Education 3-13: International Journal of Primary, Elementary and Early Years Education

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/rett20

A potential value of familiarity and experience: can informal fieldwork have a lasting impact upon literacy?

Graham W. Scott [a] & Margaret Boyd [a]

[a] Department of Biological Sciences, University of Hull, Hardy Building, Hull, UK

Version of record first published: 23 Oct 2012.

To cite this article: Graham W. Scott & Margaret Boyd (2012): A potential value of familiarity and experience: can informal fieldwork have a lasting impact upon literacy?, Education 3-13: International Journal of Primary, Elementary and Early Years Education, DOI:10.1080/03004279.2012.731418

To link to this article: http://dx.doi.org/10.1080/03004279.2012.731418

Education 3–13
2012, 1–11, i*First* article

Routledge
Taylor & Francis Group

A potential value of familiarity and experience: can informal fieldwork have a lasting impact upon literacy?

Graham W. Scott* and Margaret Boyd

Department of Biological Sciences, University of Hull, Hardy Building, Hull, UK

(*Received 30 March 2012; final version received 15 May 2012*)

This paper demonstrates that an informal field trip can have a lasting impact upon aspects of learning in a primary school context. Specifically, we consider the longer term impact of an informal trip to a rocky shore upon scores achieved in literacy assessments taking place five months after a relevant five months after a fieldwork. Pupils provided with an opportunity to write about organisms that they had encountered during the field trip and with which they were therefore familiar achieved higher literacy levels than those children writing about less familiar animals that had not been encountered during fieldwork. Specific improvement in the ability of the children to use specialised vocabulary and elaborated descriptive were recorded. Our work adds to the growing body of research evidence that demonstrates the benefits of outdoor learning experiences focused upon ecology/biology across the wider curriculum.

Keywords: fieldwork; out of classroom learning; literacy; ecology

Introduction

A trip to the seaside to do some rock pooling has for a long time been the basis of a day out during the summer term for primary school children. But does this kind of informal fieldwork offer a benefit beyond having fun? In this paper, we explore the possibility that such activities may have a lasting cognitive impact.

There is a general belief held by ecologists and many biologists that fieldwork is an essential component of any science course delivering ecological concepts (Lock 1994; Nundy 1999; Tilling 2004; Scott et al. 2012). Examples of motivation and interest being directly affected by a fieldwork experience have been reported by several workers. For example Randler, Ilg, and Kern (2005) have shown that secondary school students who had carried out an environmental conservation task related to the preservation of migrating amphibians benefitted from hands on experience and performed significantly better on post-task achievement tests. Hoese and Nowicki (2001) found that first year college students who made a personal study of a particular organism or small group of organisms, as part of an introductory biology course, demonstrated a positive interest in biology. These students also reported a self perception that this process of active learning resulted in greater retention of information. Prokop, Tuncer, and Kvasničák (2007) found that 11/12-year olds who had taken part in a one day field trip demonstrated a higher level of

*Corresponding author. Email: g.scott@hull.ac.uk

ISSN 0300-4279 print/ISSN 1475-7575 online

http://dx.doi.org/10.1080/03004279.2012.731418
http://www.tandfonline.com

ecological knowledge when compared to a control group who received only classroom-based instruction. So the active involvement in learning which fieldwork permits enables higher levels of engagement and as a result deeper learning (Laevers 2000). When combined with personal interest, fieldwork acts as a motivator for learning, promoting the desire to learn for its own sake and therefore enhancing cognitive engagement (Stokes and Boyle 2009). Nundy (1999) showed that fieldwork has a marked impact on higher order skills and promotes both subject motivation and self motivation. He also suggested that the novelty of fieldwork, being in an unusual location with unfamiliar organisms, provides pupils with a unique opportunity to deal with uncertainty. Waite (2007) suggests that actual, tangible contact may be important for memorability. Outdoor experiences are thought to be particularly effective in the production of 'good' memories (e.g. Chawla 1999; Berryman 2000). Primary school children interviewed by Waite (2007), following a school trip, commented that things they were able to actually see and possibly touch, made them 'real' and this kind of memory episode highlights the importance of the outdoor experience, aiding recall and subsequent links to knowledge learnt during the fieldwork activity. Farmer, Knapp, and Benton (2007) studying the long term effects of a field trip found that pupils remembered the experience and the activities undertaken and that the field trip presents an 'active' learning experience which helps episodic memory, which then gives rise to a base to hang other semantic memory on. In a study by Maynard, Waters, and Clement (2011) working with practitioners in the Foundation Phase framework (Framework for children's learning for 3–7 year old in Wales), observational data appeared to show the cognitive challenge of outdoor activities to be higher than those that took place indoors and that the practitioners involved were more likely to support child initiated learning (a key element of Foundation phase), if working outdoors. Thus, the conclusions from the range of studies point to the acknowledgement that pedagogies involving direct contact with the environment will result in positive cognitive and affective learning.

