



Research project report:
Argumentative skills in first year undergraduates
A pilot study

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Not all the data that was collected has been used in the present report; we intend to develop the analyses further and publish specific papers in due course.

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Abstract

Argumentative skills in first year undergraduates

This one-year study, undertaken between September 2005 and August 2006, consisted of two parts: a systematic review of the research literature on effective strategies and methods for improving argumentative skills in undergraduates (see Torgerson et al. 2006); and a pilot study which aimed to clarify issues around the development of argumentative skills in first year undergraduates, as well as to explore which methods were best suited to further study in the field.

The pilot study examined practices, as well as the views of students and lecturers, in three disciplines: biology, electrical engineering and history. It operated at three universities: The University of Illinois at Urbana-Champaign in the US; Queen Mary, University of London and The University of York in the UK. A mixed methods approach was used which included a questionnaire survey of first year students, interviews with staff and students and document collection and analysis.

The tentative results of the study indicate that first year students believe argument to be important in their disciplines; that they feel the need for more explicit instruction or discussion of disciplinary argument; that they draw on argumentation skills learnt in the previous stage of formal education and that they generally do not report scepticism in their academic reading. The study also suggests that differences between institutions, disciplines and individual lecturers are highly significant when studying argumentative practices; that there is a mismatch between the way students and lecturers see argument and its place in learning; that whether argument is formally assessed is key to how highly it is valued by students; and that the term argument itself is contested in terms of its applicability to higher education in the disciplines.

Executive summary

Argumentative skills in first year undergraduates: a pilot study

Background

The pilot study, which should be read alongside the systematic review (Torgerson et al. 2006) on strategies and methods in improving argument in undergraduates in higher education, takes as its background two main strands of research literature: on the one hand, studies in teaching and learning in higher education; and on the other, studies in argument (the product) and argumentation (the process). The problem investigated is that, despite moves forward in key and transferable skills in higher education in the UK, argumentation appears to have been neglected.

Aims

The principal aim of the present pilot study was to clarify issues involved in researching argumentation in higher education in three disciplines, namely biology, electronics/electrical engineering and history. A further aim was to explore methods which are best suited to further study in the field. The research took place in three institutions: Queen Mary, University of London; The University of York; and The University of Illinois at Urbana-Champaign.

Methods

The project involved a mixed methods pilot study, reported here. Four methods were used: questionnaire, focus group (as a pre-pilot approach), interviews (with students and lecturers) and document collection and analysis.

Results

Results from a pilot study must be taken as highly tentative. They are that:

- first year undergraduates generally do not report scepticism in their academic reading
- they believe argument to be important in their discipline
- they feel the need for more explicit instruction and/or discussion of the argumentative demands of (parts of) their discipline
- they appear to be drawing on argumentation skills learnt in the previous stage of formal education (usually A level or American senior high school)
- there are significant differences between institutions, disciplines and individual lecturers in the interpretation of the nature and place of argument(ation)
- modes of assessment are critical in terms of how argument is perceived by students; if argument is assessed formally, it is given high priority
- students and lecturers do not always see argument, or its place in learning in the discipline, in the same way (especially in the first year of undergraduate study)
- the term 'argument' is itself contested in terms of applicability to developing critical skills in higher education; 'argument' is one of a number of modes of intellectual, attitudinal and affective operations.

Conclusions

The conclusions reached on the basis of these tentative results are that further research must:

- build on the work of Entwistle (n.d.) and on the present study to explore history, biology and electrical engineering in more depth, and across all years of the undergraduate course
- undertake more strictly comparative studies between the US and UK, and with other countries
- examine argument at pre-university (e.g. A-level) in relation to university level requirements
- explore the relation between the first year experience and that of the whole degree
- determine exactly how argument and argumentation operate in the various disciplines, and distinguish where they are useful concepts/categories and where they are not
- work toward recommendations for the improvement of argumentative skills, where appropriate, in the teaching and learning of specific disciplines
- explore the balance, if appropriate, between disciplinary and study skill demands and practices
- explore multimodal argumentation
- determine the balance between affective, intellectual, attitudinal and motivational elements in argument.

In methodological terms, further research in the field requires substantial resources if a national or international survey is to be taken of argumentative practices and the place/nature of argument in higher education. There will be a need for further pilot work on such a questionnaire, if used. At present, if more in-depth (national and/or local) studies are to take place, the implications from the present study are that a further refined questionnaire, more formal interviews, focus groups and document collection and analysis are useful methods to employ, including close readings of students' and lecturers' work. Projects might also wish to consider whether to use direct observation of lecture and seminar practice, and whether to build in a longitudinal dimension. A comparative dimension, between countries, could be built by using these methods; such a dimension was not, strictly speaking, possible in the present study. A fully-fledged comparative study would require further development of the methods.

Recommendations

The main recommendation is that, before any implementation work is carried out, a major study be commissioned by the Higher Education Academy in collaboration with one of the large funding bodies. Such research should be large-scale, cover all three years of undergraduate programmes, build on the conclusions of the present report, and include a development phase in which improvements to the current situation can be trialled.

Given the extensive work to date in history, electrical engineering and biology (e.g. Entwistle et al. 2004, Hounsell et al. 2004), it would make sense to continue work in those disciplines. An extensive national study might be undertaken before further international comparative work.

References

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Torgerson, C., Andrews, R., Robinson, A. and See, B.H. (2006) *A Systematic Review of Effective Methods and Strategies for Improving Argumentative Skills in Undergraduate Students in Higher Education*, York: The Higher Education Academy.

Background

Research background

Much research has been carried out on improving teaching and learning in higher education (Biggs, 1979, 1989, 1993, 1999; de Corte, 1995; Entwistle and Ramsden, 1983; Marton, 1988; Ramsden, 1987; Gabel, 1999; Gibbs, 1994) over the last 20 years. The need for such research becomes more intense with the introductions of Teaching Quality Assurance and Quality Assurance Agency (QAA) exercises which monitor and assess the quality of provision in higher education institutions in the UK.

Some educators have argued that an effective strategy to enhance the potential of undergraduate students to learn is a good command of argumentative skills (Mitchell and Andrews 2000; Kuhn 1991). Whether such skills are taught (implicitly or explicitly) and how they are taught differ between disciplines and within disciplines (Berrill 2000). In molecular biosciences, an area of weakness identified by the QAA was the support given to students to help develop their generic skills (Quality Assurance Agency 2000). One of these skills was the ability to “construct reasoned arguments to support their position on the ethical and social impact of advances in biosciences” (Quality Assurance Agency 2002). The benchmarking document also emphasised the need for students in biosciences to use argument as “much of what they are taught is contested and provisional, particularly in the light of continuing scientific advances.” (Quality Assurance Agency 2002, p.4). As scientists they are “expected to be able to debate issues in a mature and critical manner, including engagement in moral and ethical themes.” (Hounsell and McCune 2002). To what extent these skills are taught depends on how the lecturers and hence the students view their relevance.

The Enhancing Teaching-Learning Environments in Undergraduate Courses project (Entwistle n.d.; Entwistle n.d.; Entwistle, Nisbet and Bromage 2004; Hounsell and McCune 2004; Nisbet, Entwistle, McQuillin and Robinson n.d.) working in similar disciplinary areas to the current project, made a distinction between teaching and learning activities that see learning “as the *acquisition* of individual knowledge, understanding and skills” (Entwistle, n.d. p5), with *participation* within a community of scholars or practitioners coming generally in the later stages of an Honours degree, “although earlier involvement was found in discursive and contested areas, like history...” (ibid.). Such a distinction between acquisition and participation can be related to the capacity for argumentation within the different disciplines we have studied in the present project: biology, electrical engineering and history¹. To argue is to participate, not just rehearse the arguments as part of the acquisition of knowledge².

¹ Essentially, Entwistle notes that Biology students are “required to develop a critical understanding of the collection and use of information and data, and the relationship between findings and theoretical frameworks, while recognising that much of what they are taught is provisional, due to continuing scientific advances” (n.d. p6). Final year students are expected to develop a synoptic and epistemic understanding of the discipline. Electrical engineering students have to build up experience of many different kinds of representations of their field (e.g. of an electrical circuit) before they can employ argumentation as part of design, resulting in ‘delayed understanding’. History students experience uncertainty about the nature of the subject, the aim being “to help students to achieve a greater awareness of the contested nature of historical knowledge and *of how evidence was used in argument*” (ibid., our italics).

² This distinction between rehearsing arguments and participating in them might be compared to the Toulminian distinction between regular and critical arguments. If we associate rehearsing regular arguments with exposition, and participating in arguments critically with a more specific and precise notion of argumentation, then further clarification will have taken place. These distinctions are discussed later in the report, and could form the basis for future work in the field.

Such participation, manifested in traditions of rhetorical instruction and understanding in Europe, dates back to ancient Greece and beyond. Aristotle's *Rhetoric*, Cicero's *On Oratory* and the *Ad Herennium* discuss and set out guidance and advice, primarily to speakers, in the social and political contexts in which they wrote. Crucially, the ability to argue in the public and private domains was linked with democratic processes. The rhetorical tradition (as described by Vickers (1988) in *In Defence of Rhetoric*) remained largely unbroken – though changed in many ways - through the medieval period and into the 19th century. The emergence of *belles lettres* studies and subsequently 'English Literature', with their focus on the fictional, brought about a crisis in rhetorical studies and practice. Whereas the Scottish tradition (Bain 1866) exported its commitment to rhetoric to the USA – where it has established a strong place in undergraduate induction in higher education, in Rhetoric and Composition or Freshman Composition programmes – in England the rhetorical tradition and Classical Studies were supplanted by English Literature as the central humanizing discipline. By the 1920s, with the publication of Sampson's influential report, *English for the English*, the demise of rhetoric was virtually complete in school and University education in England.

Twentieth century revivals of an interest in rhetoric and argumentation have taken place via the work of Burke in the USA, Toulmin (especially as taken up in composition and speaking courses in the US), Van Eemeren/Grootendorst in Russia/Europe, and Eagleton in the UK. Most of the applied work in higher education, however, has taken place in the States.

In the U.S., textbooks for first-year college composition (e.g., *Everything is an Argument*, Lunsford, Ruskiewicz & Walter; *The Craft of Argument*, Williams & Colomb) routinely foreground argument, usually a mix of neo-Aristotelian concepts (logos/pathos/ethos; topoi; stases) and the Toulmin model. Nevertheless, work on argument (e.g. *Argument Revisited*; *Argument Redefined*, edited by Emmel, Resch, & Tenney; Lunsford's 2002 *Written Communication* report on situated uptake of argument instruction) has highlighted the theoretical and pedagogical challenges facing instructors. Research on graduate and undergraduate writing across the curriculum (e.g. Casanave, 2002; Herrington, 1988, 1992; Prior, 1998) has highlighted the complex, often tacit nature of disciplinary argumentation. In short, despite considerable attention to argument theory, research, and especially pedagogy, it is apparent that much remains to be done in articulating effective tools and strategies for argument, especially with the expansion of multimedia genres (e.g., Lemke, 1998; Kress, 2003).

In the UK, applied research in argument in higher education was revived in the 1990s by Mitchell and Andrews. Two projects for The Leverhulme Trust in the early to mid-1990s, at Hull and Middlesex Universities respectively, explored the place and nature of argumentation in higher education. The first was concerned with the transition from sixth form (16-18) education to first year undergraduate education in a range of disciplines, including politics, sociology, biology, English literature and history. The second was concerned solely with undergraduate education, and conducted a series of case studies at Middlesex University in the disciplines of engineering, visual arts, geography and dance. The research was written up in a series of reports and also in *Essays in Argument* (Middlesex University Press 2001) and *Learning to Argue in Higher Education* (Heinemann/Boynton-Cook, 2000), an edited collection including work from the USA, Canada, the UK and Australia. Results suggested a lack of explicit teaching in argument; little or no meta-language for argumentation; different disciplinary instantiations of and expectations of argument in reading, critiquing and producing argument. Despite moves

forward in key and transferable skills in higher education in the UK, argumentation appears to have been neglected.

Aims

The study begins to explore the comparative opportunities offered by the different ways first-year undergraduate students in the UK and US are introduced to academic, disciplinary, and professional argument, as well as by the differences across institutional and disciplinary boundaries within each site. The aims of the research are:

- to clarify issues involved in argumentation in higher education in three disciplines, namely biology, electronics and history and in three institutions (two in UK and one in US);
- to review, systematically, effective strategies and methods in improving argumentation skills in undergraduate students in higher education
- to determine the best methods for approaching the topic of argumentation in higher education by undertaking a pilot study .

In order to fulfil these aims, the pilot study addressed the following research questions at three sites: the University of York; Queen Mary, University of London; and The University of Illinois at Urbana-Champaign:

- how are students in the first year of university introduced to argumentation?
- how do different curricular structures address argumentation?
- what are the obstacles and opportunities in the teaching and learning of argumentation in different disciplines in UK and US?

and the systematic literature review addressed the following question:

- what strategies and methods are effective in improving argumentative skills in undergraduate students in higher education?

Context

The research was carried out at three institutions: Queen Mary, University of London; The University of York; and The University of Illinois at Urbana-Champaign.

Queen Mary, University of London is a multi-faculty institution with more than 11,000 students, and is situated in the East End of London. It is an 'old' university, with a very strong reputation for research and stated commitment to local development and widening participation. There is a diverse student population with many students drawn from local communities, as well as a high percentage of international students who make up 20-25% of the student body.

The University of York was founded in 1963 with 200 students. It currently has over 10,000 in 30 departments and research centres; and has plans for further expansion at its campus on the south-east of the city of York. Like Queen Mary, it has a high proportion of international students and, as well as setting high store by teaching and supervision, is one of the most research-intensive universities in the UK.

The University of Illinois at Urbana-Champaign is a major public research university with approximately 30,000 undergraduates and 11,000 graduate and professional students. About 89% of the undergraduates are residents of Illinois and about 4.5 % are international students. The first-year cohort in 2005 was approximately 7500.

Methods

Instruments

The study employed a mixed-methods approach involving a systematic review (published separately as Torgerson et al., 2006); and a pilot study consisting of focus group interviews with students (used as pre-pilot), a large-scale questionnaire survey, semi-structured interviews (both with students and lecturers) and document analysis. The study population for the pilot study included first year undergraduates in three disciplines (biology, history and electronics engineering) in two UK institutions (The University of York and Queen Mary, University of London) and one US institution (The University of Illinois at Urbana-Champaign).

Focus group interviews

Prior to the questionnaire survey, exploratory focus group interviews were conducted at York and Queen Mary to trial the question items to be used in the questionnaire and to explore the possibility of alternative responses. These focus groups were conducted in October/November 2005. The number of students involved in these focus groups ranged from 2 to 7 people. First year students were used at Queen Mary and second years at York. The justification for the use of second years is that:

- (a) second year students had just completed their first year and would be able to tell us about their learning experiences, so we could start the focus group immediately without having to wait for the first year students to go through with their first written assignment and lecturer's feedback;
- (b) second year students were not involved in the questionnaire survey, so including them in the focus group interviews would not have an influence on the questionnaire responses.

However, there are issues arising from a decision to use second years (as well as using first years). Second year students are much more aware than first years of the ground rules within their studies. First years travel on a rapid learning curve, so that the point in the academic year at which they are asked about their studies is likely to be significant. There is the added concern that first years might have been used in the actual questionnaire survey.

