

## Fieldwork is Good: the Student Perception and the Affective Domain

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**ABSTRACT** *This paper reports on research that investigates the effectiveness of residential field courses in geography, earth science and environmental science courses at UK institutions of higher education. The research focuses on the effects of fieldwork in the affective domain, which is thought to be linked to the adoption of effective approaches to learning. Approximately 300 students were surveyed immediately before and after a field class, enabling analysis of changes in responses brought about as a result of the field experience. Potential differences were looked for between groups of students determined by gender, age, previous experience of fieldwork and place of residence. The research finds that fieldwork leads to significant effects in the affective domain. In general, student responses were very positive prior to fieldwork and became more positive as a result of the field experience. Some groups exhibited higher levels of anxiety about this learning method prior to the field class; however, such differences were mitigated by the field experience. This study concludes that fieldwork is good.*

**KEY WORDS:** Fieldwork, affective domain, group work, Likert-scale statistics

### Introduction

The fundamental educational question to be asked is whether or not fieldwork achieves any of its stated objectives and, in all honesty, we must recognize that we do not know . . . There is no clear evidence on the general value of fieldwork. (Gold *et al.*, 1991, p. 27)

Fieldwork in higher education (HE) encompasses a wide range of activities from an hour-long local walk to a lengthy overseas project. Following Gold *et al.* (1991),

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fieldwork can be defined as any component of the curriculum that involves leaving the classroom and learning through first-hand experience. In UK higher education, fieldwork features prominently in national subject 'benchmark statements' for geography, earth sciences and environmental sciences (QAA, 2000a, 2000b). Most degree courses in these areas include a fieldwork element and many lecturers believe it to be an effective and enjoyable teaching method (Kent *et al.*, 1997). However, there is some concern that fieldwork is being, or will be, reduced within universities in the UK and elsewhere for a number of reasons, five of which are mentioned here. First, some disciplines have been moving away from the need to leave the classroom, for example through the development of technological alternatives to fieldwork, including remotely sensed data, GIS and virtual 'field' exercises. Second, it is argued that the growth in student numbers, combined with declining unit-funding, makes fieldwork too expensive. The subsequent need to charge students for fieldwork raises questions about whether field courses are equitable: Kent *et al.* (1997) find that they can be 'manifestly unfair'. Third, somewhat perversely, with the advent of 'top-up' fees in academic session 2006–2007 in parts of UK higher education, many UK universities have decided that students should pay nothing towards compulsory fieldwork but are not necessarily willing to cover existing full costs, which places financial pressure on many existing field classes despite more money being available from 'top-up' fees. Fourth, it is argued that the time burden on staff can detract from their ability to complete research. Fifth, the introduction of SENDA<sup>1</sup> in the UK places pressure on traditional expeditionary-type field classes because it requires education to be inclusive; compulsory field classes must accommodate students with disabilities (Hall *et al.*, 2002, 2004). Lastly, safety concerns and a growing 'blame culture' in the UK make some institutions worry about the potential legal implications for field classes of accidents.

Despite such changing contexts, there is some evidence that fieldwork continues to hold its own in the UK (Gold *et al.*, 1991; Kent *et al.*, 1997) but there is also a growing view that its place in the curriculum is no longer sacrosanct. The Geological Society of London has moved away from specifying a minimum number of field days for an accredited geology degree, for example. Scott *et al.* (2006) surveyed the views of UK HE lecturing staff in geography and environmental science departments and report that, while they considered fieldwork a vital teaching and learning tool, it is not considered central to geography and environmental science education. Other pressures come from questions regarding the fairness of fieldwork as a teaching and assessment instrument because it may discriminate against the disabled (Hall *et al.*, 2004) or on the basis of gender (Rose, 1993; Maguire, 1998).

This is not just a UK issue. For fieldwork in the USA, Salter (2001) commented on the disinclination of departments to support fieldwork in the face of calls for redirecting funds into digital technology, while Zelinsky (2001, pp. 1–2) wrote:

Well, then, just what is the status of fieldwork within the ranks of professional geographers today? How does it rate as a topic for serious cogitation, research or pedagogy? The sad and simple answer is: Pretty much fallen off the screen . . . As far as I am aware, none of the leading American schools of geography currently requires training in field methods of its aspirants for higher degrees, and only a handful offer relevant courses at any level.

Given these diverse pressures, it is to be expected that practitioners will have to make a strong case for the value of fieldwork and, as the opening quote of this paper suggests, there is a lack of rigorous research findings that can be called upon to support such a case (Winchester-Seeto & Hart, 2000; Johnston & Cooke, 2001; Fuller *et al.*, 2006). Nearly all of the available literature is based on the evaluation of particular teaching and learning methods used during field courses, and most is based on single case studies (Healey & Blumhof, 2001). To redress this imbalance, we undertook a cross-institution and -discipline research project investigating the effectiveness of fieldwork by eliciting student feelings about fieldwork—an excursion into the affective domain.

*Why Focus on the Affective Domain?*

It is common to distinguish between two ‘domains’ of learning activities. Cognitive activities are those involving the processing of information and the construction of meaning; they are most directly linked to learning outcomes. Affective activities are processes that deal with emotions, feelings and values; they lead to perceptions of learning tasks (or moods) that help to determine students’ approach to learning activities. The affective domain can be characterized as being indirectly linked to learning outcomes.