Yet despite this, fewer children are being taken outside to learn. Fisher (2001) who conducted a survey of 30 secondary schools in the United Kingdom found that half of them did not provide their key stage 3 pupils with an opportunity for fieldwork. Similarly, Waite (2009) noted a sharp fall in outdoor opportunities for learning particularly from age 6, in her study of outdoor learning provision for 2–11 year olds in Devon. Research carried out by O'Donnell, Morris, and Wilson (2006) showed that visits to the natural environment were less common than trips to urban and manmade sites. Reasons for this decline in the quantity and quality of fieldwork that is provided within the UK have been thoroughly discussed (Barker, Slingsby, and Tilling 2002; Rickinson et al. 2004; Waite 2009) and can be attributed to a number of factors such as cost, risk, teacher experience and curriculum over-crowding (O'Donnell, Morris, and Wilson 2006). Recent work carried out by Maynard, Waters, and Clement (2011) reveals that Early Years Phase practitioners remark positively on the benefits of outdoor learning but still fail to go outside to make use of the outdoor environment. This confirms the view that barriers to fieldwork persist and suggests that perceptions of the value of fieldwork are often not sufficient to overcome them. The practitioners involved in the project carried out by Maynard, Waters, and Clement (2011) saw 'real work' as taking place inside the classroom. There is clearly a need to demonstrate to practitioners that fieldwork not only has a subject specific value but that it has an impact upon the wider curriculum:

an added value. A call for more research evidence to support the value of fieldwork in terms of cognitive benefit, both in terms of ecological concepts and within the wider curriculum has been made by a number of authors (e.g. Rickinson et al. 2004; Dillon et al. 2005).

Current practice and culture in the UK education system is target driven, and there is continued pressure upon primary school head teachers to meet and improve their school's numeracy and literacy targets in light of the outcomes of the Office for Standards in Education, Children's Services and Skills inspection regime. Because ecological fieldwork is often seen primarily as a means by which elements of the science curriculum may be delivered, rather than as a vehicle for the delivery of the wider curriculum, participation in fieldwork activities may not currently be seen as being sufficiently directly related to national targets to make it a priority in some school settings. But can a fieldwork experience benefit pupils in other aspects of the curriculum and therefore persuade more non-science practitioners to let their pupils experience living things through outdoor learning? In a study in which a class of primary schoolchildren (9–10 years old) undertook experiential, inquiry led fieldwork on a rocky shore, Scott et al. (2011) found a significant improvement in their ability to write about the ecology of an animal that they had encountered firsthand when compared to an animal that they had not encountered. Hapgood and Palinscar (2006) in their work with 4th and 5th grade pupils learning literacy through science, recorded significantly higher levels of student achievement in formal writing tests, as well as a more positive attitude towards both science and reading. This supports the personal observations of practising teachers recounting the positive efforts of their pupils in terms of their own writing about an organism encountered in the field and demonstrates that 'learning about the world and sharing one's own discoveries can be powerful motivators for learning to read, write and speak effectively' (Hapgood and Palinscar 2006). These studies focus on the short term benefits of an experience of out of classroom learning, but can these benefits be maintained? The broader aim of this current project is to add to the body of research evidence needed to evaluate the educational impact of fieldwork that was called for by Rickinson et al. (2004) by investigating the longer term effect of a short field visit on aspects of literacy levels of year 5 pupils at a large, English primary school. The specific aim of the paper is to demonstrate that after a period of five months, the effect of a short term informal fieldwork experience can be evidenced through an assessment of the pupil's written work. In doing so, we consider literacy in a broad sense and focus particularly upon the deliberate use of specialised vocabulary and elaborated descriptions via the use of adverbial expanded noun phrases.