Standard matrix analysis of qualitative data was used to identify points that needed to be taken into account in the design of the questionnaire.

Questionnaire survey

Based on the feedback from the focus groups, the questionnaire instrument was designed and refined. There are three sections to the questionnaire:

- section A deals with students' background with regards to the use of argumentation. The purpose of this section is to provide a baseline judgement of students' ability to read critically and to identify their needs with regards to the use of arguments;

- section B aims to identify students' experience of argumentation in their course. The purpose of this section is to identify differences in curricular structure in the teaching and learning of argumentation;
- section C aims to get basic demographic information about the individual student. The purpose of this is to help identify important factors in explaining differences in students' ability and experiences in the use of arguments³.

A total of 508 questionnaires was given out at York and Queen Mary. Of these 237 were returned. The response rate was 53%. The questionnaires were distributed in the spring term to the whole cohort of first year undergraduates in three disciplines (biology, history and electrical engineering) at York and to students in key lectures on the identified degree programme streams at Queen Mary. Different strategies were adopted depending on approval of access. In some cases students completed the questionnaire in the class, while in others questionnaires were distributed at the beginning of one lecture and collected in the following. As the number of returns from UIUC was not large enough, it was decided to exclude the quantitative data from UIUC in the final analysis and to report the data from the US separately (see separate section in this report).

Table 1: sample and response rates for the questionnaire

Subject	Response rate	York	Queen Mary	Total
Biology	No. given out	86	82	
	No. returned	86	20	106
	Response rate	100%	24%	
Electronic engineering	No. given out	39	77	
	No. returned	25	27	52
	Response rate	64%	35%	
History	No. given out	186	55	
	No. returned	50	29	79
	Response rate	27%	53%	

Data collection presented a number of difficulties. At Queen Mary, for example, an initial approach was to email students *en masse* and ask them to volunteer for focus groups and later interviews⁴. However, due to low response rates, the help of lecturers and tutors was enlisted to allow for time in tutorials for completing the questionnaire in all the disciplines. Although this was the most successful method for collecting questionnaires, it put a strain on the little time the tutors had with students.

In addition, the timescale of the project assumed a three-term year, whereas Queen Mary's academic year runs on two semesters with May and June being given over entirely to examinations; this may have complicated the gathering of data. Questionnaires were distributed and collected close to the end of semester where attendance at lectures and tutorials was even more irregular than usual; the follow up interviews were scheduled towards the end of the exam period where many students may have started to disengage with their first year studies and may have been reluctant to be involved in any further university commitment, or had left campus altogether.

³ We have not, to date, followed up the data collected in section C in this report.

⁴ At Queen Mary, once it was realised that the subject cohorts were too large to produce paper copies for all, particular programme streams were identified. Questionnaires were distributed after key lectures. There was an initial poor response, so staff were enlisted to give out questionnaires in tutorials, and in some cases to complete them on the spot.

Problems in collecting questionnaire data at UIUC were more acute, in that it was not possible to gain access to, nor gain the co-operation of students in completing questionnaires, even with incentives. These problems are discussed in more detail in the section on argumentation in first years at UIUC.

Analysis of the questionnaire

The analysis of the questionnaire was undertaken in four stages⁵: the collapsing of responses for easier analysis; a frequency count; a correlation matrix; and cross-tabulation.

⁵ The stages of analysis of the questionnaire were as follows:

Stage 1

The first stage was to try and collapse the responses for easy analysis.

- For question A.01, responses were recoded as: 'Agree' and 'Not agree'. The latter would include 'Not sure'.
- For items A.02, 'Agree' and 'Not sure' were collapsed into one category (which now reads as Not disagree) because if students are not sure about the answer, it means they are not clear about what is required in critical reading.
- All questions on a 5-point scale, have been collapsed them into a 3-point scale. This is necessary because of the small number of respondents in some categories of students.

For Question A.02, points were awarded for the answers, e.g. 1 point for 'Not disagree' and 2 points for 'Disagree'. These were then added up for each student to obtain the total score thus creating the new variable, 'Total approach to reading'. For example, if a student had indicated *Disagree* to all the items in the question, then his total score would be 8 and students who indicated *Agree* or *Not sure* to all items would have a score of 4. As there is no clear cut answer to item 3 'a good piece of research should be substantiated by numerical data', it was decided to leave this item out in the final analysis.

For Questions B.02, B.03 and B.04 part 1 the responses were recoded as:

- 1=rarely (this collapses the bottom 2 scales, i.e. 1 and 2);
- 2=sometimes (this is scale number 3);
- 3=often (this collapses the top 2 scales, i.e. 4 and 5)

For Question B.04 part 2, the responses were recoded as:

- 1=not useful (this collapses the bottom 2 scales, i.e. 1 and 2);
- 2=slightly useful (this is scale 3);
- 3=useful (this collapses the top 2 scales, i.e. 4 and 5).

To narrow the range of responses, items in Questions C.03 and C.04 have also been collapsed to include 3 categories only. English and European languages were regrouped into one category known as European, and Asian and oriental languages as Asian. The rest will be under Others. Similarly, for countries of origin, there are now 3 categories:

- 1= Europe
- 2= Asia
- 3= Others

For Question C.06, university entry qualifications were converted to UCAS tariff points. However, the International Baccalaureate Diploma was not covered by the UCAS tariff point system. Therefore, to estimate the tariff points for these students such that the result did not affect the mean scores, the median score for each subject group in each institution was used. For Access students where it was not possible to calculate their points, the minimum points for each subject in the institution were used as the entry score.

Stage 2

The second stage was to do a frequency count to get a feel of students' exposure to arguments, the kind of activities they are engaged in and the kind of feedback they receive. These activities included both general college/university-related ones and more specific classroom activities.

Stage 3

A correlation matrix was used to find out which factors related strongly to each other. The significance test was not used in this case because this was not a random sample, so the test of whether differences could have occurred by

Semi-structured interviews

Semi-structured interviews with 2-3 students and 2 lecturers from each discipline in each institution were conducted to help us understand how the different curricular in the 3 disciplines and 3 institutions were introduced. These interviews added depth and provide the subtle nuances that were not possible to extract from questionnaire responses. They also enabled us to unpack how the term 'argument' was understood and used by students and lecturers. An interview matrix was drawn up to facilitate the analysis of interview data.

The number of participants in the focus groups and interviews is listed in Table 2 below.

chance or is the result of sampling error doesn't apply. In most cases it was decided that only factors that correlated at .4 and above were considered. This means that these factors would explain about 20% of the differences between groups.

Stage4

To find out if there were differences between students in terms of their use of and attitude towards the use of argument, cross-tabulations between groups were carried out. However, because of the large sample size, it is not unusual for small differences to become statistically significant (Pallant, 2001). These differences may not have any practical or theoretical significance. Moreover, because the study population was not random, a test of significance would not be relevant. As the study population was a partial census, the mean differences between groups were sufficient to indicate whether there are real differences.

Table 2: number of participants in focus groups and interviews

	Biology (%)			Electronic Engineering (%)			History (%)		
	York	QM UL	UIUC	York	QMUL	UIUC	York	QM UL	UIUC
Focus groups	4 + 1 email interview	4 + 4 (2 groups)	4	2	7	-	2 + 1 email interview	1	-
Student in-depth interviews	2	2	2	-	2	1	3	3	1
Lecturer interviews	2	2	1	2	3	1	2	3	2

Document analysis

The questionnaire items also take into consideration information from departmental documents that included course modules, timetables for first, second and third year, undergraduate handbooks and assessment guidelines. These documents were also examined and analysed to obtain information about the methods of teaching, learning outcomes and assessment criteria. Students were also encouraged to bring texts to the interviews for discussion: these included assignment rubrics and student texts.

Triangulation

We have not attempted formal triangulation in this project. Rather, we have used different methods to begin to answer the research questions. The function of the focus groups was to help us refine and improve the questionnaire; the questionnaire and interviews (with students and lecturers) provided the main data, shedding light on the main problems we were addressing (as identified in the research questions); two main sources complement each other. The document collection and analysis provides informing background to our discussions with students and lecturers.

See Gorard and Taylor (2004) for a discussion of triangulation.

Ethical issues

Ethical issues are of increasing relevance to educational research practice and funding in the UK and are beginning to be accorded the same status as in medical or psychological research. In this respect, the UK is somewhat behind the USA. It was therefore highly beneficial to the project to be able to follow the guidance provided by The University of Illinois at Urbana-Champaign's institutional review board (IRB). Full documentation is available from the project, and the issues and practicalities of implementation are discussed more fully in the section 'Argumentation at the University of Illinois'. Pseudonyms are used throughout to protect the identity of the interviewees, as agreed

with participants at the outset. The identities of the institutions involved, however, have been made explicit.

The main issues for the present project were approval of the research instruments, informed consent and access. The first two were successfully navigated; the third proved more difficult, particularly in the USA.

Systematic review

In order to answer our fourth research question, a systematic review was undertaken of all the experimental studies (published or reported between the years 1990 and 2005) that explore the effectiveness of methods and strategies for improving argumentation skills in undergraduate students in Higher Education. The review was limited to studies published in the English language from 1990 onwards, thus reflecting the current state and structure of higher education provision in the US and UK. The aim of the review was to take an inventory of experimental studies on what strategies and methods are effective in improving argumentation skills in higher education and to explore the cumulative findings of those studies if they were a large enough number with sufficient homogeneity to meet the conditions for statistical meta-analysis.

While we would have liked to complete the systematic review before undertaking the empirical pilot study, in the time-scale of the proposed project, we had to run the two concurrently.

Systematic review methods, as outlined in Torgerson (2003), were used throughout the conduct of the review, in order to limit bias, and to enable replication of the review. The protocol was developed in order to establish: the research question; the scope and limitations of the review; the methods for conducting the review; the inclusion and exclusion criteria; and the procedures for extraction of data and quality appraisal. The systematic review is reported separately in Torgerson et al. (2006).

Results

The results of the pilot study are reported both in this section and the following one, which gives a critical account of the research at UIUC. The present section concentrates on the questionnaire and interview data from the two UK universities.

Results from the questionnaire

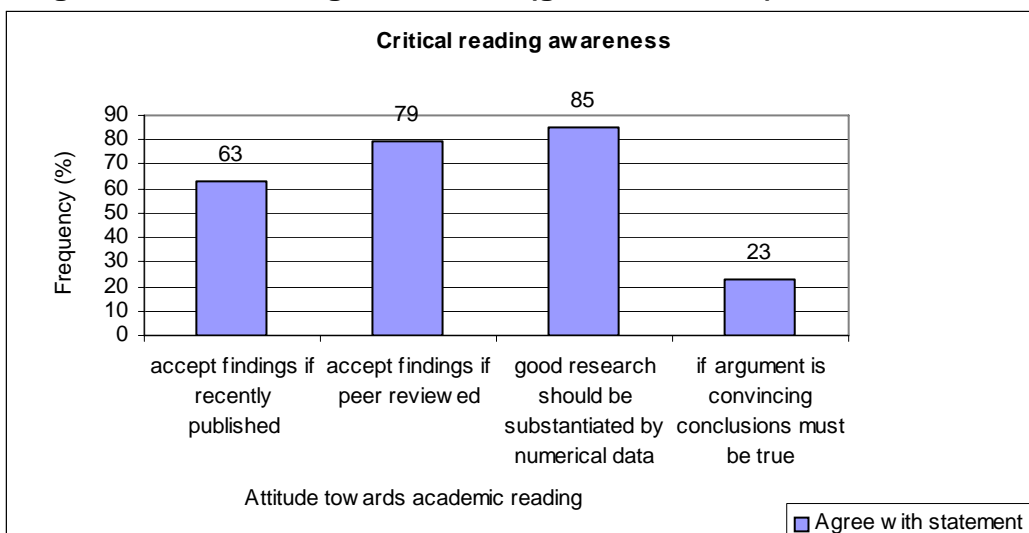
Because we do not have 100% response rate across all disciplines (which is rare in any case) and also because we did not survey all UK HE institutions, the results of the questionnaire survey can only reflect the views of those who responded at Queen Mary, University of London and at The University of York. However, there are strengths in the fact that we had 100% response rate in Biology at York and that the survey in that limited respect took the form of a census rather than a sample.

Awareness of critical reading

To provide a broad baseline judgment of first year undergraduates' use of arguments, we assessed their ability to read critically. Critical thinking skills are often associated with the ability to argue (Bensley and Haynes 1995, Sanders et al. 1994, Joiner and Jones 1993).

The questionnaire showed that first year undergraduates in our sample generally do not appear to display scepticism in academic reading (according to self-report). Many seem to accept the findings of articles or reports that are peer reviewed (79%) or recently published (63%). The majority of students (85%) are willing to accept a piece of research as good if it is substantiated by statistical or numerical data. However, more than three-quarters of the students (77%) are aware that the conclusions need not be true even if the argument is convincing (see Fig 1).

Fig 1: critical reading awareness (general results)



There is a difference between students in different subject groups and their attitude towards critical reading. Most students are able to accept the fact that good arguments, no matter how convincing, may not necessarily be true. However, history students appear to be the most critically aware. They are more likely to recognise that one cannot accept the

findings from journals simply because they are peer reviewed or recently published. They are also more likely to accept that good research need not necessarily be substantiated by numerical or statistical data. Biology and electronics students, on the other hand are less sure about this (see Table 3). Samples of comments from history students reflect the quantitative results:

I disagree with the statements as you can never accept findings at face value. All work needs interpretation.

History is a subject whereby one never accepts anything. Much interpretation and conclusion can be disputed.

Table 3: critical reading awareness (disciplinary and institutional breakdown)

Awareness of critical reading	Biology (n=106)		Electronic engineering (n=52)		History (n=78)	
	Disagree (%)		Disagree (%)		Disagree (%)	
	York (n=86)	Queen Mary (n=20)	York (25)	Queen Mary (27)	York (50)	Queen Mary (29)
Accept findings if recently published	36	20	20	11	60	48
Accept findings if peer reviewed	21	15	12	4	34	31
Good research should be substantiated by numerical data	9	10	0	7	34	24
If argument is convincing conclusions must be true	88	75	60	37	90	76

The question we need to ask, then, is whether this difference in attitude towards reading is the result of institutional differences, differences between disciplines or individual differences. It is possible that the difference could be the result of individual academic performance rather than institutional or disciplinary differences. However, the question in the questionnaire simply shows us how students self-reported their own critical reading awareness; it does not show us how they read.

Importance and relevance of argument to first year undergraduates

Almost all students believed that it is important for them to learn to construct an argument (92%). This is especially so for history students (100% agreed), but less so for biology (93%) and least for electronic engineering students (79%).

This is perhaps because students see this as essential to getting good grades (84%; 85% for York and 84% for Queen Mary). Electronic engineering students were the least likely to see the relevance of argument to academic success (only 67% agreed), compared to 82% for biology and 99% for history.

Although biology students believed that it is important to learn to construct an argument, they were less likely to think that they need to be able to state their views clearly in order to do well in written work (74%). This is perhaps because in biology, they take written work to mean essays that do not count towards their final grades. As one student put it:

[for] quite a lot of people I know, the essays (because they don't count towards the course and they are not officially marked...) are just something to get over with and they'd like [to do so] quickly the night before and not necessarily put [much] thought into it. Because essays for history...are what is marked, [and] that's what counts towards the final grade, I think you're going to put a lot more effort into doing them and finding out about them and thinking about them.

