HEA STEM Conference

Animal behaviour fieldwork: Introducing psychology students to the process of science

Thomas E. Dickins & Peter Donovan

In this paper we discuss the development and running of a residential animal behaviour field trip. The trip has a number of elements that challenge and develop the students. First, this trip is open to students at levels two, three and M. This allows us to engineer a certain amount of peer assisted learning. Second, the students live together and have to cook and maintain the property. This leads to teamwork and sensible methods of dealing with disagreement. Third, the academic work is curiosity led. We expose the students to a number of field sites and allow questions to naturally emerge. From these questions we can develop project hypotheses. Fourth, the students develop appropriate methods for observation and analysis. Fifth, theory is gradually introduced through discussion in the field, the accommodation and at a drop in surgery at the tavern where they can talk one-to-one with a staff member. Finally, when back at university, they can engage in more formal supervision to complete their project. The benefits of this approach are many but include developing a sense of the scientific process, which is lacking in the more prescriptive class-based assessments that typically form research methods teaching. Finally, all of the students report feeling better prepared for future scientific project work.

Keywords: *Fieldwork; ethology; scientific method; observational method.*

THE British Psychological Society (the Society) accredits undergraduate psychology degrees in the UK, advising on the curriculum, and conferring the Graduate Basis for Chartered Membership upon graduates. The Society recommends a broad representation of types of psychology and the provision of quantitative research methods training up to multivariate general linear models. The Society encourages a focus upon experimental method, but makes some concession for qualitative methods. At the University of East London (UEL) core research methods training is conducted in the first two years, preparing students to enter the final year and conduct an independent research project. Students are exposed to lectures on statistical analyses, and are given structured exercises to do, which simulate a full experiment, generating data that can be analysed. UEL does not provide students with the experience of developing a hypothesis and designing a study to test it. What is more, students are not exposed to the relationship between observational and experimental studies, as the Society do not demand it. We regard this as problematic for an empirical discipline.

In this paper we discuss the development of an optional module in animal behaviour fieldwork that has been designed to redress the balance between observational and experimental work, as well as to guide the students from initial curiosity to a full study. We begin with a brief history of the fieldtrip, and then a detailed account of the first trip, our pedagogical philosophy and a description of the diet of activities each student is exposed to. We discuss the problems students encounter and the methods they learn, how we have adapted to this and a summary of the students' views. We conclude with our future plans.

History of the fieldtrip

Each June, from 1979 to 1999, David Dickins (Psychology, University of Liverpool) ran a fortnight long animal behaviour field trip on Lundy island, off the north Devon coast. His ambition was to introduce students to field ethology and an evolutionary perspective on behaviour. The trip enabled Level 2 students to complete a short project and Level 3 students to complete their final year thesis. David Dickins collaborated with colleagues within his own department, and also those from the neighbouring Liverpool Institute of Higher Education, bringing this experience to a diverse array of students from Merseyside, and also leading to research on siblicide in kittiwakes (*Rissa tridactyla*; D.W. Dickins & Clark, 1987). To many of these trips he brought his eldest son (the first author), exposing him to the key lessons of this science, as well as teaching him the detail of the island's behavioural ecology. The end result was a happy collaboration jointly teaching on the island in the 1990s.

The initial UEL fieldtrip

In July 2009 we ran the first Lundy field trip for UEL. This was the result of discussion with David Dickins, our then Dean, David Rose, and Stephen Lea at Exeter, who also had much experience of teaching on the island. Our Dean was persuaded that a Level 2 option in animal behaviour would be beneficial to students who had a particular interest in this area, and following a full risk assessment, the Dean part-funded the trip, the rest being paid for by the students.

The first trip was modelled very closely on past practice. The basic philosophy was to immerse students in the phenomena of animal behaviour and to allow them to freely think and comment on what they observed. These observations would be questioned in an increasingly detailed manner, gradually allowing students to realise inadequacies in their first notions as well as the strength of their own observational skills. No question was ever treated as foolish, but rather seen as a seed to generate more questions, with a mind to testing them in the field through systematic observation, and later, perhaps, experiment. Furthermore, staff exposed their own observations and thoughts to the students, questioned each other publicly, and in this way acted to build a team spirit and a sense of a shared objective. We return to these issues below.