Methods

The pupils involved and the fieldwork experience

This research involves 85 year 5 (9- and 10-year olds) pupils from three classes. School policy is to allocate pupils to classes to achieve a balance across the year group of mixed ability classes. No attempt was made by us to manipulate the composition of these classes. We can be confident that range of abilities of the children in each of these classes were broadly similar because a comparison of the median literacy scores (standard teacher assessment) of the children of the three classes confirmed that no class level differences in literacy existed at the time of our project (Kruskal–Wallis analysis $K = 0.157$, $p > 0.05$). Nor was there any difference

in median teacher assessment of the children comprising our two experimental groups of children who were asked to write about either rock pool or pond animals (see below) (Mann–Whitney U test $p = 0.6$). For this reason, the analyses presented in the remainder of this paper are focused upon a comparison of two groups of children, one group who completed written work on pond organisms and a second group who completed written work on rock pool organisms (rather than a comparison of the children from three different classes).

As part of the routine activities of their school, the children had (towards the end of year 4) taken part in a field trip to a local rocky shore where they used basic field equipment (hand lenses, nets and buckets) to investigate rock pools and the organisms found in them. Organisms were identified with the aid of field guides and the knowledge of the accompanying teachers and adult helpers but little formal tuition was given to the children. The objective of the trip was to enjoy the experience of a novel habitat in an informal way, and to spend time investigating the organisms that could be found.

To test the longer term impact that such a fieldwork experience has on children of this age, in terms of their gains in scientific knowledge and the enhancement of their writing skills when describing a familiar organism, these children were enrolled as participants in the research that is the subject of this paper. This project had ethical approval from the relevant ethics committee of the University of Hull.

Post-fieldwork assessment

To measure the longer term impact of the informal fieldwork experience, a period of five months was allowed to elapse and the children (by now in year 5) were each asked to complete a single written exercise ($N = 85$) designed to enable us to evaluate their literacy skills when writing about an organism and aspects of its ecology; the adaptations it possesses which enable it to survive in its habitat, the features of that habitat and the feeding relationships of the organism. The children of one class ($N = 28$) completed a task featuring rock pool animals. Their task sheet was similar in format to tests issued as part of the UK national assessment system – (SATS) with which children are familiar. The task sheet presented the pupils with a choice of four photographs of living things found in a rock-pool; anemone, shore crab, limpet and periwinkle. The activity asked them to write a short description of one of the organisms. They were asked to describe the adaptations of the organism to its habitat, to describe its habitat and to describe the organism's feeding relationships within the habitat. The four organisms featured in the photographs had been encountered by the children on their trip to a rocky shore. The children of a second class ($N = 28$) were given task sheets which featured four pond organisms; dragonfly larva, water boatman, pond snail and midge larva. The pond is a habitat with which they were less likely to be familiar and of which they had not, to our knowledge, had firsthand experience. The written task asked them to write a short description of one of the organisms as described above. The children of the third class ($N = 29$) were presented with a choice to enable us to test the hypothesis that children would choose a familiar organism. Their sheet included two rock pool organisms (limpet and anemone) and two pond organisms (dragonfly larvae and midge larvae). To complete the task, children in all classes were asked to explain (in writing) why they chose a particular

organism. The reasons for choosing a particular organism were analysed and grouped according to similar responses.

The task lasted 20 min and the written work was carried out independently. The children were encouraged to ask for direction about the aim of the task if they required it but they were not told anything about the animal that they had chosen. Children with special educational needs were assisted in the writing process following the standard support practices of the school. The resulting written work was assessed via APP (Assessing Pupil's Progress), a structured approach to assessment (linked to the UK National Strategy) which enables teachers to assess pupil's work in relation to assessment criteria benchmarked against national standards (National Literacy Strategy 1998) resulting in a level score. By this assessment protocol, attainment in literacy is measured on a 1 to 5 scale where a level 5 is the usual upper limit at UK primary schools (IE is used to indicate work of insufficient evidence to attribute a level 1, see below). Within each level there are sub-levels; c, b and a, where c is lower than b, which in turn is lower than a; for example work being awarded a level 4a is of a higher standard than work awarded 3b.