Another explanation for this is the way biology is assessed. In first year biology, most of the exams are closed exams with short-answer questions that require factual statements or a 'yes' and 'no' answer.

Yeah, maybe the exams are more really fact-based so, as I said, people [who] want to do well are just going to look at the facts really. They are not going to think about other issues. It does depend on the area of biology because there's so many - such a broad subject - and some areas are generally more open to debate than others.

In electronic engineering most of the written work is in the form of laboratory reports where they are required to put their views clearly. Hence it is not surprising that most of them (83%) agreed with this statement about clarity. For history students, the ability to put their views across clearly is essential (100% agreed) to academic success. Excerpts from student interviews suggest that this is largely due to the fact that essays are assessed and they have more time to prepare for their exams, so they are required to put in more thought into their answers.

...exams for history were open exams and you had two days to write two essays. [For] the ones I'm doing this year [biology] you just go in for an hour and a half or whatever and it's closed and you have to answer the questions on the paper.⁶

How is argumentation introduced?

As most students felt that it was important to be able to construct an argument, it is not surprising that many (82%) also believed there needed to be instructions on argumentative skills at university. Electronic engineering students at York, however were the least likely to see the relevance of such instructions (see Table 5).

Table 5: percentage of agreement on statements about instruction

Nature of instruction	Biology (%) agreement		Electronic engineering (%) agreement		History (%) agreement	
	York	Queen Mary	York	Queen Mary	York	Queen Mary

⁶ We must insert a caveat here: the quotation is from a Biology student reflecting on History at A level.

Is there a difference in the way you are expected to write in school and in university?	81	85	84	89	96	79
Is there a need for instruction on argument at university?	87	85	64	85	78	86
Should you be given guidance on using argument at university?	50	70	48	67	68	72
Should you be given guidance on using argument before university?	85	90	72	74	82	83
Is there formal instruction on argument at university?	21	50	36	67	38	69
Is there formal instruction on argument before university?	64	70	40	59	60	41
The best way to learn is through specific ideas with discipline.	80	65	76	82	82	83
The best way is through general courses.	43	50	36	56	30	55

Biology students seem to be keenest on such instructions. However, there appears to be a mismatch between students' perceptions of their needs and provision. This is especially so at York where only 21% indicated that there was some kind of formal instruction. This does not mean that biology students are not getting the instruction they need. It is possible that instructions on argumentation may be implicit and informal as evidenced by the fact that more students believed that they were given some kind of guidance on using argument at university. Moreover, students may actually prefer informal or implicit instruction within the discipline.

Excerpts from interviews with biology lecturers and students at York suggest that this is so.

Interviewer: What we want to know really is how explicit that has been that to you, particularly in your first year.

Student: You're not doing it ... you're learning it ... as you develop your ability to do it whether you're being told that [they are] argumentative skills or discussion skills. I doubt whether we [would] really notice the difference.

Lecturer: Last week, we were discussing diseases. Would say that that was part of argumentative or discussion skills?

Student: No, it was things like this, yeah. So yeah it's implicit.

For history at York, not as many students as would be expected wanted such instructions on argumentation. This could be explained by the fact many had received some kind of

guidance on argumentation before university and hence felt no need for it⁷. For example, one student said:

[...] well I'd done philosophy till 'A' level which is a lot to do with arguments and... although they like you to have your own opinion, it's very much [whether] you can repeat someone's argument [and/or] someone else's challenges to that argument rather than [whether you can develop your own].

At the institutional level, it was found that Queen Mary students were more likely than those at York to have received some kind of guidance at university. At York a larger proportion of students received some guidance on using argument *before* university than *at* university. These students were also more likely to have received *formal* instruction on argument before university than at university. This suggests that university courses at York, in general, do not cater to the formal teaching of argument, or that the concept of argument is not emphasised. It is also possible that the teaching of argument is implicit or indirect. Examples from focus group interviews at York suggest that this might be so.

Electronic engineering students:

B: At university there has been very little to help us to improve our argumentative skills. I'll say any argumentative skills I have [must] have been gained from previous education.

S1: I agree with that but I wouldn't go as far as to say that they haven't taught us any argumentative skills in university. I'd say they have not formally taught us argumentative skills or in any detail; [there are] no dedicated lectures on argumentative skills.

S2: Yeah, yeah. And also some of the lecturers [through their] lectures kind of improve your argumentative skills. You can clearly see some techniques that you definitely think would work. [And] there are some that you definitely think, no, it's just not worth it at all. Indirectly... you learn from the lectures probably what works and what doesn't.

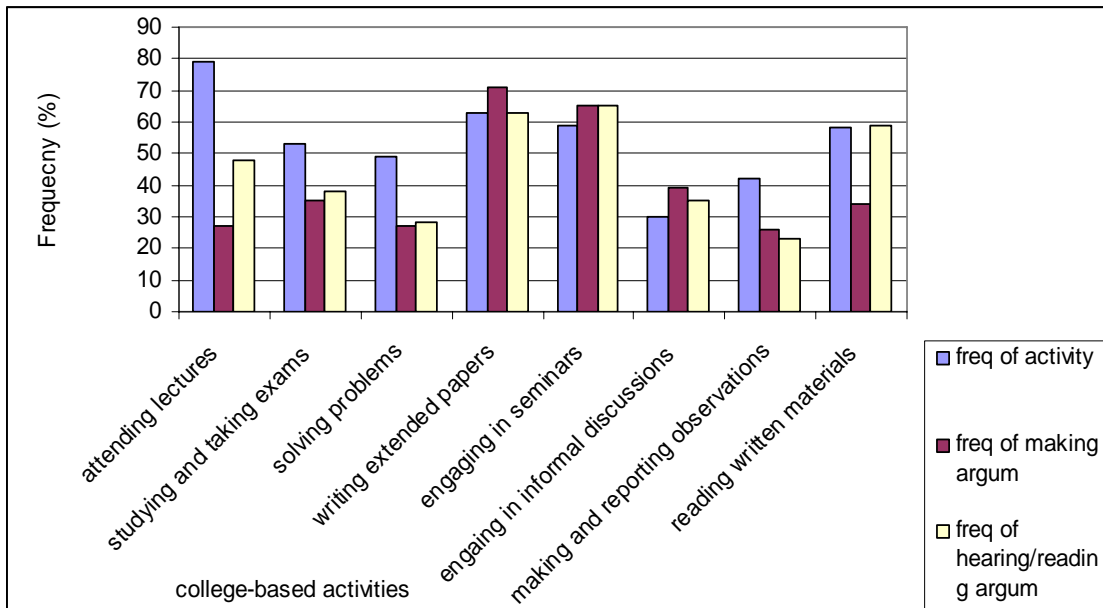
Opportunities and barriers for using argument

The main opportunities for learning and using arguments for all subject groups are:

- *writing extended papers*
71% of the students indicated that they often make argument when engaged in this activity. Only 63% said they read about argument during this activity.
- *engaging in seminars and tutorials*
65% of students make some kind of argument when engaged in this activity. 65% said they either hear about arguments in this activity.

⁷ This seems to suggest that many students get most of their training in argument before university – an assumption that would need to be tested in future research, particularly given later discussions in the report of how students are not making the jump between A-level argument and university level argument.

Fig 2: activities that students reported having spent most time on

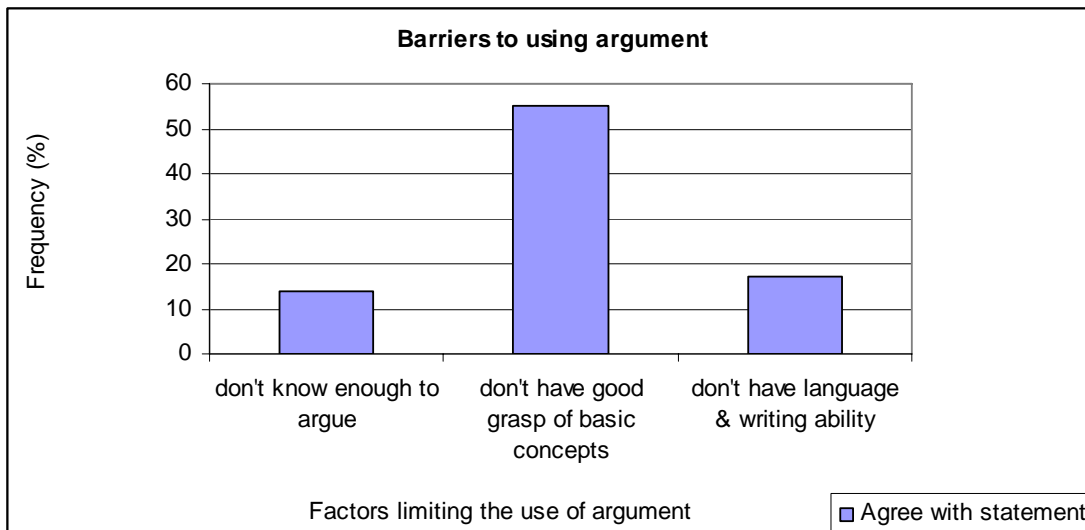


History students appear to have the most opportunities for making argument, while electronic engineering students had the least. This is not surprising because of differences in the curricular structure of the three disciplines, the demands of the courses and the assessment modes.

All these views seem to suggest that one of the main barriers to the use of argument for first year undergraduates is the course demands and the assessment modes. For example, in biology and electronic engineering, first years are largely devoted to the acquisition of knowledge and scientific skills or report writing skills. This is reflected in their assessments, as in biology where exam questions tended to be short answer type requiring mainly factual recall. At the higher level, the relevance of argumentation is more obvious where students are required to apply knowledge.

The questionnaire survey shows that lack of subject knowledge is not perceived as a major hindrance to the use of argument (see Fig 3 below). Only 16% of the students see this as a problem (18% for Queen Mary and 14% for York). This is most likely to be a problem to electronics students with 29% indicating so, compared to only 14% of biology and 4% of history students. Of the list of barriers in the questionnaire, students indicated that 'not having a good grasp of the basic concepts or theory in the subject area' was the major obstacle to using argument. Over 55% indicated that this was a barrier to their using argument (63% for Queen Mary and 51% for York). Biology students are marginally (61%) more likely than history (51%) and electronics (48%) to think so. We need to explore further why there is an apparent distinction between lack of subject knowledge and 'not having a good grasp of basic concepts or theory in a subject area' in these results.

Fig 3: barriers to using argument



The lack of language and writing skills does not seem to be a major hindrance to the use of arguments for the majority of the students. Only 17% of the students indicated that this was a problem (15% for Queen Mary and 19% for York) with electronic engineering students (25%) being more likely than the other two groups (16% for biology and 14% for history) to report so.

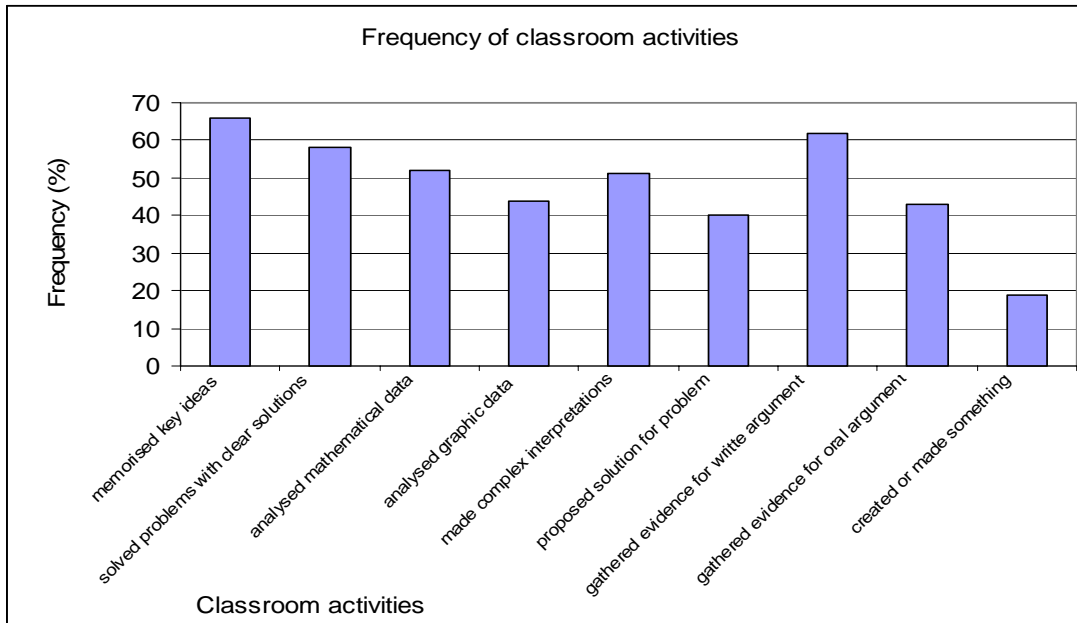
Class activities and the use of argument

To assess students' exposure to the use of argument in class, we analysed the frequency of common classroom activities.

The three classroom activities that students reportedly spent the most time on are:

- memorising key ideas and facts (66%);
- gathering evidence to make written arguments (63%)
- solving problems with clear solutions (58%):

Fig 4: frequency of classroom activities



Biology and electronic students are more likely to engage in the first three activities than history students. History students, on the other hand, are more likely to gather evidence to make written and oral arguments.

Table 6: classroom activities by institution and discipline

Classroom activities	Biology (%)		Electronic engineering (%)		History (%)	
	York	Queen Mary	York	Queen Mary	York	Queen Mary
Memorised key ideas/facts	85	75	80	63	35	48
Solved problems with clear solutions	81	70	88	70	6	31
Analysed mathematical data	85	50	68	78	4	3
Analysed graphic data	69	55	60	59	6	3
Made complex interpretations	48	50	48	56	59	48
Proposed a solution for a problem	33	20	16	44	67	46
Gathered evidence to make a written argument	59	65	16	41	94	79
Gathered evidence to make an oral argument	34	10	16	52	76	57
Created or made something	4	10	72	70	-	11

Results from the interviews and other data

Before a presentation of the results from interviews with students and lecturers at York and Queen Mary, we wish to reiterate that we have not attempted formal triangulation of the questionnaire and interview data. Rather, we present the initial findings of the pilot study for the questionnaire and interviews separately, in order to shed light on the problem we are addressing from different angles.

History at York

History students appear to be most engaged in the use of arguments. Compared to biology and electronics students, a considerably large proportion of history students report hearing arguments being made in *lectures*, and reading about arguments in *written materials*. They are most likely to make, read and hear about arguments when *writing extended papers* and when *engaged in seminars*. This is further confirmed in focus group interviews with students:

Int: What are the main opportunities for learning to argue well in university?

C: I think it's just discourse and seminars that are probably the main opportunities. I think oral presentations in seminars are great; it's even better than writing an essay, because it seems quicker and it seems [that] you're into your work... you have given a presentation just there and then and some one's challenging it. Even if you have to agree at some point that that person is better on that particular point...I think it'll just help you to develop further. I love that, discussions and discussing your ideas.

L: I think they can be really helpful because they will help you, they will sort of get ideas clearer and everybody will sort of add their own contributions to it, which is definitely good because somebody will have a completely different way of looking at it that you can then take on board.

