What Contribution Can Residential Field Courses Make to the Education of 11-14 Year-olds?

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Brief description of article

Residential fieldwork can have a number of benefits for science education but teachers need to plan how to maximise these

Abstract

In this article we evaluate the effects that residential field courses had for 428 KS3 (11-14 year-old) students from 10 London schools in 2004. Teachers and students reported that levels of motivation and participation were very high, particularly where activities were adventure-based rather than purely academic. Many students surpassed their own expectations of achievement during the courses, and both students and teachers felt that the general levels of trust in others and the self-confidence shown by the students on the courses were higher than in school. Teachers were very impressed overall by the development of teamwork skills amongst the students and the vast majority of students maintained or built positive relationships with each other, with teachers and with centre staff. However, although students generally recognised that they had used or learnt new subject-specific skills, few teachers had planned how to monitor the effectiveness of the learning opportunities or how to follow them up in the longer term.

Key words

Informal learning, residential field work, personal/social impact

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5097

Learning science outside the classroom

There have long been enthusiasts for learning school science outside the classroom and in many secondary schools the ‘biology fieldtrip’ has existed for decades. Although concerns have been expressed that fieldwork is declining (Lock and Tilling, 2002), the last decade or so has seen a renewed interest in learning science outside the classroom and this has manifested itself in a number of ways (Braund and Reiss, 2004). For one thing, there has been a very considerable growth, not just in the UK but in many other countries too, in the educational role of such out-of-school sites of science learning as museums, science centres, zoos and botanic gardens.

In addition, organisations such as Learning through Landscapes (http://www.ltl.org.uk/) have helped many schools to develop the educational potential of their school grounds. Indeed, even back in 1955 the Department of Education & Science was exhorting schools to improve their school grounds for educational uses (Department of Education & Science, 1955). Things have moved on a pace since then and in July 2002 the House of Commons Select Committee on Science and Technology called for fieldwork to be strongly recommended in all 14-19 science courses (House of Commons Select Committee on Science and Technology, 2001).

The training of teachers, in science and other subjects, has now begun to catch up with these developments. Since September 2002 one of the standards for the award of Qualified Teacher Status expected of all trainee teachers in England and Wales is:

> As relevant to the age range they are trained to teach, they are able to plan opportunities for pupils to learn in out-of-school contexts, such as school visits, museums, theatres, field-work and employment-based settings, with the help of other staff where appropriate,
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> (Department for Education and Skills, 2002/3, p. 10. Standard 3.1.5.)

However, the benefits of fieldwork, including residential fieldwork, remain unclear. This study examines what these benefits might be in the context of

an initiative to provide residential fieldwork to 11-14 year-olds from across the socio-economic spectrum.

The 2004 London Challenge Residential Initiative

The 2004 London Challenge Residential Initiative offered 51 schools from the London boroughs of Hackney, Haringey, Islington, Lambeth and Southwark the opportunity to take a group of Key Stage 3 students (11-14 year-olds) away on a fully-funded residential course at a designated rural field study centre in the UK or Eire. The Field Studies Council (FSC) had developed a wide range of curriculum-linked (science, geography, PE) and eco-adventure courses after extensive consultation with schools (FSC, 2004a; 2004b) and with the backing of London Challenge (the Excellence in the Cities coordinator for the Department of Education and Science (DfES)).

We were commissioned to evaluate the initiative and in our evaluation we used a framework of questions that derived from Rickinson *et al.* (2004) who proposed four possible areas of impact that outdoor learning might have:

- **cognitive impacts** – concerning knowledge, understanding and other academic outcomes
- **affective impacts** – encompassing attitudes, values, beliefs and self-perceptions
- **interpersonal / social impacts** – including communication skills, leadership and teamwork
- **physical / behavioural impacts** – relating to physical fitness, physical skills, personal behaviours and social actions.