To attain a particular literacy level, pieces of work are judged against criteria laid out in eight different assessment focuses (AF) which look at different aspects of the written work. For example, AF 1 considers the use of descriptives, AF 7 considers the use of vocabulary and AF 8 looks at actual handwriting. Work must be judged to be at a particular level (e.g. 3b) in all eight foci for that level to be awarded.

To ensure consistency all assessment was carried out by one of the authors (MB). To ensure reliability, MB and eight primary school teachers from a number of schools (who were not involved in the project) worked together to standardise the assessment process and in addition each of the three classroom teachers involved in the project were asked to mark five pieces of work which were compared to the assessments made by MB. As a result of this careful benchmarking, no moderation of marking was required.

AF1 and AF7; descriptive detail and appropriate vocabulary

In the context of this work, two of the assessment foci for two of the strands of the APP structure (AF 1 and AF 7) were felt to be particularly relevant and so were explored in more detail. These foci assess the level to which pupils are able to demonstrate descriptive detail in their writing. The ability to put in more descriptive detail is matched to criteria in assessment focus 1 (AF 1), a secure level 4 (4b) script 'showing some ideas and material developed in detail, e.g. descriptions elaborated by adverbial and expanded noun phrases', this compares to a secure level 3 (3b) writing that shows 'some attempt to elaborate on basic information or events, e.g. nouns expanded by simple adjectives'. For example (from the work of the children):

> A shore crab is easy to tell what it is, it has 6 legs, a round body, it is brown and black and looks like a huge spider (level 4)
>
> It's got two big eyes and a black blob on its back (level 3)

The criteria for achieving secure level 4 (4b) in the assessment focus 7 (AF 7) states that 'written work should show evidence of deliberate vocabulary choices

together with some expansion of general vocabulary to match the topic', whereas level 3 criteria state that 'simple, generally appropriate vocabulary is used, but limited in range, with some words selected for effect'. For example (from the work of the children):

> It's hard, brown shell, camouflages it from the creatures that hunt it – like crabs (level 4)
>
> The pond snail looks like a normal snail except the pond snail can go under a pond (level 3)

Results and discussion

Choice of organism

When presented with a choice, more of the children chose the familiar rock pool organism (17) than the unfamiliar pond organism (12), although this apparent preference was not statistically significant ($\pi^2 = 0.87$, $p > 0.05$).

The children were asked to explain, in their own words, why they chose to write about a particular organism. Their responses may provide some insight into their learning motivations and are grouped under key themes in Table 1.

In interpreting this information, two important points must be borne in mind. Clearly, the most frequently cited reason for choice of rock pool organism was based upon the child having prior knowledge of the organism. However, it is not reasonable to assume that the children did not have prior knowledge of the organism if they did not indicate as much. It is more likely that they simply had another over-riding reason for making their choice. The second important point to make concerns the possibility that our belief that the children had not undertaken pond-based fieldwork is undermined by the fact that a number of children in the pond group do refer to *having prior knowledge* of or *having seen before* as reasons for choice. We cannot discount the possibility that some children had firsthand experience of a pond outside of their school experience but Tunnicliffe and Reiss (1999) have shown that children of various ages are able to recognise and name a selection of common 'types' of animals when presented with a variety of specimens,

Table 1. Pupil's choice of organism.

Reasons for choice	Number of children providing reason	
	Rock pool organism	Pond organism
Know a lot about it (more than others)	15	7
Looked interesting	9	12
Seen one before	4	4
Favourite animal	6	1
Looked easy		6
Looked nice/good	2	3
I have heard of it		3
They are common	3	
Not seen before	2	
Thought it would be challenging		1
Other	3	3
None	1	
Total	45	40

and based upon our observations of the children involved in our project may in fact be doing just that. For example, snails in general are very common in urban terrestrial habitats and we would expect all of the children to recognise them and all four of the children who chose a pond animal because they had seen one before chose the pond snail. However, their descriptions of these snails focused upon colour and shape/anatomy (having a shell or having antennae) for example rather than upon specific features related to an aquatic lifestyle and we feel it likely therefore that their familiarity was with snails *per se* rather than with pond snails in particular.