C: And I think maybe it helps you make things clearer because you've worked on a particular topic that you know the others haven't worked on that you have to be very, very clear and very constructive about what you say, rather than writing an essay to a tutor. The tutor always knows more about what you're writing about than you do anyway.

Students further explained how the discipline itself might encourage the use of argument.

C: For example, in history we could argue from a communist view but we would just have to state we're communist and therefore this is our view of the world.

L: Yeah, I still remember being taught very clearly by our history teacher that the examiner does not want to know what you think, which meant you did all these sort of verbal sleights of hand: that this essay feels that, or it shows that, so you did make your own argument but you, sort of, you didn't clearly make it. That's what they said you shouldn't do: you never said this is my argument because that wasn't what they are interested in.

C: All right, I was actually required to do it. Had you not done it you wouldn't have got a good mark.

L: No, it was more you quoted other people; that was really good because it shows the examiner that you'd done lots of wide reading.

I: So they don't want your opinion. They want you to be able to use somebody else's opinion in other words. Is that right?

At York, skills in structuring an argument were emphasised in some departmental documents. In one of the first year students' handouts, *Planning and Writing Essays*,

students were told that their main job was to construct an argument. In the handout, they were encouraged to use persuasion, cite evidence to support their contentions and be a soap salesman as well as a lawyer. Learning outcomes in course modules provided good examples of the kind of skills emphasised in each discipline. Some examples of the learning outcomes in history included:

- exploring, analysing and engaging in history debate;
- presenting ideas and responding to arguments;
- developing critical reading;
- applying methods of literary criticism;
- developing critical skills;
- expounding a general overview and grounding exposition in sound evidence and cogent argument;
- citing evidence to support your contentions.

There were two interviews with lecturers: David Woodhouse and Margaret de Rijke.

Margaret teaches mainly on history of race, slavery (Caribbean, American slavery), women and the post-emancipation period. These topics relate closely to her research. The teaching is based on 15 student seminars, and some lectures to 200 students. She has been teaching in HE since 2000, and since 1997 at university level as a teaching assistant; plus to American students at a summer school in Maastricht.

The term 'argument' is certainly used in Margaret's field. By argument she means the main thesis: either confirming or disproving it with evidence. Evidence is weighed according to the topic. With an economic or political issue, she looks at numerical or statistical data; for social and other aspects of history, qualitative evidence is more important. She looks for good summaries by students in order to get to the heart of an argument. Related terms are assertion, claim, thesis; for evidence, accounts, sources. Sources and evidence often conflate in History, but evidence is which is used to support a thesis.

For History students, Margaret believes it is crucial to learn to argue. First years, she thinks, are not doing too badly. The students have the confidence to speak. Third years draw more heavily on the scholars they've read; but some still do not get the main thesis of an argument. They have wider reading, but don't always solve the structural problems in argument. Argument is central to a 'good' degree. She notices a difference between schools: some prepare students well in these regards; others don't. She sees a clear distinction between the argument and a discussion: argument is the thesis. The role of argument is "to make the field go forward; to revisit particular arguments; to polish them up or reject them; and to progress in our interpretations". It's a high priority in History.

Students at York engage in oral argument with the lecturer and with each other. They are used to counterargument. Quite often those who are good oral arguers cannot get to the point on paper, however. Other activities that help argumentative development are, for example, forced debate: they can't choose sides, but must argue according to a brief, and come up with three arguments to support a position.

One of the weaknesses of students is that "they can't structure things in order of importance". They are weak in horizontal (logical) connections as well as in vertical (drilling down) connections.

David Woodhouse is a modern historian who has taught at York since 2003/04. His teaching includes modules on the 1960s; on Poverty and Charity (in collaboration with colleagues) and on Issues in Historical Thought – the “least popular but most important” module. In 2005/06 he has taught a period topic to first years, primarily through secondary source material. He has not taught outside the UK, but has supervised as a postgraduate at Cambridge, and at a summer school there.

According to David, the term ‘argument’ is very much taught in the field, and especially when giving feedback to students on their essays. For him, historical argument is based on an appeal to evidence about the interpretation of events in the past. It includes source criticism of primary and secondary sources. At first year level “we would only expect students to engage with secondary sources”; we teach our students to argue by ‘drilling down’ from tertiary to primary sources. “I see what we do [in the first year] as questioning summaries, critiquing the bases of evidence, what are the limitations of the evidence, i.e. a critical reading of secondary works”. By the third year, the students should understand how historians construct their arguments from primary and secondary sources, be able to critique these arguments, and make their own historical arguments. This ability is developed through the special subject, which is traditionally seen as the pinnacle of an undergraduate History degree in the UK.

In discussing the different terms around the term ‘argument’, David tends to talk about ‘making a case’ and making an analogy with a court of law. Students have to make a persuasive case. The best answers will admit their own limitations. That approach seems to clarify the requirement for students. David sees the role of argument as central to History: “it’s the discipline”. Students often see History as narrative; but that is problematized for them. There is dispute about ‘what happened’ in the past. According to David, historians need to drill down “at the points of dispute”. The analogy with Greek *topoi* was made. David admits a tendency to get down to the epistemological level; he has to stop himself “going too far down that well”, to stop students losing confidence.

In the first week of the course, he asks students to find a review of a book in a journal; the following week they are asked to write a review. They prepare a bibliography. Then they are asked to write an essay, with guidance from the course handbook. In tutorials, they tend to talk about the practicalities of essay-writing, rather than the content. The first essay is not marked. After that, there is tutorial feedback. For the next essay, an essay plan or plans are requested. Then tutorial notes are written by the students. Content is meshed with study skills.

David comments: “I regularly use debates” e.g. line-up debates where there is a spectrum of positions, and “I sometimes take questions and dissect them with them...I use role-play – not directly for argument – [but] to empathize with others’ point of view”. David hopes that essay-writing and tutorials are the most helpful for developing argumentative skills. Debates are also as important in shaping ideas, but perhaps not acknowledged as such by students.

In response to questions about the strengths and weaknesses in first years’ argument, David mentioned a lack of specificity – you get generalized statements like “some historians say...”; then you tend to get over-specificity. “Another thing I find frustrating is paragraph use, which reflects an inability of students to structure their thoughts clearly”. The problem is largely at paragraph level, linking ideas and evidence from sentence to sentence (not so much within the sentence). The use of the personal pronoun leads students to express an opinion rather than to argue, but David encourages some students

to use 'I' where students can compare their own view to less personal positions. The word 'however' and other connectives like 'therefore' seem to be over-used by students who fail to make the distinction between sounding like they're making an argument and actually making an argument.

History at Queen Mary

History is one of the largest departments at Queen Mary, with over 20 staff and 110 students in the first year. The main areas of research are recent and contemporary British, European and American history and medieval history, and students can opt to take a single honours in any or a combination of these fields, or a joint honours with history and politics, journalism or film studies. All single honours History students also have to take a first year, first semester six week course called Historical Writing, which sets out "to improve students' written English" and in the view of the lecturer who teaches most on the course "is designed to make students aware of argument" (Patrick Brady).

For this research, three lecturers and three students were interviewed.

Lecturer interviews

The three lecturers interviewed were Professor Judith Taylor, who is currently the head of department and whose primary area of interest is medieval history, Dr Mark Leroux who is a lecturer in Early Modern British and European history, and Dr Patrick Brady who specialises in the social and political history of France.

The lecturers agree that argument is used as a term in the discipline, and accept it as a term for discussion in the interview, but two, Judith and Mark, express initial hesitation in using it to describe what happens in their discipline, and in their classes. They also agree that history, and learning about history, is about the process of interpretation. Rather than using the word argument to describe this, though, they talk of "challenging received wisdom...presenting a picture of the past which may run counter to, or challenge, existing pictures of the past" (JT), "posing questions about the past rooted in the present" (PB), while for Mark it is linked to having a wide perspective, a degree of empathy and awareness "that you can comment on something without being simply for or against it". Lecturers' descriptions of what they do provide a more nuanced view of history than use of the term argument would suggest, and although these descriptions contain elements of argument, 'argument' alone does not describe what happens. This complexity extends to how argument is seen in teaching. Judith talks of taking a step back before using the term argument with her students, and of the need to teach students to think about how history is constructed; another prefers to talk of "having something to say...having a view that is identifiable" (ML).

Regardless of how they describe it, when asked directly in the interviews staff do agree that students are expected make arguments in their work, and feel that essay questions are set to encourage and elicit argument explicitly.

None of them (the essay questions) should call for a narrative of any sort or a list of facts –(we) do expect students to take up a position and support it with evidence. (JT)

...questions are posed in a way that invites argument. (PB).

Yet despite this consensus, where and how argument is taught is extremely variable. For Patrick who designed and teaches on the Historical Writing course, argument happens primarily in this course; students prepare and write an essay that is assessed in the core content course, and students are expected to transfer what they learn in Historical Writing to other contexts. Another lecturer, Mark, uses his seminars to introduce the students to rhetoric in the context of essay writing, teaching them about classical oration and the structure and ordering of discourse, using the original terms like *exordium*, *narration*, *refutation* and so on. He values the form of the writing that the students produce: “what I look for is writing style, that’s the main thing, clearly individual, not plagiarised”. This approach is quite different from that taken in the Historical Writing course, which the students will also be taking. Judith teaches a course called ‘Reconstructing the Past’, which is designed to introduce first years to all forms of different evidence; more generally in her teaching, she feels that “before teaching argument, we need to teach them history is not simply one true picture of the past”. It is this ethos of questioning what information is used and where it comes from that forms the basis of her teaching of argument.

Student interviews

Three students were interviewed. Two are taking single honours in history, one, Samila Alam, specialising in medieval history, and the other, Claudia Jowell, in contemporary British and European history. Both have A-levels in English and History and both are aspiring to continue to further study in history and to work in the field when they graduate, either in academia or as a museum historian. They feel that they have been successful in negotiating the first year of their courses. The third student, Agnes Osman, is doing a combined history and journalism degree. She has come to the UK from secondary education in Italy, and feels that she had great trouble with the history section of the course.

Samila and Claudia, the two single honours students, accept the interviewer’s definition of argument and feel that it is a term used frequently in history. To them it describes both what they are expected to do in the work they produce - Claudia says “I think you are supposed to argue in all history essays” - and also the nature of the discipline, or “how history works”. They share the lecturers’ feeling that knowledge is created through interpretation, and feel that critical argument is fundamental in history, with Samila saying that it is more crucial than in any other discipline. Agnes, on the other hand, is far less sure about how argument fits into history; her perception of the role of argument in history developed very late in her first year and she is still not confident about it. When asked if she thinks it is important to know how to argue in history, she replies “It seems like it but I’m not sure...I am realising it might be”. While the students perceive the importance of argument, they do not modify or question the term or the definition given, and in the interview it is difficult to unpack what argument means in practice to them. Their understanding of argument does include elements of comparison “it’s got to be this, that, or something in the middle” (CJ) and “I look at critics for and against (the topic)” (SA). It also seems to be associated very strongly with the essay.

All the students see essays as the primary place for the making of argument, and most of their comments in the interview are about essays, and using arguments or views they have read in their essay writing. In one case where Samila talks of argument as it happens elsewhere in her learning, it is in relation to how it works in an essay: in describing a seminar debate, she talks about how it is a useful source for learning about argument as “the structure is like an essay, only oral”. The third student, Agnes, who for a long time felt

she had trouble understanding the importance of argument, thinks that this happened because she didn't - and still doesn't - know how to write an essay; she says "I try to think of an essay as a longer article, but it isn't, is it?"

The relationship between argument and the essay form, as well as the problems that Agnes has, appear to be connected to the fact that to write their essays and to make arguments, the students seem to draw primarily on their A-level experiences. Although the first two students have A-levels in History, it is interesting that it is not History but English A-levels that they mention – Samila describes her essay writing as like doing her English essays all over again and says they are "more similar to English A-levels; you need to mention authors, critics, contexts". Claudia talks of learning about essay structure in A-levels, and feels the difference between that and her university essays is in details like footnotes and referencing, not in the structure or the way she makes an argument.

The students' perception of what influences their writing correlates with the staff comments about how students sometimes don't seem to develop their abilities to make an argument much in first year, and that they rely a great deal on their A-level knowledge. JT feels that students enter with a "tick the box" mentality, where their goal is to get high marks and pass exams by learning what is required and giving it back to the marker; that correct content is separated from and prioritised over how that knowledge is explored and presented. This situation is somewhat frustrating to the staff, while the students feel that it enables them to succeed at university, and don't perceive it as a problem at all. It raises the questions of whether the English A-level essay form is a suitable model for students to be drawing on, and of what can be done to move students to learn new forms of writing and argumentation.

Agnes's comments and experience provides an interesting counterpoint to the other two students'; she entered university without any A-levels, having come from Italy with a background in humanities, and feels like she has no basis of knowledge to draw on to tell her how to write essays, how to make an argument, or even that argument is an important part of history. It is clear from reading her essays that they are highly descriptive and narrative, and she received very low pass marks for them but with little feedback on argument. She also seems to have received little teaching about making arguments or how to present historical knowledge at university; because of her journalism classes, she was unable to take the Historical Writing course, although she wanted to and feels it would have helped her. In writing essays, she seems to be drawing on her knowledge of writing in journalism, where exposition and not argument is key.

It is difficult to make any generalisations about argument in history at Queen Mary; due to the scope of the research, we have vignettes from three lecturers and three students, all of whom participate in different courses and have varying interpretations of what argument is, and of how it should appear in the work students do. Although there is agreement about the discipline being rooted in interpretation and multiple sources of explanation for any one event, and that the nature of knowledge in history is contested, the term 'argument' does not seem to capture this at Queen Mary, and how the teaching of argument fits into this is unclear. The students who seem confident about using argument are importing it as a skill from their A-level learning and this prior knowledge may hamper their progress in coming to share the knowledge of their teachers. It is noticeable that the one lecturer who seems confident about what argument is and how it should be taught is the lecturer who teaches on the skills focused course where argument stands as a topic, where it is seen more as a product and a form of writing connected to the essay, rather than a process of building an understanding of the discipline of history.

Electronic engineering at York

In contrast, learning outcomes in first year electronic engineering focused on mathematical skills and knowledge acquisition. Some examples of learning outcomes in first year electronic engineering included:

- knowledge acquisition, e.g. understanding sound transmission;
- analysing circuits;
- writing programs;
- designing filter networks;
- undertaking basic calculations.

Interviews with lecturers and students also suggest that there are limited opportunities for arguments, at least in the first year.

Electronic engineering lecturer A:

Arguments are used in a very limited way in electronics...]but [that] doesn't mean we still don't have to teach it. At graduate level, there's obviously more argument, discussions, agreement, disagreement. You test things. At the undergraduate level, we teach the very fundamental stuff, very prescriptive[ly]. [There's] very little argument. [It's] more mathematical.

Electronic engineering lecturer B:

We don't have students making arguments. I suppose the only other area where students would be expected to make arguments, and, of course have written assessment, [is in] the final year projects. It's not so much a discussion as a document describing a project. There is no real scope, I don't think, for discussions, because most of electronics is very much like maths and physics. It's there, it exists. Therefore you can't debate certain things. You might be able to debate the advantages or disadvantages of a particular way of doing something, but there is no real way of debating anything else.