The meta-analysis of Rickinson *et al.* (2004) also concluded that there is a lack of UK-based research into: young people's fears and concerns about outdoor education, teachers' aims for, and students' experiences of, outdoor learning in all its kinds, teachers' and educators' conceptions of the 'outdoor classroom' and science-based fieldwork particularly at secondary school level.

Methodology

Thirteen courses with 428 students from 10 London schools (two from each of the five boroughs) were studied. The students were asked to complete a two-sided A4 questionnaire, with both open and closed questions, before and after the course. The questionnaire (available from us) examined attitudes to relevant subjects in school (science, geography, PE) as well as expectations for and feelings about the course. The questionnaires were distributed and collected by the lead teacher in each school. The intention was to give students time to reflect upon going on and returning from the course.

The lead teachers were interviewed before and after the course. The first interview was conducted over the telephone and its purpose was to establish the teacher's understanding of the programme of activities as well as their expectations for impacts on the pupils. The second interview was conducted at school, one to four weeks after the end of the course, and concentrated on the impacts with reference to Rickinson *et al.* (2004), as well as the expectations set out by the teachers in the first interview.

In five of the schools a small focus group of students was interviewed one to two weeks after the course. The questions concentrated on impacts with reference to those proposed by Rickinson *et al.* (2004). The students were in small groups of females and males (between three to six students in each group). The questions used were closed and similar to many of those asked of the teachers. All interviews and focus groups were audio-taped and transcribed.

For each of three schools a visit of between one and two days was made to the centre during the course and field notes and photographs were taken.

Course descriptions

The courses sampled in this study were run at five FSC field centres in England, Wales and Eire. Schools were offered two types of course. The first type was more curriculum-focused. Two courses were entitled *Gifted & Talented* (one geography-based; one science-based), one *Real Science* and another a *SATs Booster.* These four courses focused on ecology or geography (which included much that science teachers and science educators would recognise as earth science) in the field and made some or considerable use of time in the field centres' classrooms or laboratories to initiate or review learning activities. Two of the science-based courses were at FSC Nettlecombe, set on the edge of Exmoor. Students studied freshwater habitats, identified small mammals and plants in local woodlands and visited nearby Porlock Bay to examine coastal erosion. On the third course at FSC Orielton on the Pembrokeshire coast, the focus was on seawater ecology. For example, students learned how to investigate and build a profile of plant and animal life on a rocky shore. There was a great emphasis on the students working in groups, learning to observe, collect and record data and to ask questions about the environments that they were in.

The second type was described as *Eco-adventure,* with an emphasis on physical activities such as climbing, shelter-building and rafting-making, intended to foster team building and problem-solving skills. Nine of the 13 courses we studied were of this type with little or no time was spent in the classrooms / laboratories at the field centres. Instead, opportunities for science experiences during these courses arose informally. Course tutors guided students on walks and night hikes, drawing their attention to features of the woodland, river valley and coastal environments through which they were passing. These features included plant and animal life, weathering and erosion effects and historical human impacts on the environment. The tutors often presented the students with stories of the local areas to engage them. Students also learnt about sustainable living (modelled extensively at all the FSC centres).

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Findings

General feedback from the teachers

The overwhelming feedback from all 13 teachers involved in the courses was very positive. One described the opportunity to take *difficult students from challenging backgrounds away on a residential course [as] invaluable [with] the potential to change things*. [Throughout, *italics* indicates the original words of teachers / students; square brackets indicate material added by us.] All 13 teachers were explicit in their praise for and appreciation of the experiences gained by the students at each centre. One stated that *the centre experience enabled students to understand the relationships between human impacts on the environment, the history of the area and conservation issues in a far more accessible way than at school*. Several felt that *the course was a great opportunity for students and teachers to work together in a more relaxed, open way*. One celebrated the fact that the course had *enabled us to see a great potential in inner city kids which is often not so apparent in school*. One teacher described an immediate effect back at school, saying *things are very different with difficult kids now they are back. They are sitting (in class) right in front of me, getting on, encouraging others. Other staff have noticed a difference*. Another hoped that *London Challenge might make it possible for every student in a year group to have this experience – imagine the possibilities*.

