

Benefits from engagement and leadership achieved by students co-creating science through Student Environment Research Teams (SERTs).

Summary

This case study evaluates the Purbeck Wildlife Student Environment Research Team (SERT) project. This is a collaboration between Bournemouth University (BU) and the National Trust (NT) with the overall aim of fostering student engagement and employability through team-based research that informs habitat management for wildlife conservation. SERT students can take on roles with different levels of leadership responsibility. The aim of this case study report is to evaluate the benefits to students of their participation of the Purbeck Wildlife SERT at different levels of leadership. We evaluate how the level of leadership a student takes on affects their i) experience on the SERT ii) perceived gain in employability competencies iii) perceived gain in educational objectives. We report our findings on the challenges and opportunities arising from the project as identified from analysis of the overall experience of 48 students studying for a range of degrees in a range of environmental sciences and from the personal perspectives of three key stakeholders; a student leader, an academic mentor and our NT partner. Our key finding is that the SERT model is effective as a student engagement tool both for student leaders and participants. However, it is through fostering leadership skills that SERTs can most powerfully develop student learning and employability.

Description of project

It is widely recognised that undergraduate students benefit when they are able to take on leadership roles (Komives *et al.*, 2011). Many opportunities for this are available on-campus and within curriculums. These include student representative positions and engagement as partners in course design quality assurance processes. By contrast, there is a lack of opportunity for students to develop leadership through partnership in research within their degree subject discipline areas. Given that students and staff are likely to share common subject area interests, it seems fruitful to consider ways in which student and staff engagement can be fostered through authentic partnership in research.

Student Environment Research Teams (SERTs) have been created by Bournemouth university (BU) as a way for groups of volunteer students and staff work to co-create new research. SERTs have a special ethos of shared leadership and responsibility that fosters students and staff working in partnership on a project they all consider meaningful. SERTs enable students to choose to engage at a range of levels on a ladder of leadership from being a participant, sub-team leader or team leader. SERTs consequently provide students with a rich range of opportunities to engage at different levels and develop important employability skills and competencies. Often

the research has practical value and the SERT may also involve external practitioners¹.

All student SERT participants are volunteers. Many choose to do SERTs as part of a work placement and are looking to gain employability skills and competencies. SERT leadership roles include opportunities to produce outputs such as presentations and reports as well as to collect data. The ability to engage in the dissemination of research findings as well as in their creation has been highlighted as of pedagogic importance (Walkington, 2015) and students who take on leadership roles that include dissemination may be able to demonstrate a wider range of skills and competencies. These can range from subject specific competencies as identified by the Chartered Institute of Ecology & Environmental Management (CIEEM, undated, accessed 2018) to key “soft” skills, consistently recognised in diverse disciplines across Europe (Andrews & Higson, 2008). Other potential benefits of students having leadership roles may include an enhanced ability of students to achieve learning goals as defined using Bloom’s Revised Taxonomy of Educational Objectives (Krathwohl, 2002). Our study explores the relationship between student engagement in leadership and their development of competencies and learning goals.

The Purbeck Wildlife SERT is a partnership with the Purbeck National Trust (NT) and creates knowledge that informs conservation management of NT heathland and grassland wildlife sites. The Purbeck Wildlife SERT occurs annually each summer and consists of two weeks of camping-based fieldwork with some planning meetings held in the preceding spring. Students typically join the SERT for one year and meet with mentors from BU and the NT to plan the research work for that year. Together we decide on research objectives for the year and how the SERT will be managed in terms of leadership roles. Once the leadership roles have been agreed, the students volunteer for the roles they wish have.

The aim of this case study report is to evaluate the benefits to students of their participation of the Purbeck Wildlife SERT at different levels of leadership. Specifically we ask three questions:

- 1) What is the student experience on the SERT and is this affected by their level of leadership?
- 2) What employability competencies do students feel they gain through the SERT experience and is this affected by their level of leadership?
- 3) What educational objectives do students feel they gain through the SERT experience and is this affected by their level of leadership?

We focus on evaluating the students’ own assessment of competencies and educational objectives achieved by participation in the project. We report results from a quantitative analysis of each of these questions based on responses from 48 students and also the personal perspectives of three key stakeholders: a student

¹ For more information and examples of SERTs please see <http://www.cocreate4science.org/serts/>.

leader (represented by Charles King) a member of academic staff (represented by Anita Diaz) and our NT partner (represented by Michelle Brown).