Second year engineering students:

S: *No I was just saying the term 'argument' or arguing your views is more to be done in subjects like history, e.g. you've got your piece of evidence or whatever, and to a certain extent it is open to interpretation, whereas in electronics/engineering and possibly the sciences it [is] more of a right...*

B: *It's more of a right or wrong answer.*

S: *It's more of a right or wrong answer because you've got to obey certain rules.*

However, this is not to say that there is no place for argument in electronic engineering. There is an increasing realisation among course lecturers of the need for students need to be critical. One lecturer explained why he is rewriting one of the second year course modules.

Engineering design might be an appropriate place to put argument, particularly since I'm changing the course over a period of years to include environmental topics such as power efficiency, power saving and life cycle analysis, from cradle to grave. So we could include argument there. For example, the latest in tungsten light bulbs or low-energy high efficiency, screw top things: which are environmentally the best? [These tungsten bulbs] are easy to make and don't have any really nasty chemicals inside, so when they get recycled or destroyed it's not too bad. The new low-energy high efficiency bulbs, the ones which are spiral with fluorescent lamps, they contain mercury, they contain electronic circuitry, they may last 8 times longer and take about a fifth of the power but to manufacture them actually takes a lot more power and to recycle them or to destroy them might be actually more environmentally damaging than the [conventional] light bulb. This is a very good [topic for] argument because you could put figures forward and opinions and so on.

Electronic engineering students are more likely to indicate that they spend a good deal of time *attending lectures, solving problems and making and reporting observations* than any other activities. These students are most likely to make arguments when *making and reporting observations* and when *engaged in informal discussions or in seminars*. They are most likely to hear arguments being made in *informal discussions* and in *seminars*.

Focus group interview with students at York demonstrate how students might be engaged in argument when writing lab reports:

S: *There was then also 2 C programming assignments, computer programming where we sort of have to argue our reasons for choosing to do certain parts of it in certain ways. I think in terms of written work, that's probably it.*

B: *I would, perhaps sometimes, when we are writing at lab work, maybe when we do work in the labs [and] write notes then, I would say we might occasionally use arguments. But mainly in labs we're just recording.*

Electronic engineering at Queen Mary

Electronic engineering is a large department that encompasses electronic, electrical and computer engineering, with particular emphasis on telecommunications, ICT and e-commerce. There are 134 students in first year, with approximately 75% entering directly from A-levels and 25% from national diploma and higher education foundation courses. Course programs are fixed: students choose a specialisation like computer engineering or electronic engineering when they enter their degree and have to take a set range of courses which correspond to that specialisation. There is extensive overlap in subjects in the first year, with students from different specialisations sharing 50-80% of their courses. Part of every students' first year is Professional Applications, a second semester course which introduces students to what goes into large scale commercial and industrial engineering projects. This is divided between learning how to assess hardware or software specifications, and the communication skills that students will need to present their ideas in an engineering business context.

Three lecturers and two students were interviewed.

The three lecturers interviewed were: Dr Monika Nikos (MN), who specialises in telecommunications and lectures in Java Programming, Dr Yu Li (YL) whose main

research interest is wireless communications, and who lectures on a course called Telecommunications and Internet Fundamentals, and Sophie Michaels (SM), who designed and runs the communication section of the Professional Applications course.

All the lecturers agree that argument is not really used as a term in electronic engineering either in the discourse of the engineering community or in teaching students; the notion and process of argument, however, are seen as important to the discipline, especially by the two disciplinary lecturers. It is part of how knowledge in the field is advanced and how certain approaches or technologies gain precedence over others. This process is described by Yu Li: “people take a position in relation to something and have to say the reasons why they take that position, maybe in relation to someone else's different positions, like one course of action over another”. The communications lecturer, Sophie, feels argument is connected to being a professional in engineering, but particularly in a management role where one might have to persuade clients to accept certain designs or pursue certain projects.

The lecturers differ in their opinions of whether argument appears in the first year in engineering subjects. Yu feels that the first year is aimed at getting the students to learn a large amount of new information, to help them build a knowledge base that they can use as a basis for understanding principles of electronic design. She describes her first year teaching as “focused on explaining principles and basic concepts, fundamental knowledge” and she feels that students are unable to progress in the discipline until they grasp these threshold concepts (Meyer and Land, 2003). Many of the assessment structures in her course and in the department as a whole support this approach, where short question quizzes and multiple choice questions are the most standard form of testing, and answers to longer questions are clearly correct or incorrect, with no space for negotiation.

Monika also talks of the need to learn new information, and of the fact that at first year level, what the students are exposed to is uncontested knowledge: “Generally things aren't debateable much, once you are at the point of teaching them, they are no longer really open for debate.” However, she does see argument or something like it as part of what students do, particularly in their lab practicals and in the course that she teaches, Java Programming. This occurs mostly in the problem-based activities, where students are given a problem and have to find a solution, or are given a solution and have to explain how they might reach it. The presence of argument on this course is clearly identified by the students too, as discussed below. In her opinion this process “will require some form of, I guess, argument, because they have to argue that what they've done actually fulfils the task”. The processes required in these types of activities are modelled by the lecturer as way of teaching students; when she gives them the first example of a section of java programming code, saying “I always include documentation in mine so they have to have documentary proof that things work”. In a sense this is like teaching the forms of argumentation suitable to the discipline, and was the most overt use of argument in the discipline that we found in this department. This modelling includes showing different types of information that students can use, including diagrams, mathematical proofs, verbal description and explanation, some of which may be less easy to identify as elements of argument but which do stand as evidence in this kind of argumentation.

In this situation, argument occurs in areas where there are multiple ways of getting to the same end—the site of argumentation is the explanation of a process to a known end,

rather the creation of a new end in itself, similar to Toulmin's notion of regular argument⁸. This is described by Monika on her Java course: "in programming there is a method called Object Oriented Programming and they can come to the solution by following various different principles of this method or they can come to it by ignoring them all; it will still work, but the process is obviously rather flawed." As students reach third year and graduate level, there are more opportunities for being creative by proposing a design or solution to a problem, and providing evidence in support of the proposal, which allows for a more sophisticated form of argument. This is not an option at the first year level because, as she explains, "there not a lot of room for creativity at the lower levels... there's a good deal of process to learn before you have the opportunity for creative argumentation". It is possible that this creative argumentation forms a bridge between regular argument that students experience in learning the basic tenets of engineering and critical argument that specialists use to develop new technologies.

Argument has a mixed role in the Professional Applications course that teaches communication and writing. The focus of the course is on presentation skills and the activity centres on a large group presentation about a new technology or product related to engineering in some way, followed by an essay on the same topic. The lecturer on this course, Sophie, says that argument may occur in either the presentation or the essay but that for assessment purposes it is secondary to organisation and form. Despite this, she says that she expects argument to appear in students' work and feels that it is an important part of knowing how to communicate in engineering. It is unclear exactly what she means by argument – in one instance it is linked to giving an opinion "I like it when they say "I think that..." so long as there is some concrete reason and they are backing their opinion with some facts, I am quite happy", while other examples that she talks of, like students questioning each other after their presentations or being able to perceive the implications of the social impact of a technology, seem more connected to the larger area of criticality than argument *per se*.

All the lecturers agree that it is important to teach argument in electronic engineering but feel that its importance lies much later in the students degrees or even careers. For Yu and Monika it is a way for students to show evidence of their thinking when they are required to design projects and make proposals, while for Sophie the ability to make an argument is necessary for them if they are to move into a managerial field in engineering. Yu also comments that there is no pressing need to teach argument in the first year as well as no time in the curriculum for it, but also comments that the timetable is so full in the subsequent years that there is no space to teach it then either. These comments point to the problems of incorporating the teaching of argument into an engineering degree, particularly if argument is viewed as a discrete skill that should be taught separately from the discipline despite being integral to it, rather than something that may already be embedded in the disciplinary teaching already.

Due to limited student response, we were only able to interview two students in electronic engineering, and had to interview them at the same time. This interview format provided less detail overall from each student but we felt it was justified as the students prompted

⁸ According to Toulmin (1984: 276-277), regular arguments are those "in which accepted rules, warrants and procedures are applied unquestioningly"; they function as tools that are applied to get reasonably predictable results within a specific context. Arguments of this type are often connected to a rehearsal of knowledge, where the outcome is known in some way, like an explanation or a solution to a problem, or the outline of a set of accepted principles. Critical arguments are "arguments in which the rules themselves are challenged"; in these, the tenets of knowledge upon which regular argument rest are developed through being contested. The difference between these types of argument can be where the former is "rule applying" while the latter is "rule justifying".

each other to reflect more on their own comments and their interaction produced interesting data. The students are Mehar Yaqoob, who is doing a four year MEng in computer engineering, and Amanda Ntleki, who is studying Information and Computational Technology in the Business Environment for a BSc over three years. Mehar came to Queen Mary from a UK A-level background while Amanda went to school in Uganda, and then did a vocational qualification in ICT in the UK, including GCSE maths and English. They share 5 out of 8 courses, including Java programming, Telecommunications, and Professional Applications, all of which are taught by the lecturers interviewed. Amanda is also taking an economics course as part of the business side of her degree where there is some essay writing and looking at case studies and where there seems to be some teaching of argument – this wasn't discussed at length because of focus of this project on engineering. Her participation in the economics course may have confused the data in terms of looking at argument in engineering only, as she may have drawn a lot on the economics course, but it also raises interesting questions about the nature of disciplines and where their boundaries lie.

Both students understand and accept the interviewer's definition of argument, but both want to add to it and reveal different orientations. For Amanda, argument is about having and giving an opinion, supporting it, and showing conviction: "make people believe that's what you believe"; it also has a strong real world connection and she says in an argument one must "give examples of where it could be applied and where you've actually seen it work". For her, argument seems quite linked to the nature of engineering as described by the lecturers in the discipline. Mehar's interpretation is more acknowledging of other's views, with argument as a possible means of reaching consensus through "discussing your views with a colleague or a friend...getting to a decision about something".

When asked overtly about whether argument comes into what they do in engineering, one student, Amanda, feels it has a strong role in the professional applications course, but her interpretation of argument here seems to be equated with explanation and persuasion - "(we) had to make oral presentation, what we were talking about had to be understood, so we had to make an argument". This mirrors the lack of clarity of the role of argument in the course that emerges from the lecturers' discussion of it. When talking about whether students need to use argument at all, she says

not in the sciences; in sciences you just have to provide a solution for a problem, it's more problem solving than presentation skills, or argumenting (sic) or giving opinions because opinion is very much welcome but you must come to a solution.

When asked if they have to draw conclusions, the other student, Mehar, feels that this happens in professional applications but is reluctant to use this phrasing for her sciences courses, preferring to say that they have to "find a solution".

The students' description of their courses is very similar to the lecturers' description – learning new information is a priority, and most assessment is to test students' retention of facts and their ability to negotiate set steps in a process. One notable exception is the Java programming course. When discussing this course, both students talk of how they find it to be quite creative, and of how once they understand the principles, they can manipulate the methods of reaching the solution - "Once you get the code working you can sit there and make it work in two different ways - if you understand how to do it, you can find two more to do it in five minutes" (MY), "you have different ways of getting to the same point but you have to get there; if you don't get to it, it's wrong. There's a certain answer

that has to be got, whatever method you use.”(AN) and “with programming... you can even come up with a method you don’t know but provided you have provided the right solution, it’s gonna be just fine”(AN). Again the students’ description of what they do is of Toulmin’s regular argument, where the argument occurs in the structured explanation or justification of a solution or position.

When discussing how she knows about argument, and where she learned how to make an argument, Amanda feels that she draws on presentation skills she learned at the vocational college: “you had to choose a topic, research it, write about it and argue it out and make a presentation on it, and say why you chose it and why that topic of all topics, and the benefits of that, so I had a bit of a flavour of argument”. Mehar is unsure of where she learned how to make an argument (in both the way she argues in engineering subjects and in professional applications); “it’s not been taught, like sit down, this is how you do it, it’s not like that” but this and further comments also show that she feels one can’t or isn’t usually taught argument explicitly, that there is a degree of learning through experience and acculturation. This is echoed by Amanda:

it is so unrealistic for someone to come up to you and say I’m going to teach you how to argue today but I think that if you can have more of it, maybe incorporate more of it, like in professional applications.

It is hard to tell where the students’ understanding and explanations of argument come from – they don’t seem to be drawn from explicit teaching of argument or from being in a context where knowledge is presented as being contested as neither of these seems to feature in electronic engineering at first year level. Despite this, both students feel that argument is important to them as students and as future engineers; however, they believe that they (and most other people) already have some ability to make arguments, and that that ability needs to be improved through experience rather than discrete teaching of argument

Anyone can argue; I mean the quality varies and that comes with experience... with more practice and incorporation in the different things you do, it (argument) is going to be strong. (AN)

Mehar also comments on the link between argument and knowledge, saying “the main thing of an argument is the knowledge; you have to have the knowledge to support what you are saying.” This reflects Yu Li’s remarks on students needing to learn the basics in the first year.

There seems to be a difference in the nature of argument and evidence between engineering and humanities or social sciences. It is possible that the reluctance on behalf of the lecturers to identify argument in their courses is more due to lack of terminology to distinguish between critical and regular argument than absence of argument in any form. In the humanities, the common mode of argument is critical argument, which is linked to supporting and contesting interpretations or advancing opinions, whereas in engineering it is more like regular argument, explaining the process by which an end is reached, where the evidence is a set of steps of a particular electronic process within a very specific set of constraints provided by a test situation. This difference is made explicit by Monika when she says

I don't know that there's a lack of argument, it's just that it's in a very different form. Because I have done a humanities degree, you don't spend a lot of time in Engineering writing essays that you prove with extra sources that you have researched, but on the other hand, you have to prove the very things you do through the steps that come before it so I think maybe it is taking a very different form.

Biology at York

In interviews with biology lecturers at York, the view was expressed that, although argument was accepted by the lecturers as important within the discipline and for public engagement in debate about issues in Biology, there was a reluctance on the part of some lecturers and many 1st year students to embrace it within their practice. Such reluctance appeared partly to do with insecurity in the subject-matter on the part of students or a tendency to avoid argument (in its demotic form). Biology students were seen by their lecturers as working hard to fulfil the assessment criteria for assignments, where, for example, critical ability is necessary for a first-class grade. However, there was encouragement to engage in debate

For example, in Biology one of the lecturers acknowledged the need for students to learn to argue or to be what he calls 'critical thinkers' and he tried to encourage this in his course:

We encouraged them to be independent thinkers and to criticise and we hope that they develop the ability to argue but to be honest they are very poor at that when they come in at first year. I try to emphasis that by the time you get to exams you can take all your notes and any handouts into the examination because I'm never going to ask you to memorise anything, but I will ask you to interpret something you haven't seen and therefore, that's the foundation of my teaching. I believe memorising thing is a waste of time. You tend to remember things that you've worked with in a subject. So that's part of my basic idea about what I'm trying to do, but in the 2nd yr course we have seminars which are debates set up with 4 or 5 different groups. They are assigned roles and they have to argue. And then they write reports about it, but there is one session where they get together and debate with other groups about their particular views and that's the only really serious teaching I do where the whole point is to debate something.

From the students' point of view, the extent to which they use argument in their course depends largely on the modules they are doing and the lecturers they have.

[...] it does depend on the area of biology because there's so many [subdivisions]. It's such a broad subject and some areas are generally more open to debate than others. I think biochemistry is very much more [based on] the facts.