More detailed feedback from the teachers can be seen using the four potential types of impact identified by Rickinson *et al*. (2004).

Cognitive impacts

All 13 teachers identified learning opportunities on the course within the national curricula for science, geography or PE. The most frequently cited were within activities that enabled students to learn about ecology, geology,

human use of land and team building (specifically in PE). However, 10 of the teachers were unable to give specific examples of knowledge or understanding gained by students, as they did not focus on or record detailed learning outcomes during the courses. The exceptions were the teachers of the group at Rhyd-y-creuau where detailed worksheets were provided for each activity on which students wrote descriptions, and recorded and analysed data. The accompanying teachers (two geography and one science) had planned the course with the centre tutors and contributed greatly to the taught sessions.

Students on the two *curriculum* courses at Nettlecombe wrote extensive notes about the ecology they were about to experience while a course tutor presented the science underpinning each activity. Students then recorded results / findings on individual worksheets on returning from the field. The students on the other science course and the geography course recorded observational data. Indeed, at key points on all the courses, students were required to read instructions, gather information and use other resources (such as maps) linked to activities and thereby to develop literacy and numeracy skills. Students in two groups wrote in journals at the end of each day.

Four teachers specifically commented on the positive effect the *hands-on*, active learning style had on the engagement and learning of students and suggested that *learning was more effective because of this practical approach*. The emphasis on adventure activities into which learning opportunities for ecology / geography were woven was mentioned by several teachers as a very important factor: *the trip was not sold as geography or science, but as adventure to the students so there was less resistance to the academic parts*. Students were mostly observed working in a focused and purposeful way throughout classroom / laboratory sessions (Figure 1). However, the teachers with two groups were concerned that sessions were too long at some points during their courses so that students' levels of concentration were not sustained throughout.

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Figure 1 Students working purposefully in the science laboratory at Nettlecombe.

Only one teacher planned to use work carried out on the course directly back at school. Another teacher wanted to build upon teamwork skills in PE using examples from the course. Most other teachers could identify opportunities to link the work to the science / geography curricula but were a little unclear about how they would pursue this saying, for example, *I will let the science department know what we did*. However, no teacher had a clear, purposeful plan of how to monitor the longer-term benefits of the knowledge and understanding that the students may have gained during the course or of how it might be measured. This was possibly as a result of courses being booked at short notice. Some referred tentatively to GCSE results as a possible indicator. Accordingly, the actual longer-term cognitive impacts of the courses on the students will be difficult to assess.

Only two schools did any preparatory academic work before the courses. One of these schools conducted some ecology lessons; another did a small amount of introductory geography work. In fact, several teachers advocated the element of surprise / anticipation inherent in taking students away to learn and did not want to dilute that by preparing activities at school.

Five groups had asked / were planning to ask students to contribute to displays, newsletters and presentations in assemblies or simply to write an account of their experiences back at school. Two groups of students were awarded participation certificates.

Affective impacts

Teachers reported that students' attitudes towards participation in the activities were very good. Six felt that *it was markedly different there. More students were more willing, more active*. *There was a much higher level of motivation.* Others reported that *the students' enthusiasm was just as strong as in school.* Students received *an immense boost to their self-esteem and confidence when they realised they were achieving well alongside those who normally do so more visibly at school*. One Head of Year in a second interview noted that *several students had re-identified themselves within their classes back at school and were now seemingly far more confident amongst their peers*. Students' attitudes to being in very rural environments were generally extremely positive.