From Table 1, it appears that children are motivated in their choices primarily in ways which enable them to remain within their comfort zones citing prior knowledge, familiarity, ease and interest as being key drivers for choice. Only one child sought to be challenged and only two chose on the basis of novelty (not seen before). In another paper (Scott et al. 2011), we have suggested that familiarity is important in that it may enable children to better engage with a learning task and similarly Hoese and Nowicki (2001) found that undergraduate students allowed to choose an organism to study demonstrated higher interest levels and achieved better grades. Strgar (2007) has also shown that when primary school children are allowed to work with living plants their interest and motivation are enhanced and academic achievement was higher compared with classmates that were only given photographs of plants to study.

Literacy levels

All pupils were able to write about their chosen organism, only one pupil out of the 85 who took part in the study produced work of a quality below the threshold for an APP standardised level (scored as IE).

Assessing Pupil's Progress-derived literacy scores were ranked by sub-level from low attainment (IE – ranked 0) to high attainment (4b – ranked 8) for statistical analysis. The mean rank achieved by children writing about rock pool organisms ($N = 45$, mean $\pm$ s.d. $= 6.44 \pm 1.4$) was higher than that achieved by children writing about pond organisms ($N = 40$, mean $\pm$ s.d. $= 5.25 \pm 2.1$). The median score achieved by children writing about rock pool organisms (4b) was statistically significantly higher than the median score achieved by children writing about pond organisms (4c), (Mann–Whitney U test, $p = 0.01$). As Figure 1 shows, more children writing about rock pool organisms were able to achieve higher scores.

AF1 and AF7; descriptive detail and appropriate vocabulary

Considering assessment focus AF 1 which credits the use of detailed descriptions, the ability to put in more descriptive detail is seen in a number of the responses written about the rock pool animals, and the use of expanded noun phrases achieves level 4.

> A shore crab has lots of detail on its small shell, it's got very sharp claws, sharp as a blade

> They (limpets) have only a few features that I know of, I know it can stick to the rocks by their slime, I also know it is incredibly hard to pull off a rock, because we have tried before when we went to Flamborough (fieldtrip site).

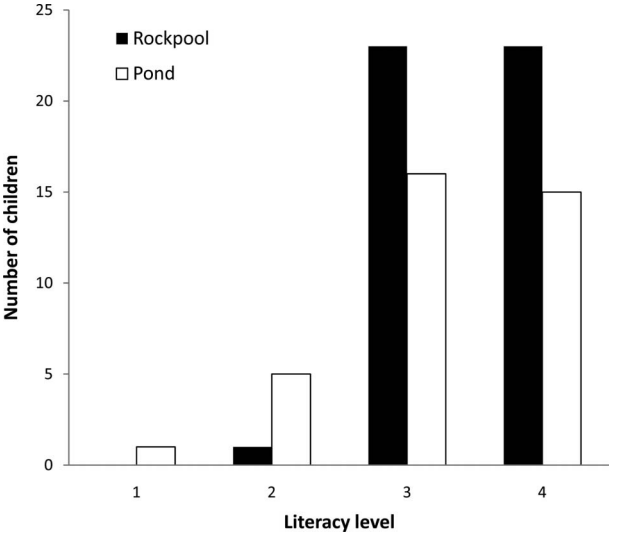

Figure 1. The numbers of children achieving each of the main APP literacy levels.

> They (limpets) stick to hard surfaces such as rock and with their thick, solid, outer shell they can resist contact like rough stormy seas or maybe a clumsy walker

Less complex descriptions were more often seen in the written work about pond animals, where nouns were expanded by only simple adjectives (level 3 AF 1)

> In a pond it is very dark
>
> Dragonfly larvae can move and run fast
>
> He (dragonfly) has big eyes, a little mouth and is small

Topic specific vocabulary is credited in assessment focus 7, where level 4 is awarded when 'work shows evidence of deliberate vocabulary choices together with some expansion of general vocabulary to match the topic'. A number of examples of these were found in the descriptions about rock pool animals:

> To escape from predators and enemies it (beadlet anemone) uses camouflage to hide beneath the sand and rocks that cover the floor of the rock pool.
>
> It (anemone) has short sticky like tentacles which can stick to their prey.
>
> The shore crab uses its pincers at the front to kill its prey, then it eats it.

Using topic specific vocabulary demonstrates greater understanding of the ecological concepts involved when describing living organisms in a piece of writing. This suggests that even 5 months on from a fieldwork experience, the use of a familiar organism is prompting recall of ecological knowledge and adding value to the experience, within a literacy context. Pupils including generally appropriate vocabulary but not being topic specific are only able to achieve level 3 in assessment focus 7 and this was more commonly found in the scripts giving descriptions of pond animals:

They (dragonfly larvae) eat fish and small animals

The shape of the snail is round with a twirl on the end and it is a browny, gold colour.