I think it's the subject, e.g. if you take chemistry, there's not a lot of... some arguments are possible but there's nothing like the ethics or things like that which you tend to get a lot more in biology so you don't really...

I find that in chemistry it's more about right or wrong answers whereas in biology it's more ...I guess you could argue a little bit more...I don't know...

The main opportunities for learning and using arguments in biology are essay writing and tutorials. These are two activities where students are most likely to be involved in making and hearing, or reading about arguments.

Umm but I think [in] the essays, there is scope for arguments [...]

I did an essay on the function of a cell, a particular cell called the Y-helper cell. Basically a lot of research d been done on how it's activated and its effects on other cells. It's all about structuring the argument, [...] You have the structure of the essay, so that there was a flow. You start with its activation, followed by the events that happen, how it affects other cells. So that was more about structuring and organising in a good flow rather than about argument, because the facts are there and it's just an explanation of the facts.

...a lot of people who are doing biology are still in that mind set that it's just facts...I don't see the arts subjects and science subjects as being completely poles apart. I can see the integration between the two and [they're both] in my essays in biology this year. I don't really see that [there's] much difference as writing an essay for history last year. I mean it's obviously completely different topics, but it's still essay writing and I learnt last year that you could write an essay on anything, you just have to go and find out all the facts, find out the opinions and ideas and then put it altogether in your own way and that's kind of exactly the same as what I do for biology. People always think that in science you just learn the facts, but actually there's a lot that we don't know and so a lot of time people are finding out new things. They might put a case forward of how something behaves or...might put forward a case, like a theory that can be argued for or against.. It can be contested. So I think a lot of people always forget that it's not just facts, it's an ongoing process of learning and finding out.

I think that's part of making up your own argument, that you can be selective. I suppose people don't realise that they are making arguments when they are selecting which facts they use.

Tutorials are where biology students have the most opportunity in using and learning arguments.

I think in the tutorials there's a lot of discussions going on without you realising it just because it's just four people and the tutor and you talk about things.

...but I think that's quite a good time for those issues kind of discussions and at the moment I've a genetics tutor and we're spending quite a lot of time not learning about genetics but looking at the social and ethical impacts of genetic findings and genetic diseases. We did a role-play as genetic counsellors. I think we're going to do a newspaper article to look at expressing science to the general population and I think we're also going to have a debate. So I think there is room for debate and arguments, especially [on topics like]

conservation and population and the environment. These are the kind of areas that you can debate over certain issues.

However, the extent to which arguments are introduced varies depending on the module and the individual tutor involved, as suggested above.

I think it depends on what tutor you have because some tutors would be more interested in that kind of thing than others...[for instance] if you're looking at bird flu and they split the tutorial group in half. Half of the group have to look from the side of, there's nothing to worry about, nothing bad is going to happen. The other side will look at like, 'Oh my god we are going to die of bird flu'. So there's a lot of conflict of ideas and what people think.

I think it depends on the tutor. The tutor I have got this term is very aware of the social aspects of science and implications of scientific findings and all of that; and that is a really hot topic for debate and is quite current really. And it's really interesting and I think other tutors can take it further. I'm sure other tutors do that but because you only have one a term it is potluck whether you get someone is kind of aware [of] being able to make debates...

At York, biology students have lab sessions (which are the equivalent of seminars). Students have a module called Scientific and Transferable Skills that they find particularly helpful in learning arguments, as shown in the focus group interviews with students below.

Int: *Is there, you know, kind of work where you have to be able to or are encouraged to support your views or is it just whether it's a right or wrong answer? Are you encouraged by lecturers to use evidence to support your answers?*

E: *Umm yeah, we are certainly encouraged to think...*

Int: *Have you all been shown in demonstrations by lecturers how you could do that? It could be in tutorials.*

HW: *We did that in the Scientific [and Transferable] Skills module last year where we learn all about how to write essays or read a paper' and you've to criticise. I mean you've got to learn to do that.*

Although there are opportunities for using argument in biology, it is not emphasised. It's only in tutorials and essays (which do not count towards the final grade) where biology students are exposed to arguments. However, students are aware that such skills are necessary at a higher level.

Most of the subjects we do in tutorials don't have ethical implications. For example, my current tutor is teaching about cancer [and] it's all about the facts. You could go into a bit of the ethics like how pharmaceutical companies are developing drugs to get money, but the core focus is on the facts. At the end of the day that's what counts.

Finally, with regard to biology, the following students' views indicate the position they see argument as having in their studies:

We were always told we have to use evidence to support our arguments, but it's not used as a way of explaining what we've been doing. It's a discussion where we use evidence to support our views. 'Argument' isn't really used.

I guess as a biologist, sometimes you use the word 'argument' because you can have conflicting evidence so you need to decide which one is more important and then you have to explain yourself, you have to like convince the reader or marker why you think that bit of evidence is more important than the other. Yeah, I would say in biology there is quite a lot of argument there.

Yeah we do, but it's not so much a matter of opinion really because we tend to have evidence, like say, the results of an experiment and you usually have to evaluate it, discuss it ... um... and it's not so much a matter of personal opinion because those are the facts, you can't change the facts. It's more like what you make of it, like how much you want to read into it.

Biology at Queen Mary

Biology is part of The School of Biological and Chemical Sciences; the Biology section encompasses a range of areas from zoology to ecology to bioinformatics to forensic science, There are 178 students in first year, with the largest intakes into biomedical sciences, biochemistry and biology, and forensic science. This range in the discipline is loosely structured along a continuum from “pure” science subjects like chemistry and biochemistry towards subjects that are more closely linked to the social sciences like ecology. All first year students take a course called Essential Skills for Biologists (ESB), a course, taught by biology lecturers in the Biology department, which aims to equip students with general skills to be used in other courses in their degree. It has an overt focus on organising information and dealing with academic texts, teaching students to read types of text, to recognise that theories are contested, that academic texts have a predictable structure, and that knowledge is constructed in a variety of ways. The activities focus on ways of gaining authority through writing, that academic argument involves engaging with and evaluating different points of view.

Two lecturers and two students were interviewed.

The lecturers interviewed reflect the variety of disciplines within the school: Dr Aidan Ryan whose research interests are evolutionary genetics and yeast biotechnology and Dr Martin Ross, who specialises in freshwater ecosystems and ecology.

From the limited data, it is clear that lecturers' and students' interpretations of the meaning of the term argument and opinions of the role of argument vary greatly. The terms “data”, “information”, “evaluate”, “discuss” are much more common than the word argument but are accepted as falling within the same scope of meaning as argument by one of the lecturers, Martin. He also sees the concept of argument as being part of the discipline and states this very clearly: “argument is central to biology.” The other lecturer, Aidan, feels that the word ‘argument’ itself isn’t used in the discipline: “I have to be honest with you and say that argument does not come into the vocabulary very easily of biologists” Instead, he says he is involved in “hypothesis driven research with results that support the hypothesis”, which he sees as distinctly different from argument. Hypothesis testing in lab work seems to start in second year, although there is a first year text book that uses the framework of hypothesis testing for discussing concepts in biology, and so students are exposed to it at first year level. What Aidan describes as hypothesis testing could correlate to Toulmin’s understanding of argumentation as a process of reasoning, being “a way of testing and sifting ideas critically” “ a means of verifying knowledge” (1984, p10 in Andrews

and Mitchell 2001, p25). The value argument holds in the discipline extends to what the lecturers expect of the students, but it is unclear just how argument is operationalised when it is discussed in a student context. When asked how important is it for students to make arguments in biology Martin says it is essential, and that he doesn't think they can become scientists without doing it. Aidan agrees with this yet claims that argument is not part of his courses or teaching. At the same time, he insists on students being critical and does mention argument: "So I ask the students to challenge everything, including what I am saying, particularly what I am saying: believe nothing I say unless you are convinced by the, well, argument, exactly, (laughs) perhaps I do use the word argument, unless, you know, you verify it for yourselves; don't believe what I tell you: test what I tell you."

The lecturers also talk of how argument forms part of their experience in terms of how scientific knowledge is created and accepted, and of how it is part of the historical and current disciplinary discourse community:

I guess we use hypotheses to (pause, with emphasis) guess at reality (laughs) and then we see how close the hypothesis matches reality in inverted commas; it's pushing back the frontier a step at a time. (AR)

and

it's a constant process of referral and revision based on received wisdom from texts and work that has gone on before, and ultimately the questioning of ideas that can lead to a major overturn of the received wisdom. (MR)

Aidan also talks of argument occurring in the process of peer reviewing journal articles, where he sees it as an important part of the process of refining one's scientific case. It would appear from these comments, that the argument that lecturers see as being part of Biology is critical argument, argument that informs the epistemology of the field of biology; it is happening at a macro level in the discipline in terms of revising biological knowledge, and at a discourse level between academics in their research capacity.

It appears that the lecturers value argument but don't locate it explicitly in their own specialist disciplinary teaching or particularly in the science subjects. Instead both lecturers identify the Essential Skills for Biologists (ESB) course as the place where students make arguments. Aidan says the course is "aimed at giving a pure exposure of argument to the students". Martin describes it as being "about constructing argument essays and making logical statements" and feels that it helps students to prepare for argument, saying that it "provides a framework within which they would see how the science would operate and how they are supposed to operate as scientists; it's taking them from a passive role into a more active way of engaging". However Aidan, despite valuing ESB for introducing the students to argument, sees it as being removed from science; when asked about the relationship between that kind of learning that happens on the ESB course, and the work connected to hypothesis driven testing that he describes on his course, he replies that they are seen as very different – "I think students would regard one as essay writing skills and one as science, and perhaps I would to be honest too". This may be rooted in differences in interpretations of what argument is (and what lecturers think students think argument is) and where it happens, in the course of a student's degree and in the types of texts or situations where it is called for.

Martin Ross feels that students tend to see argument as “more of a courtroom situation than a logical progression of ideas”; his interpretation of the nature of argument is connected to assessing, evaluating, and discussing “but not necessarily taking one extreme standpoint and arguing against one other opinion”. Aidan Ryan’s explanation of argument to the students, however, is more similar to the courtroom style “I do think they do make arguments, and I say to them when you watch Newsnight on the television, what happens and they say “he’s interviewing someone from the Conservatives and someone from Labour” and I say “and what happens then”, and then there’s an argument and I say “well that’s what you should do in your essay: one side of the story the other side of the story and then make a conclusion, your own conclusion”. So that’s what we try to teach them”. This interpretation of argument seems to be connected either to the term argument in common parlance, or possibly to the process of critical argument at very advanced levels of scientific knowledge; if this is the understanding that is evinced by use of the word, it is not surprising that he sees no connection between argument and ESB and the kind of criticality or regular argument he asks students to engage in in his first year courses.

Both of these views of argument are also part of a reaction to what lecturers see as students’ concept of science. They feel that students have trouble engaging with the idea of argument or contested knowledge in biology; in Michael Ross’s opinion, students “feel that science should be purely a cold hard statement of fact which is largely because they are not familiar with the process of how science develops and evolves over time. A-levels and GCSEs they are taught facts with not really any clear evidence of how that was arrived at.” In both cases, the current approaches to teaching argument may not be effective because argument is linked to ‘for-and against’ style essays and to particular types of essay topic rather than to scientific processes and knowledge.

We interviewed two students, Janna Al-Abri and Jessica Wood, both of whom came straight from doing A-level to Queen Mary to do Biochemistry with Forensic Science. This was the first choice of course for Janna, but not for Jessica who hopes to transfer later in the degree to study dentistry. Both are currently enjoying the course as a whole, and feel that they are doing well. Our assessment of how these students see argument in their learning is based on a combination of their comments in the interview and a reading of three essays from the ESB course, two from Jessica and one from Janna. The topic of Janna’s essay is “Smoking ban will eliminate all heart disease”; Jessica essays are entitled “Exceptions to Mendel’s laws” and “What is a gene? Do they exist?”. The difference between these topics and how the students respond to them seems to both reflect and inform their feelings about argument within biology.

From their comments in the interview, the students seem to understand argument in different ways, and give different meanings when asked if they want to add to the interviewer’s definition. Jessica describes argument saying “When you are writing an essay you have always been taught that you should take one side of an argument and give evidence for that and also evidence against, and in the end conclude to your way of thinking.” which echoes the interpretation of the word given by the interviewer, but links it firmly to a particular text type which is not common in science. Janna says “I wouldn’t say it’s to give logical or scientific reasons like you said, I think that’s more like describing or explaining, rather than, like, arguing...arguing would be...oh...giving both sides of it, I think, with reasons but not generally scientific or logical...” For her, the word argument does not seem to be connected to what she knows of science. It also seems to be more linked to general world knowledge language than new disciplinary knowledge and scientific language.

This suggestion of a separation between science and argument extends to - or perhaps derives from - students' descriptions of their science courses. For Janna, argument does not play a large role in what she is learning; the majority of the activities are lectures where the goal is to absorb new information and answer questions based on this, and lab work, where she has to learn steps of procedures for various tests, involving calculation of equations, drawing diagrams, or using a computer program to chart experiment data. According to her description, there is little or no opportunity in these activities to offer opinions or even analyse data in depth. "I don't recall giving my point of view in any of them; generally the course work is just questions and it doesn't say 'what do you think?'; it's just 'answer these'". In describing her experience, Jessica says: "Most of the science courses have been purely learning we haven't been asked to write anything yet...well practical write ups and things like that but not essays".

However, when asked directly if the courses involve argument at all, the students do see some degree of argument in them. Janna refers back to the interviewer definition, even though she seems unsure - "I suppose when you say giving logical or scientific reasons in that sense it does, because when you explain an answer or give an answer, you've got to explain as to why you've come up with that so in that sense it does...(pause)". Jessica talks of activities in a forensic science course, where students are given a crime scene scenario and have to conduct various chemical tests to make a prediction about who the murderer is - this might have elements of argument in that it involves analysis, and the students have to suggest a candidate and give reasons for their suggestion using their data "With the murder one it could be debateable but I think there is a right or wrong answer depending on the chemistry that you use". In thinking about these activities, the students are seeing connection between what they do and 'regular argument' as described by Toulmin - they are working towards a known solution, and make their argument in explaining how they reach that end.

For both students ESB is the place where they identify having to make an argument. Janna says

I suppose like when we do our ESB work, we get taught how to write essays, and in those essays, we just wrote a big one last week, we have to write both sides so you'd have a question and you have to give you opinion as to both sides of the argument.

Jessica also links argument to the essay form when she started her definition of argument by saying: "When you are writing an essay...". The location of argument on this course connects argument very closely to essays, which seems to reinforce students' views of how argument appears in their degrees, and shapes how they see argument in relation to biology.

Both students are already familiar with general essay structure and are drawing on past knowledge to write these essays, yet they seem to have very different feelings about the value of what they are doing, and of how it helps them become biologists. The essay about a smoking ban eliminating all heart disease asks the writer to take issue with policy, as well as to offer an explanation of heart disease and a general opinion on the topic. In writing this essay, Janna doesn't seem to develop within the discipline - she feels that her current knowledge is sufficient for this task, and she seems no more able to engage as someone in the field of biochemistry than she was before she wrote the essay:

I already know how to present my ideas and that because I did A level in English, like I said, so I kind of knew that, that exercise was a bit, like, pointless, I didn't really need to know how to do it.