Students were recruited from the autumn of 2008 through a 10-minute presentation to Level 1 students, mass emailing and word of mouth. The trip was the first Level 2 option that students could take, hence our targeting of Level 1 students. The result was a diverse and representative group who were called together for two meetings in the spring of 2009. The first was a briefing on the island, what to expect and health and safety issues. The second was a trip to Richmond Park.

The Richmond Park trip served two functions. First, it enabled us to teach the students how to use optical equipment. Second, it allowed us to assess and adjust how the students operated in a relatively wild area with free roaming animals. The day began with an equipment practical, followed by a walk. On this walk we would stop and ask students to report on what they could see, to describe it, and to hypothesise about the possible function of the behaviours. We would question more anthropomorphic suggestions, and focus the descriptions on increasingly relevant aspects of the observation. On the return we debriefed the students. For many this was entirely novel and they were clearly excited by the prospect of Lundy, which they knew would be far wilder. As such a third function, to maintain enthusiasm, had emerged.

We landed on Lundy on a Saturday afternoon, established our accommodation (a converted barn in the village) and then went on a walk. This was organised in much the same way as the Richmond walk, and served the same purposes but also introduced the students to the species on the island. The next day was an extensive tour of most of the island with planned stops where

students were asked to observe particular species, write notes and speculate on function, with a mind to bringing these observations to a seminar after dinner in the barn. At this seminar we asked each student to present the most interesting observation they had made that day, and we encouraged the other students to ask questions. Our own questions were not too challenging but were focused upon how the observation might be turned into a more systematic study. We also pointed to various sources of information that we had brought with us, and those that were available in the Lundy Field Society Library in the tavern.

The next two days were dedicated to the students working in small groups to produce a far more detailed account of a species, to generate specific questions for possible testing, and to begin keeping a field diary of their work and related events. Students were required to note their daily plan in a safety logbook so that we knew where they would be and when they were due to return. This enabled us to plan a walk taking in all the student study sites. At each visit we would spend time discussing the developing ideas and we would introduce the concept of an ethogram – the exhaustive list of behaviours a particular species will produce – and how to begin creating a partial ethogram with tight motoric or functional definitions (Martin & Bateson, 2007). This methodological lesson in the field informed the evening seminars. We allowed students to present in groups in order to make them feel less exposed, as our questions were becoming more focused and challenging. For example, where students had opted for functionally described behavioural categories they were essentially making a theoretical claim about the behaviour, and we would ask why they had made this claim, what evidence they might have, and how they might deal with alternative accounts.

The next stage was for the students to develop a project over the remainder of the week, with a mind to having a rest day on Friday. They were encouraged to work in groups, but to ask slightly different questions from one another. Again, we visited each field site at least once each day, discussed the developing behavioural categories, and now issues around sampling decisions and the precise focus of the project. These discussions were the core business of the evening seminar but we began to introduce our own observations that we had made, and discussed some of our own interests, asking for the students' views and opinions. In this way we emphasised that we were all working toward an understanding as a team, and that we did not necessarily know the outcome.

By the end of the first week students were increasingly requesting individual meetings to discuss the details of their emerging projects. At these tutorials we would help each student to sharpen their focus, point to relevant literature, and begin to discuss data analysis. These students had only one year of research methods training, so we did not act to extend their statistical knowledge but rather to use what they had in order to deal with the kinds of data they were collecting. This put some constraints on their projects, but also presented an opportunity to experience how practicing scientists use statistics as a tool.

The second week saw the students working hard to collect data for their projects. The daily round of staff visits to field sites continued, and the evening seminars saw discussion of various issues in ethology. The tutorials began to focus upon the writing of the projects and this supervision was continued back in London before submission in early October.