Interpersonal and social impacts

Nine teachers noted that students' *levels of trust in one another improved over the course*. Generally, students readily accepted that rules were necessary for safety, success and respect. Eleven of the 13 groups were made up of students who did not necessarily know each other well before the trip, although very rarely did a student not know anyone else. All teachers observed new friendships being formed among students and one Head of Year noted in the second interview that *students are subsequently interacting back at school and the trip has initiated this*. She hoped that the group will *infiltrate* the whole year and foster better relationships generally as students move into Year 9. Teachers were extremely pleased with the development of teamwork skills that *students negotiated whereas they wouldn't in school*.

Most teachers felt that the impacts on males and females were very similar on the courses. Two teachers were pleased to report that usually dominant boys were *more co-operative than at school*. Males who were not considered to be the most vocal / dominant were seen being much more active. There were

also friendlier, more open interactions between males and females than at school. Three teachers felt that some girls had demonstrated *better organisational / leadership skills at key moments than boys*, often leading to more successful outcomes. No other particular groups, such as ethnic minorities, were seen as having experienced different impacts. Two teachers mentioned that for cultural or religious reasons some students, particularly girls, would not attend residential courses at all.

Physical and behavioural impacts

Two teachers felt that most of the students were physically fit, five that the fitness varied across the group and two (one of whom was a Head of PE) that they were not very fit. All students could access all the activities, although teachers reported that some overweight students found the walking difficult and a few struggled with climbing. Difficulties with walking may have been partly due to lack of motivation as some of the same students performed very well over the same distance during orienteering.

Teachers were generally pleased with the emphasis on developing key physical skills. They cited *surfing, canoeing and horse riding* as *very popular activities* and they felt that *stamina, balance, swimming and upper body / arm strength were all developed in specific sessions*.

Teachers reported *many examples of students surpassing their own expectations of what they might be able to achieve during key activities*. Many of the water-based activities were a big challenge for some. *Almost without exception, students did achieve success and received an enormous boost to their self-esteem*.

Most teachers recognised that *where there had been a combination of academic / adventure activities, students appeared to have enjoyed the adventure ones more*. All teachers commented that *students' behaviour was as good as, and often better than, at school*. There were some minor behaviour problems but most were dealt with quickly.

General feedback from the students

Three hundred and ten before questionnaires were received from 11 groups and 203 after questionnaires from 11 groups. Only 8 of the 13 groups returned both before and after questionnaires. Many students did not complete all the open response questions in either the before or after questionnaire and a very small number of students ticked only one column for almost every question. Information has been aggregated to describe the overall findings as no school managed to provide complete sets of data for every student.

A t-test comparison was applied to each of the closed questions, for females and males separately, to ascertain whether the courses had significant impacts on their attitudes towards science, geography, PE and so on. Most of the values of t revealed no significant difference. Only one of the comparisons for boys and five for girls have before and after means that differ significantly at the $p < 0.05$ level (i.e. there is at most a one in twenty probability that the difference could be due to chance). The overall shortage of significant changes may be due to the fact that the mean scores before the students participated in the courses revealed that they already felt generally positive about their abilities and generally confident about the trip.

On one course, girls felt more confident about participating in group work after the course, realising that listening skills are more important than they had previously thought. On another course, girls felt that they had become more effective members of a team in sports and were more confident in new places but felt that listening well was less important than they had previously thought. On one course, the boys actually said after the course that they enjoyed geography less than before but this may have been due to their not appreciating the connection between school subjects and the eco-activities at the centre. The girls on one course, however, now felt more confident in new places.

The answers to open questions have been used to provide overall quantitative data on the expectations for and impacts of the courses. The data for the specific, curriculum-focused questions have been collated as appropriate for each type of course. The percentage values quoted are based upon the number of questionnaires received and, where applicable, upon the number of responses made to each question.