Whilst there is an intrinsic interest in knowing whether fieldwork leads to positive feelings amongst students, our principle interest is in the impact of fieldwork on the performance of students in achieving learning outcomes. It is difficult, but not impossible, to attempt to measure directly the impact of fieldwork on achievement. For example, Kern & Carpenter (1984) set up an experiment in which a geology class was split into two groups, one field-based and one class-based, both preparing for the same summative assessment task. Seeking evidence from a larger sample, Fuller *et al.* (2003) analysed the impact on student grades arising from the reduction in fieldwork enforced by the 2000–2001 outbreak of foot and mouth disease in the UK. The former found evidence that fieldwork is effective, the latter did not (reportedly due to the obscuring impact of special efforts to sustain student grade profiles). In contrast to these studies that measure impact in the cognitive domain, this project focused on the affective domain. The rationale for this is discussed below; in summary, a positive outcome in the affective domain is considered to be an important antecedent to success in the cognitive domain.

The linkage between affective and cognitive learning outcomes is mediated by approaches to learning (Table 1). In particular, affective outcomes that foster deep

**Table 1.** Defining features of approaches to learning

Deep approaches to learning	Surface approaches to learning
Intention to understand material for oneself	Intention simply to reproduce parts of the content
Interacting vigorously and critically on content	Accepting ideas and information passively
Relating ideas to previous knowledge/experience	Concentrating only on assessment requirements
Using organizing principles to integrate ideas	Not reflecting on purpose or strategies in learning
Relating evidence to conclusions	Memorizing facts and procedures routinely
Examining the logic of the argument	Failing to recognize guiding principles or patterns

Source: Entwistle (1991).

approaches to learning lead to better student performance due to higher levels of understanding (Vermunt & Verloop, 1999; Entwistle & Smith, 2002; Biggs, 2003). What leads students to adopt a deep approach to learning? Early experiments found that approaches to learning are associated with different forms of motivation. The way in which students perceived a learning situation (as reflected in what they said about the emotions they felt about it) was actually what determined their learning approach (Marton & Saljo, 1976; Entwistle *et al.*, 2002; Entwistle & Smith, 2002). More specifically, deep learning is associated with interest and relaxed self-confidence and surface learning with anxiety and fear of failure (Entwistle, 1991; Entwistle & Smith, 2002). As a result of these influential findings, research has started to focus on what teaching and learning methods evoke the desired emotional responses. For example, over-assessment has been found to result in anxiety (related to fear of failure), thus encouraging a surface learning approach and reduced understanding (Biggs, 2003).

Within geography, earth and environmental sciences, fieldwork is anecdotally considered to elicit positive affective responses. It is thought to develop social capital through group dynamics, the breaking down of barriers between staff and students, and making friends. It is also considered to stimulate high levels of interest and motivation. This accumulated experience of students and lecturers, often supported by course evaluation questionnaires, should not be dismissed. However, despite the wealth of individual case experiences, there are few empirical studies to support this presumed link between fieldwork methods, the affective learning domain and learning approaches. Kern & Carpenter (1984) found that fieldwork significantly enhanced affective responses, with greater enjoyment, interest and value generated than in corresponding class-based work. They followed this up with research which found that such affective responses resulted in significant improvements in higher-order (deeper) learning performance (Kern & Carpenter, 1986). This relationship between the affective and cognitive domains is supported by Large-N empirical studies in other subject areas, finding that confidence about a learning task is a determinant of anxiety, which in turn is a determinant of motivation and performance (Rozell & Gardner, 2000; Rouxel, 2001).

So, is fieldwork good? The design of this research is based on the assumption that fieldwork is good if it triggers positive emotional responses, i.e. if it is particularly likely to trigger a chain of emotional and learning responses: high confidence in ability to do well—low levels of anxiety—high motivation—deep-learning approach—high performance. Thus, whilst this research does not seek to measure performance outcomes *per se*, it does seek to measure some of the well-known antecedents of those outcomes.

## Methodology

The research addresses the following questions:

- (1) What is the effect of fieldwork on student affective domains?
- (2) Do students' attitudes to learning change as a function of completing fieldwork?
- (3) Does fieldwork have the same effect on all stakeholders?

The research questions were addressed through paired questionnaires<sup>2</sup> that elicited the views of students immediately before embarking on a field course (the pre-questionnaire) and on its completion (the post-questionnaire). Questionnaires were piloted during

induction field classes in September 2001 and full data collection took place between February and October 2002. Using paired questionnaires in this way also provided the facility to:

- monitor changes in students' attitudes to learning that occur as a result of the field experience;
- examine changes in how students value the field experience;
- identify differences in the fieldwork experience of subgroups of the student population.

A total of 365 students studying for degrees in geography, earth sciences and environmental sciences completed questionnaires. Of these, 315 formed the main part of the study representing students from all HE levels (Table 2). A later replicate study, which will not be fully developed here, involved collecting data from 50 students attending an induction field class before the start of Year 1 at Ulster University. All of the main-study field classes were designed on an 'active learning' basis in which the students were set up with tasks or problems that they needed to solve. They were not lecture-in-the-field, Cook's Tour field classes.

