to the context of the research. The measure was internally consistent (alpha = .78) and no items were deleted to improve reliability. This alpha is somewhat lower than that reported by Pintrich, *et al.* (1991). The items that made up the scale can be seen in Table 3.

Table 3: Item, item number, and scoring direction for the four items in the questionnaire making up the evoked self-efficacy scale.

Number	Item	Scoring Direction	Item
24	sse1	Normal	I'm confident I can do an excellent job on the assignments and/or essays in my degree course
39	sse2	Normal	I'm certain I can understand the most difficult material in my reading lists
44	sse3	Normal	I'm confident I can learn the basic concepts introduced in this degree
58	sse4	Normal	I'm certain I can master the skills being taught in my degree course

In order to examine the relations between the three evoked prior experience scales a confirmatory (maximum likelihood) factor analysis was conducted. Based on a scree plot (Preacher & MacCallum 2003), a 3 factor solution was selected. Table 4 shows the factor matrix that supports the assertion that generally the three scales operate as separate scales. Factor 1 contains high positive loadings on all eight of the evoked motivation items and no loadings above 0.3 for items from either of the other evoked prior experience scales. Factor 2 contains high positive loadings for all eight of the evoked conceptions of learning items. It also contains weak loadings for two items of the evoked motivation scale. Factor 3 contains high positive loadings for all four of the evoked self-efficacy items with no items loading above 0.3 from the other two scales.

Table 4: Factor Analysis of Items from the three evoked prior experience variables.

	Factor		
	1	2	3
scl1rev		.335	
scl2		.482	
scl3		.566	
scl4		.668	
scl5rev		.333	
scl6rev		.584	
scl7rev		.659	
scl8		.418	
sm1	.546		
sm2	.499		
sm3	.677	.331	
sm4	.775		
sm5	.713		
sm6	.592		
sm7	.552		
sm8	.578	.316	
sse1			.688
sse2			.642
sse3			.573
sse4			.784

Note. Loadings less than .30 removed; eigen > 1.27 (based on scree plot); Maximum likelihood factor analysis with oblimin rotation with kaiser normalization; n= 831.

Scale reliabilities and typical questionnaire items for learning approaches, and perceptions of the learning environment scales are shown in Table 5.

Table 5: Scales (for learning approaches, perceptions of the learning environment) and alpha reliabilities and an example item from each scale

Scales	No. of items	Alpha	Example item
Surface approach	6	.74	Often I feel I am drowning in the sheer amount of material I'm having to cope with in my degree
Deep approach	6	.74	When I am reading an article or book, I try to find out for myself exactly what the author means
Good Teaching	6	.81	My tutors put a lot of time into commenting on my work
Appropriate Workload	4	.82	I am generally given enough time to understand things I have to learn
Clear Goals and Standards	4	.76	The tutors made it clear right from the start what they expect from students
Appropriate Assessment	3	.63	My tutors seem more interested in assessing what I have memorised than what I have understood

Analyses of the relations between variables were conducted using Pearson two-tailed correlations and a Ward's method hierarchical cluster analysis. Selection of the reported two cluster solution was based on the increasing value of the Squared Euclidean Distance between clusters. The cluster analysis was followed by between-group contrasts (of scale means and z-scores) using cluster membership to form the groups (Seifert, 1995).

Finally, students' scores on the evoked prior experience scales were related to their broad discipline area, their gender and their previous schooling using a comparison of means.

Results

Relations between evoked prior experience and perceptions of the learning environment

For each of the two groups of students identified in the cluster analysis in Table 6, all variables included show coherent sets of relations. The first group includes 600 students who, on average, have lower evoked conceptions of learning scores that are more focused on learning as the acquisition of knowledge than learning as the development of personal understanding than their 230 colleagues in the second cluster. They are less motivated and have lower confidence in their ability to engage with the requirements of the first year course. They also perceive their teaching as less good, their workload as less appropriate, the goals and standards of their course as less clear, and their assessment as less appropriate. They adopt more of a surface approach and less of a deep approach than their colleagues in cluster 2. All of these differences are statistically significant with the effect sizes of the difference being high in the case of all variables (using the measure as described by Cohen, 1988).

Table 6: Mean (and standard deviations) of cluster scale scores for evoked conception of learning, motivation, self-efficacy, approaches to learning, and perceptions of the learning environment scales, and the effect sizes for the differences between the cluster means

Scale	Cluster		Effect Size
	1	2	
n =	600	230	
Evoked conception of learning	3.17 (.56)	3.69 (.50)	0.90
Motivation	3.91 (.54)	4.48 (.33)	1.04
Self-efficacy	3.27 (.61)	3.99 (.53)	1.08
Surface approach to learning	2.98 (.60)	2.16 (.49)	1.20
Deep approach to learning	3.45 (.51)	4.05 (.46)	1.11
Good Teaching	3.35 (.60)	4.03 (.49)	1.05
Appropriate Workload	2.74 (.77)	3.64 (.59)	1.08
Clear Goals and Standards	3.11 (.68)	3.73 (.58)	0.79
Appropriate Assessment	3.76 (.72)	4.28 (.50)	0.74

Note. Differences between the two cluster means on all variables are statistically significant at < .001

Table 7 shows how the three evoked prior experience scales correlate with the four perceptions of the learning environment scales and the two approaches to learning (surface and deep) scales. This shows that apart from the Clear Goals and Standards Scale, there are significant correlations between the evoked prior experience scales and the other scales. In all cases, the relationship is in the direction expected using the model described earlier and shown in Figure 1.