The overwhelming response of the students participating in all courses was very positive. Ninety seven percent of students who responded stated that they had enjoyed their course (although 11% of these had a least one reservation). Eighty three percent would definitely go on a similar trip again – *I'd love to go again* – and a further 10% would go if some changes were made. Suggested changes included *better food, choosing their own room, more free time, less school work.* Many students welcomed the opportunity to *do new things, be in nature, to get to know people in school better*. They described the courses as *brilliant / amazing / wonderful, the best school trip ever, a great time, fun, interesting and educational, I will never forget it.* Students in one group expressed the most doubt about going on another trip, most citing *too much work* as the main reason. This may have been as a result of the course taking place after the end of the summer term.

More detailed feedback from the students is summarised below within the four impacts defined by Rickinson *et al*. (2004). Comparisons have been drawn, where possible, between student expectations before the course and how they felt afterwards. While the main interest, for many science teachers and educators, is likely to be on the cognitive impacts of field courses, affective, interpersonal / social and physical / behavioural impacts are important for a number of reasons, not least because the evidence suggests that unless these impacts kick in, cognitive expectations are not met.

Cognitive expectations and impacts

Before the courses, about 7% of students were looking forward to *learning new things.* After the courses, students were asked to describe their two best

memories of the experience. Only 1% of responses referred to learning something new. Beforehand, the majority of students (76%) were able to describe at least one skill or area of knowledge from geography, science or another appropriate curriculum area that they might need to use on the trip. The examples given included *map and compass work, orienteering, ecology, experiments, investigations and observations.*

Over half (56%) could suggest at least one new area / skill that they would learn about *map skills, orienteering, the environment / science outdoors, animals / plants.* On the four curriculum-focused courses, students were often more specific: *identification of animals, setting mammal traps, habitats, freshwater animals, coastal erosion, mapping and navigation.*

After the courses, 78% described at least one skill or area of knowledge from geography, science or another appropriate curriculum area that they needed to use, and examples closely matched those that they had expected: *map work, ecology, orienteering.* Some new areas emerged including *rocks / fossils*, *classification* or *chemistry* for some groups.

Students in one group were observed carrying out a freshwater ecology study at Nettlecombe (Figure 2). Initially, the small stream to which they were led in the grounds visibly unimpressed them. However, when it brought forth a great variety and number of invertebrates and fish they were totally enthralled. The extent to which they were able to observe and classify the animals was in dramatic contrast to the work that they would probably be able to do in their school laboratory in London. Several students did not want the activity to end.

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Figure 2 Freshwater ecology at Nettlecombe.

The following are a sample of science-based questions asked of the students who went to FSC Rhyd-y-creuau in North Wales before and after their experiences:

1. If you can, describe how soil is formed.
Only seven appropriate responses were made before the course, talking about, for example, *decomposed things, erosion* and *weathering*. However, after the course 13 appropriate responses were given.

2. What effects might a river have on the landscape?
While all the students could give a suitable response before the course using terminology such as *erosion* and *fertile land*, after the course, more specific, geological terms such as *abrasion, U-shaped valleys* and *transport* were apparent in answers.

3. In Snowdonia, where you are going / have been, how were many of the mountains formed?
Only four responses were given before the course, citing three factors: *plate collision, during ice age* and *glaciers.* Afterwards, there were 19 responses, citing five factors: *glaciers, plate tectonics, volcanoes, mountains was initially under the sea* and *land was initially under the sea*.

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This suggests that by the end of the course, students had gained more knowledge about these earth science learning outcomes.

Affective expectations and impacts

Eighty five percent of students stated that they generally felt positive before going on the trip about going on it, making such comments as *I feel very excited*, *I feel great / good*, *I can't wait*, *I feel (very) confident*. Nine percent felt neutral and 6% expressed some reservation: *I feel a bit nervous / scared / anxious*.

When asked before going on the tip if anything worried them about it, 53% of students expressed a specific concern such as *I'm worried about not being able to do things / getting lost / getting hurt / the long journey / insects* and *spiders / animals*. Very few (four) students were specifically worried that they might not be safe. After the course, 41% of students stated that there had been a specific problem during the trip such as *argued with friends, strange food, fell off [something], couldn't climb, didn't want to wear cold wetsuit, bus late after surfing, was ill, lost something, bitten by midges, rained too much, students from other places were rude, foul smells, problem with room / showers, journey too long.* Of these, about half felt that some solution had been found where that had been possible.