#### *Questionnaire Design*

The questionnaires comprised a mixture of Likert-scale, ranking, free-form text entry, and respondent-specific (e.g. gender, age, previous experience) questions organized under the following sections (for the pre-field-class questionnaire):

- (1) Core Data. (respondent specific)
- (2) Why did you choose this programme? (ranking)
- (3) If you have been on fieldwork before what was your most memorable fieldwork experience? (free text)
- (4) Which three of the 10 following descriptions best describe your feelings about the fieldwork you are about to undertake as part of your degree programme? (ranking)
- (5) Anticipation of the fieldwork. (three-point Likert)
- (6) Knowledge to be gained. (five-point Likert)
- (7) Perception of fieldwork as being useful. (five-point Likert)
- (8) Collaboration, enjoyment and motivation. (three-point Likert)
- (9) Procedures and techniques in fieldwork. (five-point Likert)
- (10) What do you hope to get out of this fieldwork? (free text)

The post-questionnaire was formulated in a similar way but with questions posed in a more reflective manner, rather than being anticipatory. So, for free-text questions rather than the anticipatory questions in 3 and 10 above, the post-questionnaire asked "What were your worst and best experiences?"; "What skills have you learnt or developed during the field trip?"; and "How has your relationship with the other students and with staff changed as a result of the field course?". Anonymity and matching of questionnaire pairs was attained by asking respondents to use a synonym such as the name of a neighbour, dog, or whatever.

The wide use of ranking and Likert-scale questions was implemented to allow systematic statistical analysis of the outcomes. All response forms were transferred into

**Table 2.** Summary of institutions, subjects, academic levels (year of study) and class sizes in the survey sample

Institution	Code	Subject	Level	Class size	No previous experience	Mature	Female	Live at home
Coventry	UC	Environmental Sci.—Aberystwyth	2/3	44	10	34	24	20
JMU	JMU	Geology—Arran	1	29	8	3	8	6
JMU	JMU	Geology—Spain	2	46	9	11	17	12
Liverpool	UL	Geology—Pembrokeshire	1	73	7	7	24	15
Southampton Solent	SSU	Geography—Dorset	1	36	8	7	7	1
UEA	UEA	Environmental Sci.—Kenya	3	15	1	2	10	0
Northumbria	UN	Geography—Pitlochry	1	45	3	4	22	20
Ulster	UU	Environmental Sci.—Algarve	2	19	0	6	9	6
Ulster	UU	Geography—Toronto	2	8	4	1	5	2
			Total	315	50	75	126	82
Ulster	UU	Geography—induction	1	50	29	5	28	14

*Notes:* Data are also presented for numbers in sub-groups: No previous residential field experience; Mature (21 or over at the time of the field class—20 respondents did not give age); Female gender; Living at home with parent/guardian.

a Microsoft Access™ database to allow wide access to the data. A script was then written to output data for analysis in the statistical package SPSS™.

### Data Analysis

Differences between pre- and post-fieldwork responses were primarily analysed using paired-sample *t*-tests rather than the non-parametric equivalent Wilcoxon test. Not all of the Likert scales were normally distributed but the *t*-test was still used because it is more powerful and because Kinner & Gray (2000) have observed that this test is quite robust against minor violations, especially with a large sample. Comparison of paired sample *t*-test results with Wilcoxon results found that the two tests show the same comparisons to be significant: the choice between these two tests does not affect the findings.

Differences between sub-groups for Likert-scale questions were investigated using independent *t*-tests. Ranked questions were analysed using a Wilcoxon matched-pairs signed rank test. This test is the non-parametric equivalent of the repeated measure *t*-test used to compare Likert-scale questions. Differences between sub-groups for ranked questions were investigated using a Friedman test to see if there were any significant differences between ranks assigned by different groups of students.

## Results

Paired sample *t*-tests analysis shows a significant difference between students' responses pre- and post-field class for each group of questions: anticipation, knowledge, usefulness, collaboration and procedures (Table 3). The statistical findings relating to each group of questions in Table 2 will now be summarized in turn, illustrating each group with representative open responses from students (using institution codes in Table 1), before proceeding to a discussion of the implications.