Enabling Partnership

The Purbeck Wildlife SERT was initiated in summer 2015 using a one-off grant of £5000 from BU to trial the partnership by bringing together 20 students from 4 universities, led by 5 BU student leaders who had received previous training from the academic mentors. The 2015 trial was very successful in terms of proving that such a model could deliver a good student experience and useful data. It divided students strongly into student leader and participant groups. This highlighted the potential for some interesting differences in outcomes for student development. Consequently in 2016-2018 the project has developed with a smaller group (8-12) of BU-only students each year to enable all students to choose to take on leadership roles. This has been achieved with further investment of BU and the NT to provide transport facilities (BU) and a new purpose-built camping facility (NT) that can accommodate up to 15 students. Camping and data analysis facilities are provided by the NT and minibus transport facilities are provided by BU as an agreed part of the collaboration. BU and NT staff mentors meet with the students before the fieldwork to plan the summer work. They then also meet daily with the students through the fieldwork period to provide training and support, to discuss new suggestions and to co-produce new analysis.

Partnership was also fostered by the smaller student team size in the 2016-2018 SERTs. This was because all students were able to be directly part of the strong collaborative partnership in place between BU and NT staff and to keenly appreciate their own important contribution as partners. This produced a strong sense of community and students reported that it was this supportive environment that led to them wishing to take on leadership roles. These ranged from the overall student team leader role with responsibility for overall coordination and communication with staff mentors to varied sub-leader roles including camp logistics or to leading the production of specific outputs such as reports, presentations, blogs, social media and videos. Indeed, after a few days when all the leadership roles the academic mentors had suggested had already been adopted by student volunteers, students without leadership roles came forward to volunteer roles for themselves. This was all the more striking because these students had previously avoided leadership roles due to a self-professed lack of self-confidence.

Evidence of effectiveness and impacts

Here we present the results for each of our three questions.

1) *What is the student experience on the SERT and is this affected by their level of leadership?*

At the end of each year's SERT students were asked to write down anonymously on a piece of paper three words that describe their SERT experience and to identify

their leadership level (Leader, sub-team leader, participant). Results were combined across years 2015-2018 to give the following sample sizes: Leaders n=8; Sub-Leaders n=20; Participants n=20). All students gave three words resulting in 24 words for leaders and 60 each for the other two groups. The frequency of each word was therefore divided by the number of students to create comparable % frequencies per group (Figure 1).

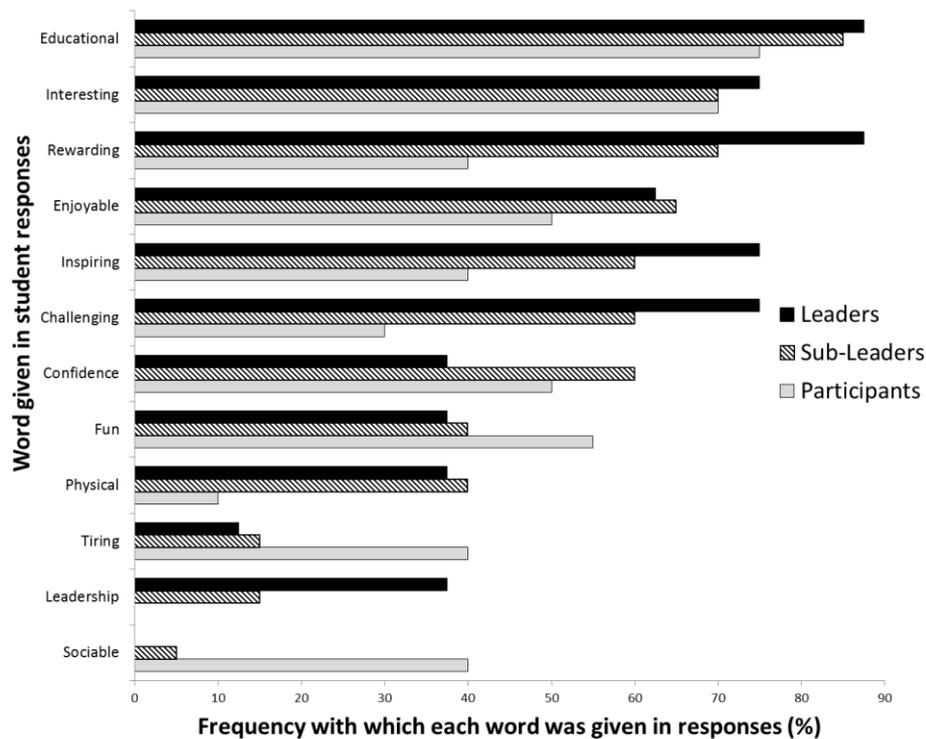


Figure 1. Most frequent replies given by each group of respondents when asked to give three words that summarise their SERT experience. Other words given with a frequency of > 5% but < 10% were: Enlightening; Exhausting; Experience; Friendship; Hiking; Identification; Learning; Outdoors; Nature; Skills; Team; Tolerance.