Interpersonal or social expectations and impacts

The vast majority of students could suggest examples of the factors needed to promote effective teamwork with *co-operation, listening well, good communication* and *being friendly* constituting about 80% of the ideas. A smaller number cited *respect, agreement / no arguing, practical / logical, ability, leadership, positive encouragement, good behaviour, concentration* and *a sense of humour / fun* as contributing factors.

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Eight six percent of responses after the course suggested that teams had worked well together the whole time (see Figure 3) with a further 7% describing effective teamwork as happening *sometimes*. The most important success factors observed by the students were *listening well, co-operating, helping / supporting one another*, which matched well with those expected.

Figure 3 Team building at Castle Head.

Physical or behavioural expectations and impacts

About 80% of the students were aware that they would be learning new physical skills such as *surfing, canoeing, climbing* and *horse riding* but 16% could not identify any and a small proportion (3%) thought that they would not learn any new skills. After the course, 66% identified a new physical skill that they had learned such as *climbing, horse riding, canoeing, surfing* or *hill walking*, and several mentioned improving skills in football and building stamina. A few students felt that the hill walking had been an unwelcome challenge: *why did we do the walk?* However, others (Figure 4) were actively engaged in observing geological features, listening to the history of land use as well as noticing social implications of living in rural areas: *I can't believe that guy has left his car window open, that kid has just left his bike outside!*

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Figure 4 Climbing Snowdon.

Discussion and recommendations

Residential fieldwork has great potential to enhance learning in school science and other subjects. In this study the teachers readily acknowledged the opportunities for academic learning. However, although students generally recognised that they had used or learnt new subject-specific skills few teachers had planned how to monitor the effectiveness of the learning opportunities or how to follow them up in the longer term.

Both teachers and students reported that levels of motivation and participation were very high, particularly where activities were adventure-based rather than purely academic. In a number of cases the second interviews with the teachers showed that these positive effects had continued back in school. This ‘diffuse’, non-subject-specific effect of residential fieldwork will likely ring true to anyone who has run residential trips but probably needs further investigation.

Several teachers noted that students’ self esteem was boosted during challenging activities, especially for students who are more reluctant to take part in school-based work. Many students surpassed their own expectations of achievement during the courses, and these achievements were often highlighted in their feedback.

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Students and teachers felt that the general levels of trust in others and the self confidence shown by the students on the courses were higher than in school. Teachers were very impressed overall by the development of teamwork skills amongst the students and the vast majority of students maintained or built positive relationships with each other, with teachers and with centre staff.

Based on these findings we propose the following recommendations for undertaking residential, science-related fieldwork with 11-14 year-olds:

- Teachers need to liaise fully with residential course staff and tutors to plan the content of courses effectively for their students.
- Curriculum-based activities need to be balanced with adventure and/or social activities to ensure that student motivation is high. For example: a rock-climbing activity might precede an investigation into weathering and erosion; students might design and build a raft after examining the ecology of the river nearby. The 'story' of the science of the local area then begins to make more sense.
- After a course, work back in school needs to build on the science that has been learnt on the course. Much that is learnt on fieldwork courses can easily be woven into units of ecology and earth science at KS3 for Years 7, 8 or 9. This includes looking at a wide range of habitats, at food webs and at the rock cycle. As science teachers and educators we can also learn from our geography colleagues and use fieldwork to promote Sc1 skills in preparation for KS3 SATs and GCSE coursework.
- Contact with and feedback from parents is useful to assess the impacts of courses. Parents can also explain the cultural / religious implications of residential visits which are important for some families.
- More work is still needed to assess the longer-term impacts of fieldwork.

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