Types of projects, problems and solutions

Lundy is home to a number of species. Nesting seabirds include herring *(Larus argentatus)*, lesser black backed *(Larus fuscus)* and great black backed *(Larus marinus)* gulls, fulmars *(Fulmarus glacialis)*, kittiwakes, razorbills *(Alca torda)*, guillemots *(Uria aalge)*, puffins *(Fratercula artica)*, shearwaters *(Puffinus puffinus)* and shags *(Phalacrocorax*

aristotelis). Oystercatchers *(Haematopus ostralegus)* are also abundant. Carrion crows *(Corvus corone)*, ravens *(Corvus corax)*, peregrine falcons *(Falco peregrinus)*, swallows *(Hirundo rustica)*, and a variety of other passerines are also found on the island during June or July, when we visit. There are also mammals, including Soay sheep (*Ovis aries*; a wild species, once domestic), domestic sheep, goats (*Capra hircus*; feral), Lundy ponies (semi-managed), Sika deer (*Cervus nippon*; wild) and Atlantic grey seals *(Halichoerus grypus)*. For the most part student projects have focused upon the Soay sheep, seals, ponies, herring and lesser black backed gulls. But the swallows and goats have also been studied.

Each species presents its own problems. The gulls nest in large colonies. When the students are first confronted with the bustling cacophony of birds they find it hard to focus upon particular behaviours. We tackle this issue by encouraging students to draw a schematic map of a colony on the west coast, with an excellent line of sight. Students soon notice organisation within the colony – more densely packed nest sites in the centre, more dispersed at the periphery; what seemed to be a colony of herring and lesser black backed gulls begins to look more separated, with the herring gulls adopting the steeper stone chute that funnels to the sea, and the lesser black backs the grassy slopes leading to it. More careful examination reveals chicks in various sheltered spots, and adults standing in some relation to them. They note size differences between the birds – the lesser black backs are smaller – and differences in interaction between and within species. We ask them to speculate on the coloration of the birds – why are they darker on the top of their wings and white underneath? Why is there a red spot on the lower mandible? The students are inventive, and some hit on key ideas in the literature to do with camouflage from prey – to fish in the sea the sky looks white – and predators – to the falcons above the sea is grey. We then introduce notions of adaptation and evolution and reflect upon the behaviours and social organisation within the colony using these concepts. The most recent gull projects worked at the colony looking at differences in aggression across both species of bird, across position in the colony, and as a function of nest attendance, which was taken to indicate parental investment. The students isolated sample nests, using their maps, and adopted a scan sampling technique accumulating in excess of 45 hours of data during the field trip and revealing significant effects.

The Soay sheep are sexually dimorphic, presenting an opportunity to investigate sex differences. They move about the middle and northern part of the island throughout the day in a fission-fusion pattern, but often gathering in mixed ewe and lamb clusters and all ram clusters, with some juvenile males. Students have looked at differences in grazing patterns and vigilance across these two constituencies, as well as flight distance with some ethical field experiments that simulate the approach of brightly clad day-trippers. In their early observations the students often refer to groups of Soay. When asked to indicate a group they point, or state where they are. Quite often the group of five sheep they are looking at are close to more sheep, perhaps having begun to separate or to join. This presents an interesting question – what is a group? Students learn that this can be determined purely on physical indices, such as body lengths apart, or upon functional assumptions around, for example, crèche behaviours in females, and sexual isolation when outside the rut. The students learn to be cautious about their categories and definitions as a result and to look for corroborating measures for any functional claims they might make. Similar issues are raised when studying the goats.

Seals are tremendously difficult to work on as marine mammals and the only opportunity to study them is when they bask on rocks or float and swim in the coves. As a consequence the students can only look at the distribution of behaviours about a cove

and measure the effect of naturally occurring independent variables such as tides, weather and the arrival of dive boats, which makes for mapping and sampling difficulties. In general the students adopt a grid reference technique and scan sample on key behaviours on a fairly tight interval, whilst noting relevant variables. This generates a lot of data, which requires much processing in order to analyse.