She feels that the experience of learning about argumentation is not relevant to her as a biologist - she says that she, and some of her friends, feel that they are not learning anything new:

I think it's a skill you just gradually get, learn to put across, if that makes sense, you don't have to be taught how to do it; you can ignore it...it's not something you've got to be taught, I don't think...

JW, on the other hand, is exploring the discipline in her essay, and learning more that about the topic through having to have an opinion about it; she also feels that learning more about how to develop an argument will be valuable for her future studies, for presenting research as a senior student. The essays that she does, about genes and Mendel's laws, both focus on discrete elements of disciplinary knowledge and are strongly linked to topics that she is studying in other courses. They both call for a regular argument, one that is non-critical and is engaged with knowledge that is not highly contested, but that challenges the student to attempt to answer a question by taking a position based on conclusions, explanation, and examples. In having to engage with these kinds of topics, she is more informed and more of a participant (at the entry level) in a discourse community than Janna. This suggests that the success and relevance of argument in biology is related to how the essay question ties in to the students' development of disciplinary knowledge. Questions that push students to write about disciplinary topics and draw on their emerging position as biologists or biochemists are relevant in a way that more general knowledge questions are not.

Argumentation at The University of Illinois

The present section provides an important international and critical perspective on the results reported so far.

Contexts for the research

The central question for this pilot study is how first-year students in the three majors are being introduced to argument. At The University of Illinois at Urbana-Champaign (UIUC), that question can be further refined to consider how the experience of students with argument might be shaped by issues such as the decentralization and variability of the students' programs of study (typical of US higher education), local institutional and pedagogical contexts (e.g. recent budget cuts have resulted in increased enrolment of students, larger class sizes, and fewer instructors in introductory courses), and the presence of freshman composition courses.

The undergraduate curriculum at UIUC tends to involve a significant mixture of general education and choice. However, different departmental majors have different degrees of flexibility. Biology and electrical and computer engineering (ECE) are among the more set curricula, whereas history would be among the more flexible curricula. In 2005, history reported 570 undergraduates, of whom 106 were first-year students. ECE reported 1,418 undergraduates, of whom 267 were first-year students. The figures for biology are more difficult to obtain because of recent institutional changes. Biology at UIUC is divided into two schools, The School of Integrative Biology (IB) and the School of Molecular and Cellular Biology (MCB). Although it appears many biology first-year students have a clear sense of which program they plan to pursue, first-year students take the large introductory courses in each school (IB 150 and MCB 150) as general life sciences students and then can declare their school in the second year. Overall, MCB and IB reported undergraduate enrolments of just over 1300 in 2005 (1079 in MCB and 251 in IB), with 98 of them in the first year. Life Sciences reported 517 first year students. It seems likely then, and enrolment in IB 150 and MCB 150 would suggest, that there are approximately 550-600 first-year students pursuing IB or MCB studies. General experience and interviews with students and faculty alike suggest that first-year students in ECE, biology and history typically find themselves mostly in large courses (perhaps with smaller discussion sections) and will interact more closely with graduate student Teaching Assistants (TAs) than faculty.

Methodological and institutional issues in this pilot study

At UIUC, the general problem of recruiting participants combined with academic calendar differences from the UK and with institutional and federal requirements for review of human subjects research, made difficult the questionnaire phase and significantly curtailed the interviews of students. This chain of events is explained in some detail here because this complex of issues became a major focus of our work and because a key purpose of this pilot research was to test out the methodological and practical design for this type of international collaborative research effort.

Research with human participants in the US has come under federal regulations (oriented particularly to biomedical research and with significant penalties for non-compliance) that are locally interpreted and implemented by institutional review boards (IRBs). If a federal

review finds that a university's IRB has not properly implemented federal regulations, all federal funding to the university will be suspended. Thus, IRBs operate in a high-risk environment and have imposed increasingly stringent and bureaucratic reviews and procedures for recruiting participants. All research and all research procedures need pre-approval (a process that can take anywhere from weeks to months). IRB review at UIUC requires the completion of an application form (12 pages in length) along with accompanying documents (i.e. informed consent forms for all participants, the Academy grant, and such research documents as interview protocols and questionnaires). As we developed plans for the research, at UIUC we went through three separate IRB reviews. The first IRB review for the study, which was also needed for the review to proceed in the Office of Grants and Contracts, was submitted September 17, 2005 and led to approval on November 7, 2005. It included basic interview protocols for students and faculty. The second review presented two amendments. One amendment involved setting up a lottery (for an iPod Nano) to reward student participation in the research (i.e., a means of encouraging participation). Adding that amendment required a description of the date of the lottery, odds, the prize, and so on be added to the informed consent documents for all students. The second amendment involved developing procedures and informed consent documents for focus groups, which were primarily aimed at helping to assess a draft of the questionnaire items. This second amendment was submitted November 29 and approved December 12, just in time to run one focus group (in biology) before students left for a one-month winter break. The third review was for approval of the questionnaire. The questionnaire for UIUC was finalized around February 20 and IRB approval to give that questionnaire (which included a new informed consent document for students) as well as procedures to advertise and recruit participants was given on March 3. By the time we had received the documents and run copies of the questionnaires, only 7 days were left before Spring Break (and the period before break tends to be a time when many tests are given and many larger assignments come due), so we decided to hold off recruitment until students returned at the end of March.

When we then advertised for student participation by putting up posters emphasizing the iPod Nano lottery as an incentive at sites around campus and by placing announcements in program email newsletters for biology and ECE, we got no responses. We first tried expanding these efforts (more posters, different locations). However, when we still did not attract participants in that manner, we then identified key courses and went to hand out small slips of paper (based on the IRB-approved posters) that introduced the research and emphasized the (lottery) incentive. Paul Prior and Rebecca Bilbro (the research assistant at UIUC) personally handed out over 500 slips of paper to individual students as they left key courses—IB 150, MCB150, ECE 110, and several introductory history courses. One student responded. (A lottery for an iPod Nano seemed a good incentive in December; however, as we were passing out these invitations in April to participate, a local radio station was running a promotion where they gave away over 100 iPod Nanos.)

When the planned means of recruiting participants also ran into problems at York and Queen Mary, researchers were able to go into classes and get the aid of subject-field instructors in getting response to the questionnaire. (The highest rate of response, and almost one third of the total sample, came from two biology lab sections at York where students filled out the questionnaires in class.) In late April, we had offers of assistance from faculty in History and ECE to recruit students in class and an offer to have students do the questionnaire in some discussion sections of IB 150. However, these offers came in the last ten days of April, had short turn-around times (the offer in biology was for classes that would meet three days later), and we would have had to return to the IRB to submit a new amendment application that detailed the procedures for approval (and such

procedures usually receive extra attention because they involve the risk that students will feel coerced by their instructors into participation and hence also typically require new language in the informed consent documents). In short, by the time of the offers, there was simply no time for another round of IRB review. We had anticipated that we would be able to identify some students for interviews from the pool who volunteered for the questionnaire. The one ECE student who contacted us did complete both the questionnaire and an interview. We also re-contacted the four students from the Biology Focus group and two of them agreed to interviews. We had set the drawing for the iPod for May 4, the day after the last day of classes for the semester. Once the semester ended and the drawing was held, we no longer had an informed consent form for students that could be used as all forms (both student questionnaires and interviews) referred to the May 4 drawing. Again, we would have had to go back to the IRB to amend our procedures and our forms and to get new approvals before any more student interviews could have been pursued. Almost all of the first-year students leave campus by mid-May, so there would have been little chance of recruiting participants in the summer.

Overall then, we completed interviews with 4 faculty (2 from History, 1 from IB, and 1 from ECE) and three students (1 from ECE, 1 from IB, and 1 from MCB) in addition to the Biology Focus Group (4 students for about 90 minutes). All interviews were fully transcribed for analysis. We collected syllabi, assignments, and other course documents (e.g., grading rubrics from IB 150) from all three departments. We also collected sample papers from the two Biology students (one provided an IB150 paper and a freshman composition essay; the second provided an MCB 250 paper). This data is limited in quantity and range, but it does suggest some insights and raise questions that can be pursued in future research.

Some key preliminary findings

First, argument seemed to be a somewhat problematic umbrella term for the research. Hickox, the instructional coordinator for IB 150, reported questioning the relevance of that class to a study of argument. She felt much more comfortable talking about critique and about having and supporting an opinion. These were terms that she used in the interview quite freely and that also appeared in writing assignments for the students. Professor Brunet, who co-taught ECE 110 and advised students, felt more comfortable with argument, but it was not a term she chose to use either in the interviews or in her course materials. Instead, she talked repeatedly of getting students to think and to understand and apply formulas. Professors Matheson and Stuart, from History, both claimed argument easily and used that term in their classes. Stuart opened the interview with the following description of what the undergraduate major in history aims to achieve:

I think that most historians would say—in this department—we are teaching students how to read critically, think critically, argue effectively. And those things happen in the context of ideally, ultimately, they're grappling with what is usually called primary source materials, and [that's] defined in multiple different ways, but, original sources as opposed to boiled-down or processed Kraft Cheese sources.

In spite of this ownership of the term argument, Matheson and Stuart both kept slipping into discussions of other terms (critical thinking, interpretation, memory, creativity, specific forms of analysis in history, even passion) as they elaborated on argument.

Second, in each of the three programs, instructors emphasized the general need to orient students in the first year away from just being consumers of knowledge (a stance all associated with high school) to being more active users, critics, and producers of knowledge. They focused, however, on specific disciplinary schemes and issues. In ECE, Brunet argued that students needed to learn to think about and understand formulas, not apply them mechanically, and one of her final assignments asked students to collaborate in designing and making a car that would autonomously (with some sensors) follow a track and perform certain manoeuvres. In both biology and history, faculty emphasized the need for students to learn to differentiate primary from secondary sources; however, they meant different things by these terms. In biology, primary sources were the original research reports written by scientists for other scientists. One of the assignments in IB 150 asked students to find a popular report of a scientific finding and then track down one of the original research reports. In history, primary sources were artifacts and documents of history as opposed to later historical analyses and arguments about that history.

In history, Matheson and Stuart each argued that students needed to come to understand how history is interpreted and written. For example, in one of the assignments Matheson shared, she asked her students to analyze an image formally and historically, presenting the historical analysis in these terms:

Perform a historical analysis of your image. Images provide historians with special challenges. What kinds of questions do historians have to ask when they are working with images as primary source documents? What kind of information would help you explain the historical importance of your image? Again, move from basic to more complicated questions.

Remember to take into account both material and contextual issues.

- i. **Who** produced your image?
- ii. **What and where** was the historical context of its production? What was going on, in general terms, at that time and place? To answer this question, you may have to look in a history textbook or do a tiny bit of research.
- iii. **Why** was your image made? Did it serve a particular purpose? What was your image intended for?
- iv. **How** was your image made? What materials were used in its production?
- v. **What can the answers to these questions tell us about how your image functions as a historical document?** In what ways can your image be understood as part of a larger series of social, political, cultural or ideological changes?

The questions take what could be a general heuristic (who-what-where-why-how) and re-specify that heuristic in terms of particular historical issues and schemes, leading to the final question of how the image functions as a historical document.

Hickox, in biology, stressed the need for students to recognize that they could critique and have opinions about scientific claims (and that they could begin to support those opinions). She also wanted activities to orient students to scientific report formats. In a grading rubric for the critique assignment in IB 150, the following descriptions indicated excellence in addressing the questions, methods, and results:

Effort writing literature critique: Excellent—Demonstrated excellent effort to understand and analyze the introduction and methods of a scientific paper. Student made a good attempt to critique both parts of paper and give their overall opinion.

Analysis/Introduction: Excellent—Concise discussion and critique of main questions /hypotheses. Study system briefly explained. No personal pronouns used.

Methods: Excellent—Concise discussion of methods; Critique of methods demonstrated good comprehension of experimental goals No personal pronouns used.

This kind of focus could be analyzed (cf. Miller & Selzer, 1985; Prior, 1998) as an emphasis on developing a rhetorical map of *special topics* (going back to Aristotle's categories) that participants in disciplines and professions need to learn to guide their attention to objects of inquiry as well as to shape presentation of their claims. The discipline specificity of such arguments can also be seen in the following extract from the IB 150 critique one of the Biology students shared with us, in which she analyzes a published research report on the relation of oxygen to placental evolution:

Figure 1 shows that data collected from the marine sediments, of the isotopic levels of carbon-13 organic and carbon-13 carbonate through time. There are two steps here simplifying their findings. The two graphs are scatter plots where the dots represent the ratio of carbon-13 to carbon-12 at a particular time. Over these dots is a curve of best fit and then over the curve is a line of best fit. The curve only very generally matches the dots. In some areas on the graph there is a greater distribution of dots than others, and during the mid Jurassic period—a twenty million year period—there is no recorded data at all. When these findings are then translated to a graph of the increase in oxygen in the atmosphere in Figure 2, it is a continuous line similar to the curve of best fit in Figure 1, that does not reflect the lack of data during the Jurassic period or the wide distribution of points.

This excerpt offers a close reading of graphical representations of data that are key to the claim of the report and displays the student's emerging orientation to detailed consideration of the data behind claims. Later in the critique, the student draws on lecture to suggest an alternative hypothesis (which could be explored) to the one that the report offered, i.e. that placental evolution might be related to oxygen effects on the evolution of C4 plants rather than direct physiological effects on the animals. Here again, the nature of argument seems to depend heavily on learning the special topics of fields and how to employ them.

Third, from the interviews with students and the focus group, a gap appeared to exist between instructors' sense that college courses were pushing students to expand and complicate their thinking, to become more critical, and in some cases to develop their argumentative writing and students' perceptions. The students did agree that the material they were studying was often difficult and challenging to read and understand, but all five students indicated that their first year of study had focused more on learning information and concepts than actively using that material. This sense was not necessarily surprising. Instructors noted the challenge of dealing with large classes. Hickox, for example, talked about the difficulty of working in IB 150, with close to 600 students enrolled in it, who ranged from seniors to freshman and who came from a variety of majors. ECE 110 also involved large numbers of students, and Brunet pointed out that the first two years of the

curriculum really focused on developing basic conceptual understanding and lab/analysis skills. Assignments in ECE, for example, tended to emphasize problems where there was one correct answer, with most being done online. Introductory history classes also involved large numbers and had recently been forced to reduce TA support; however, we did not have the opportunity to interview any history students to get their take on the first year in the university.

Nevertheless, it would probably come as a surprise to the faculty we interviewed to hear that, at the end of the first 15 weeks of study at UIUC, four biology students, all of whom were also taking general education courses in other departments (including history, psychology, philosophy, and classics), all indicated that they had learned how to argue in high school and had done little arguing (or even interesting writing at UIUC). One of the biology students, who went on in the spring to take freshman composition, assessed that course as one that hindered rather than helped her develop as a writer. In short, whereas faculty seemed confident that they were issuing a challenge to students, the five students (4 in biology and 1 in ECE) interviewed in their first year did not seem to register that challenge. All would agree that they had rarely been asked to make arguments in their courses and several at least felt that the arguments they had made in high school were more sophisticated and serious than the ones they had been asked to complete in college courses.