Overall there were some large differences with Leaders reporting most frequently the words “Educational” “Rewarding” “Inspiring” and “Challenging” while participants report most frequently the words “Social” “Fun” and “Tiring” (Figure 1). Sub-leaders generally gave intermediate results but most frequently gave the responses “Enjoyable” and “Confidence”. These results suggest that students benefited from leadership roles but that sub-leadership roles were optimal for student experience overall. It suggests that Leaders may benefit from a little more support from mentors and agrees with findings that students enjoy and benefit from being stretched out of their comfort zones as long as support is sufficiently scaffolded (Hill et al., 2016).

While the above analysis does demonstrate important impact of leadership roles on the student experience, it is worth noting that the additional activities associated with leadership may not be what the students themselves value as most engaging at the

time. To examine this, students first discussed and agreed with mentors what “engaged” meant to them for a SERT. We used words and phrases from Ratcliffe & Dimmock (2013) as a starting point for discussion. The definition we decided to use was the phrase “involved and empowered”. This captures the concept of gaining self-empowering skills through being part of something. It also resonates strongly with the term leadership and adopted some key words in the differently focused QAA definition of engagement as being about “involving and empowering students in the process of shaping the student learning experience” (QAA, 2012). Immediately at the end of the 2015 and 2016 Purbeck Wildlife SERT students scored how engaged they had felt during the SERT from zero to 10 (where 10 is very high). Students also provided a brief reason for their answer.

Both years gave very high scores for levels of enjoyment with no significant differences in mean results (for 2015 mean = 8.5, Standard Error = 0.22; for 2016 mean = 8.9, Standard Error = 0.35; Independent sample t test $t = -0.97$ $P = 0.336$). In both years students reported that their high feelings of engagement were associated with learning new species identification skills (> 80 % of respondents in both years) and with a strong feeling of community/inclusivity within the team (> 70% respondents in both years). This very similar result between years is interesting as it suggests that in 2015 students did not feel less engaged overall as a result of not being engaged in leadership and output production. It appears then that only the academic mentors actually perceived it as an issue that could affect engagement. Furthermore, in 2016, although students gained a wider range of skills including data analysis and presentation skills, only the species identification skills were generally identified as actual drivers of engagement by the students. Other skills, particularly report writing and presentation skills, were noted as gained and valued for their employability value in some of the reflective logs written by students in 2016 but were highlighted as a reason for engagement by only three of the students in 2016. This finding shows that student engagement can be high despite a lack of engagement in leadership roles because the student expectation was firmly based around gaining species/habitat skills and the project met this expectation. It also emphasises the high importance for student engagement of feeling part of a shared “community of practice” (Morley *et al.*, 2018).

2) *What employability competencies do students feel they gain through the SERT experience and is this affected by their level of leadership?*

At the end of each SERT students wrote a reflective account detailing what they felt they gained from their participation in the Purbeck Wildlife SERT. Students were asked to reflect on skills and other competencies gained and to reflect on what they had learnt. They were not directed by SERT mentors to either the professional body CIEEM competency framework or to Bloom’s taxonomy prior to writing their reflections to avoid these constraining responses. In 2015 the account was written immediately at the end of the SERT while in the subsequently years the account has been written a few weeks after the SERT which allowed more time for reflection. Each account was read by the BU academic staff member and compared with the CIEEM’s table of competencies (CIEEM, undated). Each CIEEM competency mentioned was highlighted. Each competency was then scored as either identified or

not in the student account. These are presented in Table 1. Only competencies identified by at least one student are listed in this table.

We found strong differences between students' reports in their achievement of employability competencies (Table 1). Almost all Leaders reported each of the competencies in their account. The much lower reporting of competencies by participants does not seem to be due to by students writing these immediately after the SERT in 2015, as Leaders who also wrote their accounts in this way still identified a large number of competencies. Results therefore suggest a real difference and benefit from having a Leader role. There were also strong advantages from being a Sub-Leader and these were comparable to that of being a Leader for technical skills. Most Participants focused their accounts entirely on reporting their skill gain in the core field work. Almost all students reported that they SERT had enabled them to work in a professional way and many highlighted the sense of responsibility they felt.