The Lundy ponies number only 10, and are all female. It is reported that they have a stable social hierarchy and some students have tried to investigate this by looking at jostling behaviours around scratching posts and grooming interactions, to see which pony is groomed most, and if there are patterns of groom-to-grooming ratio across all possible pairs. Many assumptions lie behind the measures, but the initial problem for students is to learn to identify the individuals from their markings, and to develop observational techniques that allow them to follow the ponies throughout the day. This project presents very specific lessons in field skills, as well behavioural categorisation.

The swallow project has some similarity to the pony project. The focus here is parental feeding decisions at the nest, and the jostling for position of the chicks. What is different is that individuals cannot be readily recognised, so filming is required to track focal chicks and break down rapidly occurring begging and feeding sequences. This project is much more involved than the others above as the film needs to be analysed using specialist software at UEL, and as a result has grown beyond an initial Level 2 project into a final year project and specific staff interest.

Level 2 projects are 4000 words in length, Level 3 are 8000 words and M-level 15,000. All conform to the usual format of introduction, methods, results and discussion, but as a part of the appendices students have to submit field diaries along with raw data and other materials. The field diaries enable us to track the development of their skills and thinking, which in turn helps to make an academic judgement, but they do not receive a summative mark for these diaries.

As we hope is apparent the projects present specific problems but also more general ones that the students share. The adoption of curiosity led, field and seminar supported research allows the students to reinvent the wheel to some extent, having the same experiences as many of the early pioneers of ethology (see Kruuk, 2003), and as a result developing a conceptual bedrock upon which to build a more advanced theoretical knowledge.

The field trip is extremely challenging and taxing for students. To some extent this was anticipated for the first trip in 2009 and we appointed a teaching assistant (TA), drawn from the final year and graduated by the time we arrived on the island. He was a natural history enthusiast with a good working knowledge of fieldwork, but his status as a fresh graduate was ideal as he bridged the gap between our scientific register and the students' developing understanding. He would let us know where we needed to work on particular issues, and also would relay questions early in the trip that students were too embarrassed to ask. This was successful and since then we have adopted a TA each year, but for the most part we have used students who have previously been to Lundy and had the experience themselves.

After discussion with previous TAs we decided that the initial exercises, described above, would benefit from some formalism in order to make the students feel more secure in their early gains. To this end we developed a worksheet for the first days covering all that we did in the first trip but with some worked examples and a discussion about the kind of data collected and how to think about it for analysis. But the worksheet is not exhaustive and it is designed to prompt questioning. It also makes the job much easier for the TA, who perhaps does not have our authority, but can use the sheet as a point of contact with the students and reassure them about the task demands.

The TA model has been further extended since 2009 by allowing final year project students, some of whom did their Level 2 projects on Lundy, and the occasional M-level student to attend (some M-level students come from Brunel). This has enabled us to build an informal peer-assisted learning element into the trip. For example, we have had Level 3 and Level 2 students working on Soay sheep together, and Level 3 and M-level students working on the gulls. The students face many of the common problems together, but the different levels of experience in the field, along with the different levels of expertise in research methods and behavioural science, enable the more senior students to encourage the more junior whilst simultaneously boosting their own confidence through successful explanation. Sometimes this works in the other direction too. We actively encourage this and take time to make clear good ideas when they are presented, to praise innovation and ideas we had not thought of, and privately to thank senior students for a job well done. We have yet to formally assess this, but we are confident in this system.

Finally, we have introduced a drop-in surgery in the tavern every evening on the second week. This is to augment the existing one-to-one support that we offered from the first trip, giving students a resource for quick questions whilst they are writing their daily field notes and planning for the next day.