It (pond snail) eats tiny things on the bottom of the pond.

Conclusion

Familiarity with, and interest in, living things aids motivation for learning which in turn may lead to increased cognitive gain (Stokes and Boyle 2009). Fieldwork allows children to experience living things in their natural environments, so that they not only view organisms in situ but they are able to experience the physical aspects of the environment themselves, making the fieldwork exercise a memorable experience that will aid recall (Waite 2007) and help to contribute to the pupil's knowledge of the organism. Ruddman (1994) has suggested that 'field trips can create relevancy to science classroom learning when connected to the outside world, encouraging science interests' and therefore increasing scientific understanding. Drissner, Haase, and Hille (2010) have shown that through an experience of participation in an outdoor 'green classroom' programme, children developed a greater level of motivation to learn about animals they had found themselves than members of a group of children who had not encountered animals first hand. Similarly Gambino, Davis, and Rowntree (2009) found that following a short excursion to a nature park to find out about the endangered native Greater Bilby, an animal that prior to the trip they knew little about, Australian 4–5 year olds were able to recall detailed information about the animal during later discussions.

Our project has demonstrated that when given a choice, children select familiar and perhaps 'safe' subjects about which to write. Familiarity as a result of the strong positive memories associated with even an informal fieldwork experience is likely to be a particularly powerful aid to learning. That fewer children achieved lower literacy levels in the rock pool task suggests to us that lower ability children in this class are finding ways to access higher literacy levels by their being enabled to write about something that is familiar and that they have experience of, an observation that we have made previously in the context of a short term enhancement of literacy associated with fieldwork (Scott et al. 2011). This longer term (5 months had elapsed) effect of fieldwork upon cognitive learning is significant because such effects are often assumed, but not regularly demonstrated, in the literature concerning the value of fieldwork. It is therefore clear that benefits of that traditional summer term outing do therefore extend beyond having fun and may have wide ranging consequences to children's learning, a view shared by many extolling the values of fieldwork (Dillon 2006; Nundy 2001). So at a time when teachers vie for portions of the curriculum timetable or slices of the budget cake even informal fieldwork and out of classroom learning can be justified not just because they provide an opportunity to have fun but because they can have an additional lasting impact upon wider aspects of learning. This potential effect of using fieldwork experiences to enhance literacy levels might just help reluctant outdoor practitioners to make that bold step and allow their pupils to expand their experiences of the natural world to aid their confidence in their descriptive writing within their literacy lessons.

Acknowledgements

We would like to thank the Esmeé Fairbairn Foundation who generously supported this project, the pupils and teachers of Hornsea Community Primary School who took part in the

project, Dr Lisa Scott, and two anonymous reviewers who provided helpful comments on earlier versions of this paper.

References

Barker, S., D. Slingsby, and S. Tilling. 2002. *Teaching biology outside the classroom: Is it heading for extinction*? A report on biology in the 14-19 curriculum. FSC Occasional Publication 72. Preston Montford, Shropshire: Field Studies Council.

Berryman, T. 2000. Looking at children's relationships with nature from a developmental perspective: Towards an appropriate curriculum. In *Environmental education and the contemporary world, Proceedings of the international congress environmental education and the contemporary world*, 19–20 October 2000, ed. P.J. Fonts and M. Gomes. Lisbon: Instituto de Inovacao Educacional.

Chawla, L. 1999. Life paths into effective environmental action. *Journal of Environmental Education* 31, no. 1: 15–27.

Dillon, J., M. Morris, L. O'Donnell, A. Reid., M. Rickinson, and W. Scott. 2005. *Engaging and learning with the outdoors*. Report of the outdoor classroom in a rural context action research project (NfER). Slough: NfER.

Dillon, J., M. Rickinson, K. Teamey, M. Morris, M.Y. Choi, D. Sanders, and P. Benefield. 2006. The value of outdoor learning: Evidence from research in the UK and elsewhere. *School Science Review* 87, no. 320: 107–11.

Drissner, J., H. Haase, and K. Hille. 2010. Short-term environmental education – Does it work? – An evaluation of the "Green classroom". *Journal of Biological Education* 44, no. 4: 149–55.