Table 7: Correlations between the three evoked prior experience scales and the four perceptions of learning environment scales and deep and surface approaches to learning scales

Perceptions and approach scales	Evoked conceptions of learning scale	Evoked motivation scale	Evoked self-efficacy scale
Good teaching	.28*	.38*	.27*
Appropriate workload	.29*	.26*	.45*
Clear goals and standards	.04	.22*	.31*
Appropriate assessment	.47*	.26*	.10
Deep approach to learning	.40*	.49*	.41*
Surface approach to learning	-.34*	-.48*	-.54*

Pearson, 2-tailed; n=830-1 (*p≤ 0.001)

Relations between evoked prior experience and students' academic discipline

Table 8 shows the means on the evoked prior experience scales for students from the different academic divisions within the University of Oxford.

Table 8: Comparison of the means (and standard deviations) of students from different academic divisions on the Evoked Prior Experience Scales

Division	n	Evoked conceptions of learning scale	Evoked motivation scale	Evoked self-efficacy scale
Humanities	255	3.65 (.42)	4.13 (.52)	3.50 (.65)
Social Sciences	196	3.47 (.50)	4.09 (.53)	3.56 (0.71)
Life and Environmental Sciences	72	3.29 (.46)	4.16 (.49)	3.42 (.61)
Medical Sciences	72	2.80 (.63)	4.26 (.64)	3.49 (.66)
Mathematical and Physical Sciences	223	2.96 (.50)	3.87 (.54)	3.34 (.66)

In terms of evoked conceptions of learning it shows that students from humanities had higher scores than students from other divisions. The difference between students from the humanities and students from the medical sciences was particularly large (0.85). This difference was statistically significant ($p<0.01$) and had a very large effect size of 1.44.

In terms of evoked motivation, the biggest difference was between the Medical Sciences and the Mathematical and Physical Sciences. These divisions have a statistically significant ($p<0.01$) difference of 0.38 and a medium effect size of 0.65.

In terms of evoked self-efficacy the main difference was between the Social Sciences and the Mathematical and Physical Sciences with a statistically significant ($p<0.01$) difference of 0.22 and a small effect size of 0.32.

Table 9 shows the differences between the students from two broad subject areas, the humanities / social sciences and the sciences on the evoked prior experience variables. In terms of evoked conceptions of learning, this is a statistically significant difference ($p<0.01$), with a large effect size (0.98). The differences on the evoked motivation and evoked self-efficacy scale, although statistically significant only have small effect sizes of around 0.2.

Table 9: Comparison of the means (and standard deviations) of students from two broad subject areas on the evoked prior experience scales

Division	n	Evoked conceptions of learning scale	Evoked motivation scale	Evoked self-efficacy scale
Humanities and Social Sciences	451	3.57 (.47)	4.11 (.52)	3.52 (.68)
Sciences	367	2.99 (.50)	4.00 (.58)	3.38 (0.65)

Relations between evoked prior experience and gender

Table 10 shows the means on the three evoked prior experience scales for female and male students who completed the questionnaire. It shows that whilst there were very small differences between the male and female respondents on the evoked conceptions of learning and evoked motivation scales, there were statistically significant differences ($p<0.01$) between the evoked self-efficacy scores of female and male students. This difference had a medium effect size of 0.55 and remains when the subject choices of the two genders are accounted for.

Table 10: Comparison of the means (and standard deviations) of female and male students on the evoked prior experience scales

Gender	n	Evoked conceptions of learning scale	Evoked motivation scale	Evoked self-efficacy scale
Female	389	3.34 (.59)	4.11 (.52)	3.27 (.63)
Male	440	3.29 (.57)	4.03 (.58)	3.64 (.66)

Relations between evoked prior experience and previous schooling

There were no statistically significant differences between the mean evoked conceptions of learning, evoked motivation and evoked self-efficacy scores of students whose compulsory schooling was in the state and in the private sector.

Discussion

There are three aspects of this study that we wish to highlight in this discussion. First, the three new evoked prior experience scales are found to be measuring different aspects of evoked prior experience, and with Cronbach alpha's of 0.76-0.84, are internally coherent. Second, there were statistically significant relations between the evoked prior experience

scales and scales examining students' perceptions of the learning environment and approaches to learning. However, the strength of these relations suggests that the evoked prior experience scales were picking up on different aspects of students' experiences than the approaches and perceptions scales. Third, in a context in which students have very similar levels of prior educational attainment, the results of the cluster analysis suggest that there are statistically significant differences between students' scores on the evoked prior experience scales and that these have large effect sizes. This suggests that the evoked prior experiences scales are picking up something that is not directly related to demographic variables that are often taken as a measure of students' prior experiences. This is supported by the lack of relations between students' evoked prior experiences and most of the other demographic variables examined (discipline, gender and school type).