Group living

The scientific work is challenging but so is group living. The barn has two dormitories, a shared living and dining space, a kitchen, a shower, a neighbouring shower block, and two toilets. We segregate the dormitories by sex enabling us to bring up to six males and six females. Of these, no more than two are M-level, and the remainder are undergraduates fairly evening split across levels. Students and staff are organised into a rota to cook dinner and wash-up on a couple of occasions each, and all pull together to maintain the property. The students can leave the barn whenever they wish to find privacy. If they leave the village area they must sign the logbook to say where they are going, but otherwise they are at liberty. To date there have been no serious disagreements or disputes between the students, and certainly nothing that they have not resolved themselves. The initial shift into group living always leads to the quiet establishment of routines and territories, and some negotiation occurs, but the students all seem to operate co-operatively, and in particular mutually as they all face the same task demand – the production of a project. The deliberate engineering of mixed level groups helps with this too as they continue to study together back in the barn and to talk in the tavern. These arrangements survive the trip and continue to operate on campus.

Fringe benefits

Over the last years we have invited David Dickins to visit along with various other academics, who all come at their own expense. They stay elsewhere in the village but we invite them to dinner on the odd evening and allow them to run the seminar discussion. The students very much enjoy this, as they know some of the guests through the literature that we cite and they have an opportunity to discuss their ideas. The students also benefit from seeing debate between our guests and our staff, seeing scientific but friendly dispute and learning more about the process. In general the island attracts many visiting experts and also PhD students from other universities. Given the size of the village conversations necessarily start and the students often come to dinner with new information about the island and its fauna, in this way making a contribution to the shared project that the staff alone simply cannot make.

Student feedback

The students complete an expectations form and a feedback form. Invariably the student expectations are fairly accurate in terms of

the kind of work, for they have read the website information, but they are not aware of the extent of the challenge. Their feedback reflects this – they wish that they had done more preparation. However, in our view they come prepared and these comments are in fact indicative of our approach working, as they now want to know more.

In conversation with former Lundy students they unanimously state that attending as a Level 2 student was excellent preparation for their third year project, even if it was not done on Lundy, and also enabled them to better understand research methods during their second year. Of the students we have taken to Lundy, and have graduated since 2009, four have gone onto do an M-level qualification in the field and one is about to start a PhD on gulls.

Future directions and conclusion

We believe that the benefits of this trip are enormous. The students draw general lessons about science, and specific ones about animal behaviour. They arrive back at campus ready for more advanced project work and primed for other aspects of the curriculum such as psychobiology and evolutionary approaches to behaviour. We are eager to continue the Lundy fieldtrip but also to expand its possibilities, and one route that we are hoping to develop is a virtual one.

As noted, when discussing the swallow projects, we use software to analyse film. This software allows the researcher to code behavioural categories for all animals in real time on a given clip. This data is stored in a readily exportable format that allows analysis in statistical packages, but analysis can also be done without export. Our plan is to develop a virtual field trip, incorporating this software, in order to give students who are unable to travel to Lundy, or elsewhere, the opportunity to learn about field ethology and to develop their knowledge.

We also aim to more rigorously assess the gains made by Lundy students. In July 2012 we will run our fourth trip and we now feel that we have developed a good package. As this is stable it can now be scrutinised. This year we have recruited a former Lundy student to help us collect interview data from current students in order to enrich existing feedback. This will then be used to develop a quantitative measure for use in subsequent years, as well as to help us recruit future students. Our aim is to demonstrate shifts in the conceptual grasp of what science is; our hypothesis is that there will be a transition from concrete, recipe following to more abstract engagement. Science is a creative adventure, and we want as many students as possible to realise this.

The Authors

Dr Thomas E. Dickins & Mr Peter Donovan
School of Psychology,
University of East London.

Correspondence

Email: t.dickins@uel.ac.uk
Website:
http://dissentwithmodification.com/

References

Dickins, D.W. & Clark, R.A. (1987). Games theory and siblicide in the kittiwake gull *(Rissa tridactyla). Journal of Theoretical Biology, 125*(3), 301–305.

Kruuk, H. (2003). *Niko's nature: A life of Niko Tinbergen and his science of animal behaviour.* Oxford: Oxford University Press.

Martin, P. & Bateson, P. (2007). *Measuring behaviour: An introductory guide.* Cambridge: Cambridge University Press.