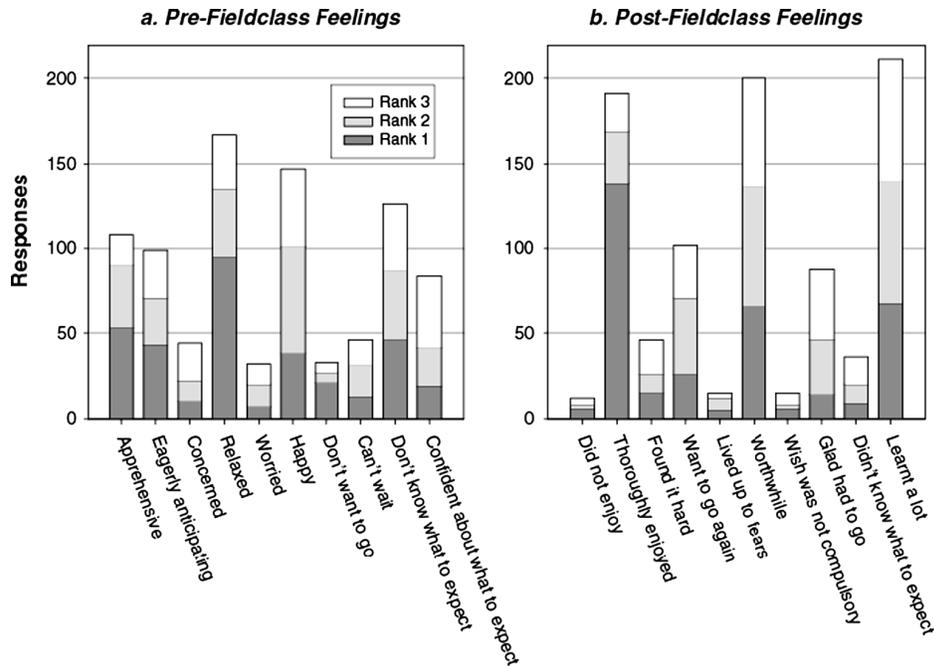
### Anticipation and Reflection

The questionnaires contained two sections on anticipation. In the first of these, students were asked to rank their feelings before and after a field course by ranking their top three choices from 10 options. Figure 1 summarizes the outcomes. The pre-field-class data indicate that while 'relaxed' was the most common first and top three choice,

**Table 3.** Overall analysis of questionnaire sections using paired sample *t*-tests

	<i>t</i>	df	Significance (2-tailed)
Anticipation Qs (8)	8.515	290	0.000
Knowledge Qs (4)	-1.972	292	0.050
Perception Qs (5)	2.208	292	0.028
Collaboration/enjoyment Qs (15)	3.108	290	0.002
Procedure Qs (3)	7.072	287	0.000

*Notes:* Number of questions in section in brackets. *t* = *t* statistic; df = degrees of freedom; significance (2-tailed) of < = 0.05 equates to 95% confidence level or better.



**Figure 1.** Pre- and post-field-class rankings of feelings. Respondents ranked top three feelings from choice of 10 as listed in the figure

‘apprehensive’ and ‘don’t know what to expect’ also feature strongly, representing the second and third highest first choices, respectively. Approximately one-third of students ranked ‘apprehensive’ in their top three feelings of anticipation. For the post-field-class reflections on feelings ‘thoroughly enjoyed it’, ‘worthwhile’ and ‘learnt a lot’ were all chosen around 200 times.

Positive pre-field-class feelings were expressed 542 times, with negative ones 343 times (39 per cent of choices). Positive post-field-class feelings were expressed 792 times, with negative ones 123 times (13 per cent of choices). It is noticeable that whilst negative feelings in the pre-field-class data (apprehensive, concerned, worried, don’t want to go, don’t know what to expect) all get ranked in the top three feelings by at least 30 students, only one of the negative feelings in the post-field-class data elicited more than 30 responses (found it hard). Student comments confirm this general positive finding. Most comments in response to “What was your most memorable experience?” are similar to these:

All the students getting to know each other through group work and socializing in the evenings. (UU Y2 student)

Getting to know other people on the course better. Getting first hand experience of geology in the field. (JMU Y1 student)

The alternative power centre and the bats. I think I’m smitten. The bank voles were pretty special too. Wow! (UC, Year 2/3 student)

Being given the opportunity to study the urban communities of Toronto and being able to talk with people in the city while doing this. Also getting to know my classmates better. (UU Y2 student)

Negative comments are rare, but generally refer to personality clashes and perceived work overload, for example:

Lack of sleep. Being thrown in deep end in labs with work covered ages ago—expected to remember techniques. Having to spend every waking moment in the company of people you wouldn't normally. (UC Y2/3 student)

Some of the Likert-scale pre- and post-feelings were analysed as pairs to test for significance of difference. The Wilcoxon test showed a significant difference in the following pairs: 'worried' and 'lived up to my fears' ( $p = 0.039$ ); 'concerned' and 'found it hard' ( $p = 0.008$ ); 'eagerly anticipating' and 'thoroughly enjoyed it' ( $p < 0.0005$ ). This test of significance reinforces the general picture emerging; that the field experience has tended to dissolve negative feelings of anxiety, whilst strengthening positive feelings associated with confidence. This set of responses therefore finds that fieldwork has a positive impact on the affective-learning domain and, assuming this to be an antecedent of successful learning, supports the notion that fieldwork is good. The feeling of having learned a lot was a common one:

Mainly the social side, but also I did enjoy the work we had to do. Felt I learnt a lot. (UL Y1 student)

Looking at the different rocks in the different time periods—I learnt a lot. (JMU Y1 student)