There are two exceptions to this, both of which would be expected given the results of previous research. First, there were relations between students' evoked conceptions of learning and the broad disciplines that they were studying, as presented in Tables 8 and 9. Both tables suggest that there are disciplinary differences between students' evoked conceptions of learning. Students from the humanities and social sciences are more likely to view learning on their courses in terms of developing new ways of thinking than students from each or all of the other three divisions. One possible reason for the difference is in the differing natures of the disciplines, with the science group of disciplines being built more around knowledge seen 'as a given', or less contested knowledge, particularly in first year, relative to humanities/social sciences knowledge (Neumann, 2001; Neumann, *et al.*, 2002; Brint, *et al.*, 2008; Nelson Laird, *et al.*, 2008; Kreber, 2009). A second reason is to do with pedagogies, with the science/medicine/engineering tutorial system including more elements of group discussions of 'closed answer' problem sheets than the more open-ended essay

focus with pairs discussion used in the humanities/social sciences area (for example, see Ashwin 2005, 2006).

While these differences may be largely due to differences in pedagogies and the nature of knowledge, it is important to note that the structure of the relations found in the cluster analysis of the whole group are also found in similar analyses conducted within each of the humanities/social sciences and sciences subgroups. This indicates that the students who report higher evoked prior learning conceptions while studying a particular type of knowledge in a particular pedagogic context are likely to be the students who experience more of a deep approach to learning in that context.

In terms of evoked motivation and self-efficacy the results appear less differentiated along nature of knowledge or pedagogy lines, and the differences, where they exist are smaller. First year medical students experience the greatest evoked motivation. Given the focus in the scale on the usefulness of the subject matter and the importance of understanding the subject matter, this is perhaps not surprising. The similarity of the evoked self-efficacy results across the divisions are probably more noteworthy than the differences and maybe related to the students' successes in learning in their previous educational contexts.

The second exception were the relations between students' evoked self-efficacy and their gender. Research into the 'gender gap' in final degree results at Oxford has suggested that differences in the academic self-efficacy of male and female students as one of the factors in this (Mellanby, *et al.*, 2000).

Overall, the study suggest that the three scales are a robust measure of different aspects of evoked prior experiences. Two things should be noted about this claim. First, it is not being suggested that these are the *only* significant aspects of evoked prior experiences. The argument is that these are three aspects but clearly there are likely to be others, in particular, as we noted earlier, evoked understandings of the subject matter that is the focus of students' degree programmes (for example Crawford, *et al.,* 1998). Second, if it is to be used in other educational contexts, the evoked conceptions of learning scale will need amendment to reflect the learning context of the particular higher education institution. In particular it is unlikely that tutorials that are a feature of the Oxford University context will be of such importance in some other higher education contexts.

As with the studies that led to the use of the Course Experience Questionnaire (CEQ) as a instrument to assist academic development (Ramsden ,1991) there is no evidence that any of the relations between the relevant variables are causal. However, as with the CEQ, the evoked prior experience scales capture an aspect of students' experience of learning which is related to their approach to learning and their learning outcome. Changing the environment in ways indicated by the nature of the students' response with the aim of encouraging evoked prior experiences that are more aligned with objectives may offer another path to improvements in student learning.

Conclusion

This empirical study involving over 800 first year undergraduate students from one university context has yielded evidence of a set of relations between the different ways university students think about their learning in a certain context, and the way they perceive their

learning environment and the way they approach their learning. Variation in the ways students conceive of their learning context is found to be measurable and related to the ways they perceive and approach their learning in that context. From the data collected for this study it has not been possible to relate the variables used to the outcomes of learning. However, the early results from a follow-up study at the same university (Trigwell, et al., in preparation) indicate that there is a positive relation between high evoked prior experiences and higher quality learning outcome.

Two clusters of students, each with coherent learning orchestrations were identified in the study. The cluster of students who have an evoked conception of learning that is more focused on developing new knowledge, are more motivated in the context, and feel they can succeed in that context report adopting deeper approaches to learning, and perceive that the learning environment is more supportive of their learning.

The relational nature of this research leads to the conclusion that while some aspects of students' previous learning experiences may not be accessible, the evoked or contextual responses found in this study may offer an alternative way of accessing these for those aiming to improve student learning. Changing the learning context to influence students' approach to learning has been one way used to improve the quality of learning. The model used to underpin this research, and confirmed empirically in this one context, indicates that changes to the environment designed to trigger some prior experiences of learning and not others, may also be a means to the end of higher quality student learning.

While this study was conducted in one specific (and atypical) context, the relations found between variables are a function of student learning not of any specific context, and will also

be found in other contexts. The results will enable those developing learning environments in any context to focus on a small subset of more relevant evoked student experiences as well as factors such as perceived workload, clear goals and standards, teaching, assessment and student independence in learning. This research therefore contributes another element to the relational studies that began in Gothenburg with the identification of qualitative differences in approaches to learning and the conceptions of learning.

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