Table 1. Competencies self-reported as gained by students in the 2015-2018 Purbeck Wildlife SERTs. Competencies were identified by the lead BU academic staff member from student accounts. Numbers indicate the percentage frequency of accounts of Leaders, Sub-Leaders and Participants who reported the achievement of each competency. Where the same competency was reported more than once in an account, it was scored only once. Only competencies identified by at least one student are listed.

Technical skills	Leaders	Sub-Leaders	Participants
Species ID	100	100	100
Habitat ID & evaluation	100	100	100
Survey design, planning and fieldwork	100	100	5
Scientific method design and implementation	100	100	0
Analysis of data	100	75	0
Interpretation and evidence-based reporting	100	60	0
Transferable skills			
Professional conduct	100	100	70
Effective communication & influencing	100	35	15
Managing quality	100	65	0
Data & document management	100	25	0
Responsibility	100	55	30
Resilience	80	10	10
Adaptability	100	15	0
Emotional intelligence, other perspectives	80	5	0

3) *What educational objectives do students feel they gain through the SERT experience and is this affected by their level of leadership?*

The reflective account produced by each student in 2015-2018 was read by the lead BU academic staff member and each level of knowledge indicated was identified and allocated to one cognitive level of Bloom's taxonomy highlighted (Table 2). Where the same level of knowledge was expressed more than one in an account it was allocated to the higher cognitive level.

Table 2. Educational objectives self-reported as achieved by students in the 2015-2018 Purbeck Wildlife SERTs. Educational objectives were identified and categorised by the BU lead academic staff member from student accounts. Numbers indicate the 100% frequency of accounts of Leaders, Sub-Leaders and Participants that reported each educational objective. Where the same educational objective was reported more than once in an account it was recorded just once and assigned to the higher competency level expressed.

The Knowledge Dimension	The Cognitive Process Dimension					
	Remember	Understand	Apply	Analyse	Evaluate	Create
Factual knowledge	Team leaders	100	100	100	100	100
	Sub-leaders	100	100	65	40	40
	Participants	100	40	5	0	0
Conceptual knowledge	Team leaders	100	100	100	75	100
	Sub-leaders	75	75	60	35	45
	Participants	25	5	0	0	0
Procedural knowledge	Team leaders	100	100	87.5	75	37.5
	Sub-leaders	25	20	15	0	0
	Participants	0	0	0	0	0
Metacognitive knowledge	Team leaders	37.5	25	25	0	0
	Sub-leaders	0	0	0	0	0
	Participants	0	0	0	0	0

We found clear progression up competency levels for Leaders and Sub-leaders for factual and conceptual knowledge. These were focussed on species identification and concepts of habitat condition and how that related to creative suggestions for conservation management. Leaders, and to a lesser extent Sub-leaders, were also able to identify some important procedural knowledge about handling survey data and implications for their strength and limitations. Leaders were able to begin to feel they could evaluate how survey results can be best used to inform conservation management given their strengths and limitations. Examples of metacognitive knowledge was limited to a few examples of Leaders reflecting on how their thoughts about what constitutes robust survey data had changed and how that would affect how they worked alone and with others in the future.

Reflections on the project

Staff perspective (written by Anita Diaz and Michelle Brown)

For academic mentors one of the most useful and rewarding elements is the strong working relationship developed with the students taking on leadership roles. This is particularly the case with the SERT student team leaders but the other sub-leadership roles have also made major contributions and resulted in the production of a much enhanced quality and diversity of outputs. These outputs help students to identify the competencies and learning goals they achieve so that they can communicate them clearly to future employers. The pedagogic and employability advantages to the students of taking on SERT team leader roles are particularly large and we suggest that this is because of the enhanced learning opportunity presented to them through their position as communication channels or “brokers” (Wenger 1998) between the team of students and academic mentors. An associated challenge for academic mentors is managing the decision process leading to appointment of the student leadership roles. In the last three years of the Purbeck Wildlife SERT the roles have been filled entirely by students simply volunteering for the positions. However, it would be ideal to have a more student-led and more formal process in future, particularly if we expand the Purbeck Wildlife SERT to involve larger numbers of students. Based on discussion with Purbeck Wildlife SERT students in 2016-2018, we aim to, in 2019, trial a process where students only apply to the academic mentor for the SERT student team leader role. Then, once that person is in post they, with mentoring support, will devise and appoint the other sub-leadership positions. This will be done in consultation with the other student team members and academic mentors.