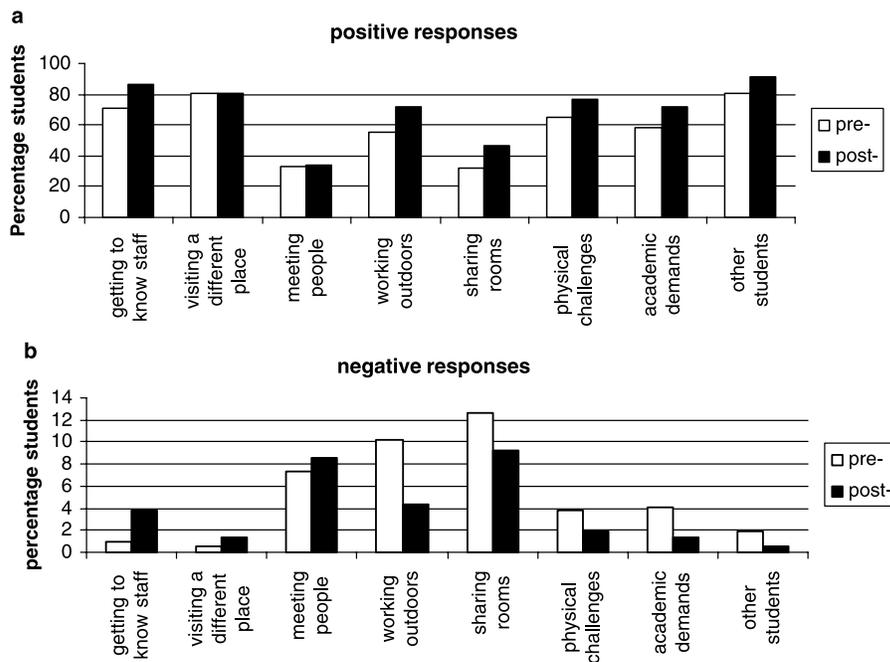
The Cairngorms day was definitely the best and I learnt a lot. (UN Y1 student)

This is not a cause for complacency: the results also show considerable anxiety amongst some students whilst anticipating the field experience. Ideally such anxiety would be addressed in advance of travelling to the field.

A sub-group analysis was performed to look for differences based on gender, age, whether the student lives at home or not, and whether she/he has previous experience of residential field courses (see Table 2 for numbers in these subgroups). For the ranked (ordinal) data generated by this component of the questionnaire, the Mann–Whitney U-test was used (the non-parametric equivalent to the independent  $t$ -test). For the pre-field-class responses there was a significant difference between males and females for the feelings 'worried' ( $p = 0.26$ ) and 'don't want to go' ( $p = 0.32$ ), with females being more likely to express these feelings of anxiety, but only slightly so. For the other eight feelings, no significant gender difference was detected. Analysis of the post-field-class data showed no significant gender differences. The analysis of age was undertaken through a simple comparison between those under 21 years of age (typical) and those aged 21 and over (mature). Comparisons showed very similar mean rankings for most feelings. The only significant difference found was for the feeling 'concerned' ( $p = 0.026$ ), although this was not a dominant response: only 8 out of 80 mature students rated 'concerned' amongst their

top three feelings, whereas 41 of them selected 'relaxed'. However, this difference appears to have remained during the field experience, evidenced by mature students being significantly more likely to have 'found it hard' ( $p = 0.021$ ). Testing for differences based on whether a student lives away from home or not showed no significant differences either pre- or post-field-class experience. Previous experience of residential fieldwork also made no significant difference to pre-field-class responses. Those with previous experience were significantly more likely to say that the current field class 'lived up to my fears' ( $p = 0.032$ ) although a fairly small number (13) actually made that response.

The second section relating to anticipation asked students to employ a three-point scale (positive, neutral, negative) to indicate their feelings concerning a series of field activities. Here, the pre- and post- statements were precisely matched, enabling a more rigorous comparison and providing a means of further testing the impact of the field experience on student feelings of anxiety. Figure 2 presents the pre- and post- field responses in a way that enables more rigorous testing of the finding that the field experience reduces the incidence of negative feelings whilst increasing the incidence of positive ones. The results show that the incidence of positive responses remains roughly the same for two activities (visiting a different place, meeting people from a local community) and increases in all other aspects. The impact of the field experience on the incidence of negative responses is slightly less clear-cut. Negative responses were reduced in five of the eight aspects, but increased somewhat in the other three. For example, only one per cent of students had negative anticipations about 'getting to know staff' before the field class; but after the field class 3.8 per cent reflected on this as a negative experience.



**Figure 2.** The effect of the field experience on positive and negative responses to feelings

For this second set of data on anticipation, differences between sub-groups were tested using the independent *t*-test. Testing the aggregate of responses to the eight field activities, it was found that there is a significant gender difference ( $p = 0.021$ ), with males more likely to have negative feelings of anticipation towards fieldwork (the opposite finding to the previous questions on anticipation). Similarly, the test found that those who live at home during term time are more likely to have negative feelings of anticipation ( $p = 0.045$ ). Age and previous experience of fieldwork made no significant difference. Analysis of the post-field-class data revealed that there are no significant differences in reflections on the field experience by any of the sub-groups tested. This provides tentative evidence to suggest that, in addition to reducing instances of negative responses, the field experience also acts as a leveller of anxiety; it is an equitable teaching method.