Final reflections

First, it should be emphasized what we learned on several methodological and practical issues. For a project of this size with the need to coordinate across institutions and especially with the challenges presented by IRB procedures, a more extended timeline would have made a great difference. It also became clear that, although we believed that we had arrived at a reasonable degree of common ground on the questions and methods for this project, that that common ground became less certain when it came to implementing the methods. In retrospect, we could have used a semester for the principal investigators at each institution to plan the studies and develop whatever background documents were needed (interview protocols, questionnaires) and then two semesters or so to implement the data collection and analysis phases. An extended timeline would have allowed for greater adaptation time at UIUC as we confronted the linked problems of recruitment and the need for IRB review of all changes. In general, in terms of methodological and practical issues, the challenge of student access can hardly be underestimated.

This exploratory study of argument points to some interesting questions. A key issue is the differences that appear to emerge between student and faculty representations of argument in the first year at college. We also found it interesting how often questions of attitude and motive were cited by all the faculty, as they introduced discussions of student passion, engagement, and an overall sense of purpose and stance. That faculty saw these issues as critical (whether they were getting that across to students being a different question) suggests conceptualizations of argument that have strong affective, attitudinal, and motivational as well as intellectual dimensions. The multiple terminologies and concepts that seem to intersect at and radiate out from faculty discussions of argument also deserve further attention. To what extent is argument a general set of stances, orientations, and intellectual/discourse strategies and to what extent is argumentation part of a fuzzy network that indexes particular types of engagement, critique, and disciplinary special topics for seeing and representing knowledge? Finally, we also pursued questions

of whether argument could be pursued in other modes (visual, mathematical). ECE offered a relatively clear affirmative to that question, with most arguments being presented mathematically or visually. It also seemed conceivable in biology; however, little was being done with multimodal argument. Hickox, for example, indicated that she had not even considered sensitizing students to critical analysis of the algorithms underlying visual representations (images and films) of biological or ecological processes. In Matheson's history course, multimodality was not only a key site of interpretation of primary documents (e.g., analyzing images formally and historically as well as analyzing documents), but also appeared as a possibility for representation of historical understanding (with one assignment asking students to make posters). We suspect that multimodality will assume an increasingly central place in understanding argument as multimedia and computational resources continue to expand in disciplinary and public spaces.

Conclusions

Methodological issues in the pilot study

The results from pilot studies are principally methodological and procedural. Our intention was to find out which methods, or combination of methods were best suited to answering the research questions.

The mixed-methods approach was a strength of the project. We used a number of methods in order to come at the problem from different perspectives. Our aim was not to triangulate in the strict, conventional sense of arriving at the same point of understanding and illumination, but rather to test the advantages and disadvantages of the various methods; to see to what extent they complemented each other; to understand better the field in which we were operating; and, as a result, to work out improved ways of researching it. While mixed-methods approaches make interpretation complicated and time-consuming, the rewards are that the research questions are answered from different perspectives.

The research instruments (questionnaire and interview protocols for lecturers and students, as well as the procedure for focus groups) were designed and agreed across the three institutions, so we are reasonably confident of their face validity as instruments. However, control of administration and implementation of such methods is difficult, despite clear rubrics, within a multi-site, international project. There were practical difficulties of meeting within the one-year timescale for the project, though an access grid meeting was held in January 2006, email contact was constant and researchers from the UK-based institutions met at conferences in June 2006. To work toward a fully-fledged comparative study between countries would require development of the reliability of application. In particular we might refine the semi-structured interview approach towards more formal interviews with students and lecturers, using a more consistent protocol and a longer design phase.

Our questionnaire was the result of a number of drafts, discussed in detail by the researchers at all three institutions. It also benefited from clarification of terms, concepts and approaches that were gained during the focus groups. Despite these careful steps in the design of the questionnaire, its administration caused problems – largely in terms of access. Even within one institution, access to students in different departments differed greatly. In order to get permission, and then get actual access to students, we used email, attendance at mass lectures and a number of chasing procedures. Access to students in one institution proved particularly difficult, with students appearing to be unwilling to participate without incentives – and then not taking part.

The final sample for the questionnaire was 237, with 68% of the responses from York and 32% from Queen Mary (no responses from UIUC). Furthermore, across the sample as a whole, 48% of the respondents were from biology, 30% from electrical engineering and 22% from history. The sample is therefore incomplete across the population we wished to investigate, and also skewed. Although the overall response rate was 53% (which is considered good), we do not feel that we have a representative sample and cannot make generalizations from it. Nevertheless, we have elements of strength in parts of the sample – especially in biology – and can be confident that we have begun to build a strong foundation for further research as the questionnaire does provide answers to the first three of our research questions. Moreover, we have to bear in mind that at York we were not

using *samples*, but the whole cohort, which represents a census. This is a strength of the report and a solid foundation for further work of a general census nature.

Having said this, we need to acknowledge that 'argument' is a complex term to investigate through a questionnaire, and indeed in interviews, and that we cannot be sure that, despite working definitions being offered, each institution's students 'read' the term in the same way. The discursive practices we were trying to identify are slippery; for some disciplines, in some institutions, 'argument' or 'argumentation' is not what they see as central to their academic activity.

For future research, therefore, we need to consider how useful it is to use the term 'argument' when looking at practices of critical thinking, and at whether the term 'argument' is an imposition from outside of the discipline. It's also worth considering either being less explicit and not using the term argument at all, at least initially in the interviews, or being much more explicit and presenting different conceptions of argument, like Toulmin's regular/critical frame. A sharper distinction between exposition and argument, explored on both sides of the Atlantic, would also be helpful.

With these caveats in mind, focus groups and interviews, as methods eliciting verbal (qualitative) data and as used for exploratory purposes, were satisfactory overall, though we could have allowed for more time between the questionnaire and the interviews with students in order for the results of the former to inform the other. Nevertheless, they allowed insights into the practices in the different disciplines and the different universities.

The collection and analysis of documents, including student assignments proved useful in that we could see the curricular and disciplinary contexts within which the questionnaire and focus group/interview data were sitting. Crucially, we could also see the gaps in provision, both in the curriculum design and also in the guidance provided by departments for their students in terms of induction into the argumentative dimensions of the discipline.

One method we did not employ but which might give more insight into argument practices was the direct observation of lecture/seminar room behaviour. Our current results are based on what participants have said about their practices rather than on what they actually *do*. We recognise that an individual lecturer's stance towards knowledge and questioning could shape their own and their students' ability to argue or (at least) be critical; and identifying strategies employed in such stances could be a valuable dimension of further research.

A key constraint in the project – perhaps partly because of its ambitious scope – was the need for more time to discuss and analyse the data. Given the scope and complexity of the research design and of the topic itself, more time is needed to draw out and clarify emergent themes; and also to look at synergies between the systematic research review and the empirical pilot study.

Our study looked only at the first year of the undergraduate experience, but we recognise that in considering the role of argument in a disciplinary setting, a longitudinal approach would have benefits. It would allow consideration of the curriculum across all the years of a course, not just in terms of how argument appears but also in terms of what concepts the students need to master before they are able to engage in argumentation in that discipline, and to develop as members of the disciplinary community, albeit at a very junior level.

Tentative Results

Again, by their very nature, pilot studies do not provide highly valid or reliable results; that's not their function. Nevertheless, we can identify some emerging patterns and themes from the data that are worth exploring further and which reveal connections that need to be confirmed or not.

- The data suggest that there are clear disciplinary differences between argumentative practices in history, biology and electrical engineering. The epistemological foundations of argument in the specific disciplines are therefore important to any analysis of its place and function in academic life.
- There are differences even within disciplines at the same institution. These intra-disciplinary differences are either the result of differing approaches by lecturers (which seem to be determined by whether they see learning in the discipline in terms of participation or mere acquisition; or whether they emphasize argument as a way of organizing thought or as a mode of discourse; or whether they see argument as a critical and discursive activity or as having a role in more 'regular' problem solving or explanatory work⁹) or they are the result of different sub-sections or dimensions of the discipline itself. In some disciplines, the term 'argument' is not used at all.
- Modes of assessment seem to have a bearing on the degree to which argument is afforded status and time. Students understand the nature of argumentation in their field, and have a generic sense of its value and operation, but only see it as worth giving much attention if they are asked to argue formally (in speech, but usually in writing). If the summative (coursework or examination) assessment in a discipline requires sustained justification for a point of view or a design, then argumentation is seen to be important.
- When discussing teaching and learning (as opposed to knowledge in the discipline in general), both students and lecturers seem to see argument as primarily located in essays and not particularly part of other activities, written or spoken. Argument also appears to be associated more with contestation than with, say, the construction of a reasoned explanation and this links it to the essay form and makes it appear more prevalent in the Humanities than in the Sciences. In Science, opportunities for argument as contestation are recognised where several 'fields of reasoning' interact, e.g. ethics, environmentalism.
- In different degrees, students in biology and electrical engineering appear to think that argumentation is an important part of their studies, but that it is implicitly rather than explicitly taught¹⁰. There is a greater degree of explicitness in history where the term is used a great deal in seminars and in feedback on essays; but, despite a firm conviction from lecturers that argument is central to the discipline of history, still a reluctance by students to see argumentation as central to the skills needed in the discipline, as reflected in their attitudes towards study skills¹¹.

⁹ The polarities outlined here are not mutually exclusive.

¹⁰ Where it was explicitly taught, it was largely as an 'add-on'.

¹¹ Clayton (2006) describes approaches to study skills in the History department at York as contained in a course 'Making history: integrating study skills into the first year curriculum'. He revisits the generic or discipline-specific debate, concluding that, at the very least, students must be taught with examples from their own discipline; and better still, such skills training will be embedded into the teaching of the discipline itself. In an ongoing project, Clayton is

- Students and lecturers do not always see argument or its place in learning in the discipline in the same way (especially in the first year of undergraduate studies) Many students are unaware of the argumentative demands of their discipline and don't seem to be learning anything new in terms of disciplinary argumentation. They also often didn't feel it was necessary to learn more. In talking about how they understood argument, they were drawing on A-level or senior high school knowledge, often from English studies.
- The degree of (albeit self-reported) scepticism among the students in our sample was not high. Students seem, on the whole, to be observing a 'vow of obedience' towards their studies rather than a 'vow of suspicion'.
- The UIUC research in particular noted how often questions of attitude and motive were cited by all the staff, as they introduced discussions of student passion, engagement, and an overall sense of purpose and stance.

Implications

We are wary of making recommendations on the basis of our results; these must wait for the results of a larger, more reliable study. However, we can suggest implications and questions for policy, practice and further research.

Policy

The mismatch we have identified between what lecturers expect of students and what students provide can be taken to imply that the basic ground rules of the discipline – with respect to argumentation – might be better introduced in the first year to make the process less implicit (and thus risking the fact that some students will not 'get it') and more explicit. There are reasons, of course, why first-year students may not be able to take on a full set of ground rules (e.g. content and procedural knowledge, social and developmental factors); so a minimum might be that departments need to clarify where they would wish their students to be, in argumentative terms, at third-year level; and so design first- and second-year programmes with this in mind.

In terms of curriculum and course design, the research so far has opened a series of useful questions for consideration, such as whether we want students to be learning how to argue only within the range of their discipline, or whether we want to encourage alternative styles of writing and argumentation as well. The results suggest that argument and argumentation may fall between the disciplinary/epistemological demands of the subject on the one hand, and the study skills agenda on the other (which tends to the generic). Can having a general skills course affect the development of argumentation in other areas of the discipline (positively or negatively)? To what extent do argument practices need to be embedded in the discipline to be a successful part of learning? What models are there for the integration or semi-integration of provision for the development of argument?

So far, it appears that a policy implication is that the UK should not move toward a generic introduction to the discourses of higher education, as seen in rhetoric and composition courses at US universities. Students in the UK are committed to their disciplines. Any work on argumentation needs to be embedded in these disciplines. There are implications here for curriculum design. Although argument is a term which seems to sit more easily in 'add-on' courses which aim to address writing, communication or study skills than in disciplinary content-based courses where more nuanced or specialist kinds of thinking are employed (which nonetheless from a theoretical point of view may be classifiable as kinds of argument), a balance has to be found between disciplinary and generic approaches that both motivates students and covers the necessary 'skills'.

Finally, the study skills or generic skills agenda in UK higher education, both at undergraduate and postgraduate/research levels, needs to see argumentation as much more central to the processes of study and to learning outcomes, once further clarification of the term and its associated terms has been carried out.

Practice

To improve argument skills (and, almost, to stop them being ghettoised as 'skills'), we need to find ways of stretching students' understandings beyond their prior educational experiences, of recognising argument that happens elsewhere, of structuring activities to highlight this, and of integrating argument more fully into the learning and assessment process as a whole. One way to do this is to look at how essay topics are framed, what kinds of knowledge lecturers are asking students to use, and what kinds of argumentation are used in the essays. Students also need to be given opportunities within their modules and courses to argue in a wider range of different 'speech genres' (Bakhtin 1986) and written forms in order to allow more varied expression of argument. They need to be helped to be aware of and understand the function of scepticism and criticality. Conceptualizations of argument that have strong affective, attitudinal, and motivational as well as intellectual dimensions also need to be explored.

Further Research

As ever, there is much more to research in the field. Further studies of argumentation in higher education will want to:

- explore a wider range of disciplines;
- build on the work of Entwistle (n.d.) and on the present study to explore history, biology and electrical engineering in more depth, and across all years of the undergraduate course;
- undertake further and more reliable comparative studies between the US and UK, and with other countries;
- examine argument at pre-university (e.g. A-level) in relation to university level requirements and practices;
- explore the relation between the first year experience and that of the whole degree
- determine exactly how argument and argumentation operate in the various disciplines, and distinguish where they are useful concepts/categories and where they are not;

- work toward recommendations for the improvement of argumentative skills, where appropriate, in the teaching and learning of specific disciplines;
- explore argumentation in multimodal forms of communication;
- determine the balance between affective, intellectual, attitudinal and motivational elements in argumentation.

In methodological terms, further research in the field requires substantial resources if a national or international survey is to be undertaken of argumentative practices and the place/nature of argument in higher education. There will be a need for further pilot work on such a questionnaire, if used. The justification for an international dimension would seem to be that concepts and practices, as well as curricular structures, may be different from country to country; it is therefore valuable to identify similarities and differences so as to highlight generic and country-specific problems and their solutions.

At present, if more limited (national and/or local) studies are to take place, the implications from the present study are that a revised questionnaire, more formal interviews, focus groups and document collection and analysis are useful methods to employ. Projects might also wish to consider whether to use direct observation of argument practices.

We have discussed only briefly in the present study whether other methods might be more appropriate and afford more insights into practices of argumentation. We collected essays as part of our interviewing process with students towards the end of the data collection phase of the project. Analysis of these, and of other forms of presentation and assessment, could form a useful part of further studies in the field. Indeed, there is much data that we have collected for the present study that has not been included in this report, and which could be used for further analysis and publication.

Recommendations

The main recommendation is that, before any implementation work is carried out, a major study be commissioned by the Higher Education Academy in collaboration with one of the large funding bodies. Such research should be large-scale, cover all three years of undergraduate programmes (thus including a longitudinal dimension), build on the conclusions of the present report, and include a subsequent development phase in which improvements to the current situation can be trialled.

Given the extensive work to date in history, electrical engineering and biology (e.g. Entwistle et al. 2004; Hounsell et al. 2004) it would make sense to continue work in those disciplines. It might also make sense to concentrate on the national picture in the first instance, ensuring that a range of types of higher education institution is included.

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