Farmer, J., D. Knapp, and G.M. Benton. 2007. An elementary school environmental education field trip: Long-term effects on ecological and environmental knowledge and attitude development. *The Journal of Environmental Education* 38, no. 3: 33–42.

Fisher, J. 2001. The demise of fieldwork as an integral part of science education in UK schools: A victim of cultural change and political pressure? *Pedagogy, Culture and Society* 9, no. 1: 75–96.

Gambino, A., J. Davis, and N. Rowntree. 2009. Young children learning for the environment: Researching a forest adventure. *Australian Journal of Environmental Education* 25: 83–94.

Hapgood, S. and A. Palinscar. 2006. Where literacy and science intersect. *Educational Leadership: Science in the spotlight* 64, no. 4: 56–60.

Hoese, W.J., and S. Nowicki. 2001. Using "the organism" as a conceptual focus in an introductory biology course. *The American Biology Teacher* 63, no. 3: 176–82.

Laevers, F. 2000. Forward to basics! Deep level learning and the experiential approach. *Early Years* 20, no. 2: 20–9.

Lock, R. 1994. Biology – The study of living things? *Journal of Biological Education* 28, no. 2: 79–81.

Maynard, T., J. Waters, and J. Clement. 2011. Moving outdoors: Further explorations of "child-initiated" learning in the outdoor environment. *Education 3–13*. DOI: 10.1080/03004279.2011.578750.

Nundy, S. 1999. The fieldwork effect: The role and impact of fieldwork in the upper primary school. *International Research in Geographical and Environmental Education* 8, no. 2: 190–8.

Nundy, S. 2001. Raising achievement through the environment. The case for fieldwork and field centres. Report published by NAFSO. Doncaster: National Association of Field Studies Officers.

O'Donnell, L., M. Morris, and R. Wilson. 2006. Education outside the classroom: An assessment of activity and practice in schools and local education authorities. NfER (RR803). London: DfES.

Prokop, P., G. Tuncer, and R. Kvasničák. 2007. Short-term effects of field programme on students' knowledge and attitude toward biology: A Slovak experience. *Journal of Science Education and Technology* 16, no. 3: 393–405.

Randler, C., A. Ilg, and J. Kern. 2005. Cognitive and emotional evaluation of an amphibian conservation program for elementary school students. *Journal of Environmental Education* 37, no. 1: 43–52.

Rickinson, M., J. Dillon, K. Teamey, M. Morris, M.Y. Choi, D. Sanders, and P. Benefield. 2004. *A review of research on outdoor learning*. Preston Montford, Shropshire: Field Studies Council.

Ruddman, C. 1994. A review of the use and implementation of science trips. *School Science and Mathematics* 94, no. 3: 138–41.

Scott, G., H. Churchill, M. Grassam, and L. Scott. 2011. Can the integration of field and classroom based learning enhance writing? The life on our shore case study. *Education 3–13*. DOI: 10.1080/03004279.2011.562216.

Scott, G., R. Goulder, P. Wheeler, L. Scott, M. Tobin, and S. Marsham. 2012. The value of fieldwork in life and environmental sciences in the context of higher education: A case study in learning about biodiversity. *Journal of Science Education and Technology* 21, no. 1: 11–21.

Stokes, A., and A. Boyle. 2009. The undergraduate geoscience fieldwork experiences: Influencing factors and implications for learning. *The Geological Society of America Special Paper* 461: 291–311.

Strgar, J. 2007. Increasing the interest of students in plants. *Journal of Biological Education* 42, no. 1: 19–23.

Tilling, S. 2004. Fieldwork in UK secondary schools: Influences and provision. *Journal of Biological Education* 38, no. 2: 54–8.

Tunnicliffe, S.D., and M.J. Reiss. 1999. Building a model of the environment: How do children see animals? *Journal of Biological Education* 33, no. 3: 142–8.

Waite, S. 2007. ''Memories are made of this'': Some reflections on outdoor learning and recall. *Education 3–13* 35, no. 4: 333–47.

Waite, S. 2009. Outdoor learning for children aged 2–11: Perceived barriers, potential solutions. Paper presented at outdoor education research and theory: Critical reflections, new directions. 4th International Outdoor Education Research Conference, April 15–18, La Trobe University, Australia.