### *Knowledge and Usefulness*

Questions regarding student perceptions of the academic value of fieldwork help to expand our understanding of the impact of fieldwork in the affective domain. These questions gauge students' confidence in the legitimacy of the learning method, which is expected to be an important antecedent of motivation. All questions relating to these sections of the questionnaire used a Likert scale, and so differences have been investigated using paired-sample *t*-tests. Only one of the four questions posed in the 'Knowledge' section showed a significant response change (Table 4). In part it could be argued that the respondents had a high level of agreement with the statements pre-field class, and this was not changed by the fieldwork experience. However, the question concerning perceived importance of fieldwork showed a pronounced significant shift in response to being in even more agreement post-field class. It changed from having the lowest mean score pre-field class to the highest after (last row in Table 4):

Finding it really hard. Although not totally happy in the field, I believe it's important. (UL Y1 student)

Table 5 summarizes analysis of questions on the usefulness of fieldwork. Student responses became significantly more positive towards fieldwork for all question pairs except the choice of career question. Interestingly, students started with a relatively low regard for study in the library rather than the field, and this was reinforced by the field experience:

It was very educational and of far more benefit than studying in the library. I got to know the other students and staff better. (UU Y2 student)

Getting hands on experience instead of text book learning. (JMU Y2 student)

Seeing reality rather than text book. (SSU Y1 student)

Fieldwork is expensive, but so are libraries. Overall, students are extremely confident about the academic value of residential fieldwork.

Analysis of sub-groups found that age is the only variable that significantly differentiates responses to questions concerning either knowledge or usefulness before

**Table 4.** Detailed analysis of 'Knowledge' questions

Knowledge	Pre-mean	Post-mean	<i>t</i>	df	Significance (2-tailed)
Fieldwork will increase my knowledge of my degree subject	4.35	4.28	1.07	290	0.288
First-hand experience of themes/topics etc. studied in class makes it easier to understand them	4.31	4.19	1.91	290	0.057
Fieldwork gives me a chance to develop my problem-solving skills	3.96	3.88	1.22	288	0.222
University courses in this subject all undertake fieldwork so it must be important	3.75	4.30	-8.94	289	0.000

*Notes:* Each question was answered on a five-point Likert scale where 1 = 'strongly disagree' and 5 = 'strongly agree'. *t* = *t* statistic; df = degrees of freedom; significance (2-tailed) of  $< = 0.05$  equates to 95% confidence level or better.

**Table 5.** Detailed analysis of 'Usefulness' questions

Usefulness	Pre-mean	Post-mean	<i>t</i>	df	Significance (2-tailed)
It is important to know how to solve problems in the field	4.35	4.52	-3.52	290	0.000
Without a field experience my degree subject would be too academic and theoretical	4.18	4.38	-3.93	291	0.000
Fieldwork skills will be important to me in my choice of career	3.88	3.80	1.06	287	0.291
Fieldwork will help my understanding of the subject	4.42	4.23	2.88	287	0.004
It would be more useful for my understanding of the subject to be given this time to spend in the library	2.19	1.75	5.30	287	0.000

*Notes:* Each question was answered on a five-point Likert scale where 1 = 'strongly disagree' and 5 = 'strongly agree'. *t* = *t* statistic; df = degrees of freedom; significance (2-tailed) of  $\leq 0.05$  equates to 95% confidence level or better.

going to the field: mature students are more positive about fieldwork's contribution to knowledge ( $p = 0.031$ ) and its usefulness ( $p = 0.01$ ). Analysis of the post-field-class data finds no significant difference in response across any of the sub-groups studied, again suggesting that field experience acts as a leveller of affective responses.

### *Collaboration and Enjoyment*

Group work is often a more prominent feature of the fieldwork learning experience than it is for most campus-based curricula. The findings of the survey reveal that the field experience strengthens positive affective responses to group work, though there are still students who prefer to work alone:

Getting to know people better and working in a group. The walks were good like coast path and quarry but it was also nice to have the two activities which didn't include too much exercise. (SSU Y1 student)

Interacting with other individuals in an organized group and meeting other people. (UL Y1 student)

Working as a group when doing practical things such as measuring river characteristics. (UN Y1 student)

Working in a group and getting to know students that I wouldn't normally work or socialize with. (UC Y2/3 student)

Worst—Having to go along with group decisions. I would sooner have submitted individual report. (UC Y2/3 student)

There were significant differences between pre- and post-field-class responses for all questions asked in this area. Following the field experience, students are more likely to 'enjoy working in a group' ( $p < 0.0005$ ), more likely to 'feel confident in being able to work with others' ( $p < 0.0005$ ), more likely to 'use colleagues as an information source' ( $p < 0.0005$ ) and more likely to 'trust the contributions of my group when completing group work' ( $p < 0.0005$ ). Furthermore, the mean responses to these questions showed very strong positive views post-field. On a scale from 1 (positive) to 3 (negative), mean responses to these questions fell in the range 1.10 to 1.23. The statement 'I feel confident in being able to work with others' elicited the most positive mean response, a finding that is important given the strong link between confidence and performance (Tremblay *et al.*, 2000; Entwistle & Smith, 2002).