For the NT it is essential that the recorders collect reliable data and so the NT invests significant time training the students in species/habitat survey skills. From the NT perspective of the partnership the most important element of the SERT is that students value these gains in skills very highly, use them well and rate them as important drivers for their engagement with SERTs. However, a key additional benefit for the NT has been the level of academic reflection produced in the outputs which compare the methods designed by the NT with other lowland heath monitoring models in order to provide meaningful feedback on their ease of use by non-experts and on design of survey forms and data entry methods. The students were able to maximise time in the field as a result of camping facilities provided by NT Purbeck, on land adjacent to staff offices. Facilities provided were basic and were able to accommodate a small number of students for a short period of time. If the SERT model is to be scaled-up, investment in facilities or the development of use of alternative facilities will be required.

Student perspective (written by Charles King, SERT student team leader, 2017)

“At first I experienced difficulty when exerting authority; the previous interactions I had shared with individuals in the team were casual and friendly. Therefore, it was challenging adapting to a more authoritative role in their presence. Furthermore,

delegating tasks was something I would have identified as a weakness at the start of the project as I lacked some of the necessary leadership skills. Creating cohesion within the team, between myself and team members and between individuals in the team, was crucial. We experienced little difficulty establishing cohesion; however, difficulty in maintaining this dynamic arose at times when the team was fatigued.

The SERT project gave me the chance to develop leadership skills. Due to the workload and number of tasks that required completion during the day it was encouraged to delegate tasks. The team were incredibly supportive of me in my role; they undertook tasks with great enthusiasm and I received encouragement and constructive feedback. Fundamentally, the cohesion within the team that was established at the beginning of the project helped us to overcome times when there was tension in the team. We overcame problems through effective communication; team discussions allowed us to identify problems within the group which I was able to talk to mentors about. Being in a camp together gave us the opportunity to interact in a relaxed environment; this helped ease tension and stress from fieldwork. Working within this team enabled me to learn about the dynamics of teamwork and how to best incorporate the multiple skills possessed by each individual to achieve tasks. It helped me develop, not only the confidence to lead, but the skills to lead effectively. The long days of fieldwork required perseverance; the motivation we found intrinsically and from each other helped us stay on top of fieldwork and allowed Sub-Leaders to also lead on their own leadership task. The key factors for success were excellent communication and organisation.

In summary, I feel that being in a position where I was able to communicate with the team in a relaxed and calm environment allowed me to identify problems and difficulties individuals were experiencing, as well as challenges that were being encountered by the whole group. At times, being in this position was difficult, as issues regarding relationships within the team were raised as well as problems that needed to be approached with sensitivity. However, I was able to discuss the team's thoughts and feelings with mentors and from this I learnt how to resolve issues within a team environment. Furthermore, I learnt how to approach these problems with a professional and sensitive attitude, as well as how to listen to and express the thoughts of the team to academic supervisors, in order to devise the best approach to overcome problems within the group."

Follow up and future plans

We wish to share our learning to develop other long-term SERTs in other locations and also to help support other ways of increasing student leadership opportunities in research partnership with academic staff. The most important factors we have learnt that we need to consider in our future planning are i) staff time to adequately support student Leaders and Sub-leaders feel supported while they develop their roles ii) that we wish the project to grow steadily, not too rapidly, so we can maintain the special ethos of SERTs and continue to learn in partnership with students. Our work has confirmed the importance of relationship building for creating successful student-staff partnerships. We feel that these findings are likely to be relevant to other student-staff research partnerships.

Regarding SERTs, we aim for this SERT model to be, in time, adopted by other NT properties as part of the NT goal of embedding Priority Habitat Assessment Monitoring as a primary means of reporting on and monitoring conservation performance and evidence-led management across the NT's national portfolio of land ownership. In the coming year opportunities will be explored for integrating local wildlife expert volunteers with SERTs through a bursary and mentorship scheme. These connections will enhance the transfer of knowledge between experts and students. We anticipate that they will also enhance student engagement and motivation by broadening perspectives (Corker & Holland, 2016) and deepening service-learning (Eyler, 2002).

We hope that student engagement in service-learning will also foster further engagement by experts wishing to share their knowledge with younger generations. We have piloted this and the success already leads us to offer the suggestion that combining student volunteers with local expert volunteers may be an excellent way of fostering student engagement on a wide range of projects. This might particularly be the case in citizen science based projects which have similar needs to SERTs of students learning while producing useful data. Citizen science projects are being developing widely in many fields. Many can involve students and academic staff in outreach as well as core research. Citizen Science offers just one set of possibilities. We believe that our findings provide grounds for optimism that with appropriate mentoring support there are a rich range of opportunities for students to engage as leaders as well as participants in research.

Related publications and resources

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