Some more general questions about student enjoyment of fieldwork were also solicited. The results again support the notion that fieldwork has a positive impact in the cognitive domain. Following the field experience, students were more likely to claim that 'fieldwork is an activity I enjoy' ( $p < 0.0005$ ), that 'fieldwork is a very valuable aspect of my degree subject' ( $p < 0.0005$ ), that 'the more fieldwork I undertake the more interesting the work becomes to me' ( $p < 0.0005$ ) and that 'I like to be challenged in fieldwork' ( $p < 0.0005$ ). On the other hand, students are less likely to 'lose interest in the work because of the weather' ( $p < 0.0005$ ) or to say that 'fieldwork is not an activity I particularly enjoy' ( $p < 0.0005$ ).

Being able to learn about both geology and physical aspects of the subject. Making good friends and getting to know fun and interesting people. To enjoy a challenge. (JMU Y1 student)

I really enjoyed the trip, mostly the visit to the quarry. (SSU Y1 student)

Learning whilst enjoying doing the work in a relaxed environment. (UL Y1 student)

I enjoyed everything, but especially the river work and walk in the Cairngorms. It was a lot more fun than I thought it would be. (UN Y1 student)

Whilst these findings are strong and clear, they probably do not come as a great surprise to most readers. Rather, they serve to validate what many field-leaders have already learnt anecdotally from their own informal and formal evaluations of field courses. The impact of the field experience on reducing differences between sub-groups might be less well known, requiring a larger dataset to reveal it. Questions about collaboration and enjoyment seem to confirm this trend. Three out of the four sub-groups analysed showed significant differences in response, with the following groups more likely to respond positively to questions about group work and overall enjoyment: students who live away from home ( $p = 0.010$ ); students under 21 years of age ( $p = 0.028$ ); and students with previous residential fieldwork experience ( $p = 0.005$ ). In all cases, no significant differences were found in the post-field-class responses and no significant gender differences were found in either the pre- or post-field-class data. This conflicts with research carried out by Maguire

(1998) and Nairn (1996) who comment on the difficulties faced by some women when placed in the historically masculinist environment of the field (Rose, 1993), where physical activity during the day and drinking through the night often prevail, and the negative impact this can have on their levels of enjoyment. Maguire (1998) also highlighted the impact of female students' perceived lack of fitness on their ability to engage fully in fieldwork activities; this was not, however, an issue for the students surveyed within the current study, suggesting that the simplistic view of fieldwork as a masculinist exercise is indeed problematic, as noted by Hyndman (2001). It is possible that for the majority of young female students surveyed in this study it is now acceptable and part of their own 'ladette' culture to engage in social drinking and therefore this is no longer of concern to them. In a post-SENDA environment, the majority of field courses have been modified to allow for disabled students to participate in them fully, which may have worked to reduce the demands on, and concerns previously noted by, female students (see quote from SSU Y1 student in Collaboration and Enjoyment section above).

#### *Procedures in the Field*

As established early in this paper, the study did not set out to investigate the direct impact of fieldwork in the cognitive learning domain. Rather, it focused on the affective domain and, based on published research (e.g. Kern & Carpenter, 1986; Stoddart, 1986; Cosgrove & Daniels, 1989), assumed this to be strongly linked to the cognitive domain. It did, however, employ a small number of questions that investigated students' self-evaluation of their working procedures. It was found, for example, that the field experience made students more likely to claim that 'I am careful to record exactly what I observe' ( $p = 0.014$ ) and that 'I am not fazed by having to use technical equipment' ( $p < 0.0005$ ):

Understanding the importance of keeping a good notebook. (UL Y1 student)

Enjoyed the practical work. Enjoyed the kick sampling and mammal trapping. (UC Y2/3 student)

#### *Correlations*

Investigation of whether pre-field-class feelings of anticipation, and views on the value of fieldwork, are correlated with post-field-class evaluations of group collaboration, enjoyment and working procedures was undertaken using Pearson correlation to detect significant relationships between sets of questions. In all cases, correlations are weak. Scatter-plots were produced for significant relationships in order to check for linearity and outliers. Analysis indicates that pre-field-class feelings of anticipation (the main measure of student anxiety/confidence) are significantly correlated to all sets of post-field responses. In particular, responses are positively correlated to post-field-class responses to questions about group work and enjoyment ( $r = 0.166$ ;  $p = 0.005$ ) and to questions about procedures ( $r = 0.195$ ;  $p = 0.001$ ). Pre-field-class views on the value of fieldwork, a measure of confidence in the legitimacy of the learning method, are not so clearly correlated to post-field-class responses. There is no significant relationship between post-field-class responses and group work or enjoyment. Whilst there is a significant

relationship between post-field-class responses and procedures ( $r = 0.158, p = 0.007$ ), this is a negative relationship, meaning that more positive pre-field-class evaluation of fieldwork is related to less positive responses concerning procedures.

### **Ulster Induction Replicate Study**

Outcomes for induction students were very similar to those for students undertaking residential field classes during their courses, with almost all students commenting on the social benefits of meeting fellow students and some members of staff. However, there was one notable difference: induction students at Ulster appear to be less positive about the perceived learning benefits of fieldwork than students in the main study (overall, but also in comparison with other Ulster students). Using comments given on the questionnaire by induction students with regard to the benefits of fieldwork, it is possible that 'induction' students are less positive about fieldwork in the post-condition because of the time at which the placement was completed:

... meet colleagues, but didn't help socialize because in middle of freshers' week.

... meet people—but not good to do in first week because trying to settle into accommodation.

Statistical analysis comparing induction students living at home with those living away from home showed no significant differences, suggesting that settling into a new residence is not the cause. While the difference may be due to missing part of freshers' week, it may also be that as the induction students have not yet started their degree programmes, they do not yet understand the relevance of the field class to their on-campus studies.

### **Discussion**

Is fieldwork good? This question has been approached by exploring the effects of fieldwork in the affective domain. Overall, students have demonstrated very positive affective responses to residential fieldwork and these feelings have been strengthened during the field experience. Whilst students do experience anxiety prior to residential field courses, the field experience has tended to mitigate these feelings and to foster high levels of confidence, both in students' ability to meet the challenges of fieldwork, and in beliefs that fieldwork is an academically valuable learning method. Furthermore, students enjoy fieldwork. Our review of educational research suggests that such affective responses will lead to higher motivation, deeper approaches to learning and effectiveness in achieving learning outcomes:

Finally being able to visualize my theoretical work in the field. This has helped me to understand the work much more. (UL Y1 student)

This chain of causality has mainly been researched in subjects other than geography, earth and environmental sciences, and for non-field forms of teaching (Gilbert & Strong, 1997; Rozell & Gardner, 2000; Tremblay *et al.*, 2000; Rouxel, 2001). More context-specific

research into this relationship would therefore be desirable as a means of furthering confidence in the conclusion that fieldwork is good.

Whilst there was no consistent evidence from this study that feelings towards fieldwork are differentiated along lines of gender, there is some evidence that age, place of residence and previous experience make a difference. Mature students and students who live at home are more likely to have feelings associated with anxiety before the field class. Students who live at home, mature students and students with no previous field experience are also less likely to respond positively to questions about group work and overall enjoyment of fieldwork before the field class. Whilst these differences are significant, they are nearly always small. Furthermore, in nearly all instances, no significant differences remained after the field experience. So, in addition to raising positive affective responses across the board, the field experience particularly helps to boost the affective responses of those groups who are less positive prior to the field class. This finding is quite surprising, suggesting that fieldwork is, in this particular respect, equitable. Of course, there may still be other respects in which it is not equitable; for example, the study did not investigate disability (Hall *et al.*, 2004) or the reasons why some students may choose not to go on field classes (Kent *et al.*, 1997).

Whilst the findings strongly support the contention that fieldwork is good at eliciting positive affective responses, the survey also revealed that a significant minority of students had feelings of anxiety prior to the field class. Room sharing, working outdoors all day and the physical challenge were amongst the factors that contributed to this anxiety (see Figure 2), factors also noted by Nairn *et al.* (2000). Whilst the field experience appears successful at reducing such concerns, this mitigation should not be a cause for complacency. Ideally, some of these causes of anxiety can be mitigated through effective pre-field-class preparation. A useful strategy might be to use students who have previously attended the field class to discuss what is entailed with prospective field-class students. The aggregate data tend to conceal the small number of students who were very anxious about the field class and who did not enjoy it socially or academically. Follow-up interviews were not undertaken with such students, partly because the anonymity of the questionnaires means the students are not necessarily known. It would certainly be useful to try to understand why some students expect to, and do, find the experience a poor one (Nairn *et al.*, 2000).

Lastly, although this is a UK-based study arising from concerns built up amongst the authors while teaching at UK universities, similar concerns regarding the value and role of fieldwork are reported from research outside the UK (Nairn *et al.*, 2000; Hyndman, 2001; Salter, 2001, 2002; Zelinsky, 2001), and from other disciplines (Bonello, 2001), suggesting that the outcomes of this research have generic implications beyond the UK and GEES disciplines.

## **Conclusions**

The implication of this research is quite clear. Fieldwork in geography, earth sciences and environmental sciences is successful in stimulating effective approaches to learning, regardless of age, gender or social background. Furthermore, fieldwork appears to be a powerful tool for social integration, boosting students' confidence in working with their peers and developing skills that are transferable beyond the course. Such integration may well play a role in student retention (Salter, 2001). There are two caveats. Almost a third of

students surveyed were apprehensive before a field class. The fact that only 5 per cent of students did not enjoy the field class suggests the apprehension is not warranted, so perhaps field-class leaders should consider ways of mitigating apprehension (Nairn *et al.*, 2000). While students taking a field class during induction before their degree programme starts appreciate the social benefits of the class, they may not fully appreciate the educational benefits. Overall, this research indicates that fieldwork is indeed good.

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## Notes

- <sup>1</sup> SENDA refers to the Special Educational Needs and Disability Act legislation introduced within the UK affecting access to education.
- <sup>2</sup> The original questionnaires together with a Microsoft Access™ database containing anonymous student responses can be accessed at: <http://www.gees.ac.uk/projtheme/pedres/pedresfw/pedrfig.htm#Outputs>

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