

Enhancing training for research skills of undergraduate students (marine biology programmes)

Final Report for 'Research Informed Teaching Initiative' Project 2009-2010

Project Team: Drs Colin Munn, Murray Brown, Jason Hall-Spencer, Stephen Votier

1. Background to the Project

Marine biology is identified as an area of world leading strength under the “marine and maritime” strategic theme of the University’s Research & Innovation Strategy, 2009-2012, which also highlights the need “to ensure ... that students have opportunities to develop and utilize research skill appropriate to their discipline” (Key Theme 10). In addition to in-house research in the Marine Biology & Ecology Research Centre (MBERC), we have many joint projects within the Plymouth Marine Sciences Partnership and extensive collaborations with other international research groups. Some students currently become involved as volunteer researchers, but such arrangements are on an *ad hoc* basis. We have also had considerable success in nominating students for externally-funded vacation studentships, to conduct a concentrated period of research between the second and final year. Although the marine biology subject group is clearly already very successful in promoting research informed teaching, the overall aim of this project was to expand and sustain the development of students’ research skills and outputs. RIT funding was used to pilot an internship system for undergraduate students, providing small bursaries to support highly motivated students, allowing them to participate in laboratory and field work alongside postgraduate students, postdoctoral fellows and academic staff.

2. Objectives

- To provide opportunities for promising first and second year undergraduates to participate in active research programmes in MBERC and other laboratories.
- To develop a more formal system for co-ordination of a research internship system.
- To evaluate the importance of providing very small grants for consumables and travel expenses needed to underpin student research activities, as an incentive to project providers.
- To evaluate the importance of the research experience in students’ attitudes to a future career in research.
- To evaluate the usefulness of undergraduates as short term research assistants to PhD students, postdoctoral fellows and academic staff.
- To evaluate the importance of providing small bursaries in enabling wider participation by less well-off students, who are often deterred from volunteering because of their need to work to meet living expenses.

Marine Biology Research Experience Scheme

3. Methods

3.1 Selection of research projects

Potential supervisors of research projects were invited to submit a proposal containing a brief description of their project, the nature of the techniques and activities to be undertaken by the student and the learning experience provided. Project providers were asked to detail arrangements for supervision and the preferred pattern for the activity. This was designated as (a) the equivalent of 1-2 days per week during term time, fitted around the student's timetable; (b) the equivalent of 3 days per week for a maximum of 7 weeks during vacation; (c) full time for 4 weeks during vacation. Proposals were evaluated by the project team. All proposals were judged suitable and a student intern was matched to all but one of the projects. Projects were located and supervised as shown in Table 1.

Table 1: Location and supervision of projects

Laboratory	Students	Project supervisors		
		Academic staff or senior researchers	Post-doctoral fellows	PhD candidates
MBERC	9	2	3	3
Ecotoxicology Research Centre	1			
Fish Nutrition Unit	1		1	1
Marine Biological Association	1	1		
Plymouth Marine Laboratory	2	1		
British Antarctic Survey, Cambridge	1	1		
Max-Planck Institute for Marine Microbiology, Bremen, Germany	2	1		1
Totals	17	6	4	5

3.2 Selection of students

The scheme was advertised through the programme sites on TuLiP and via tutorial sessions. Applications for bursaries were invited from students in years 1 and 2 of the BSc Hons Marine Biology, Marine Biology & Coastal Ecology or Marine Biology & Oceanography degrees for full-time vacation internships (4-6 weeks) in summer 2009 (5 places) and 2010 (6 places) or for part-time internships in the spring term (5 places). Students were required to complete an application form with details of educational achievements to date, special skills, future career aspirations and a statement of interest in a specific project. These forms were ranked independently by members of the RIT project team and shortlisted candidates were interviewed by CBM and the prospective supervisor. A standard interview format and scoring sheet was developed, ranking candidates on a scale 0-3 for the following criteria:

- (a) Communication skills (3 = very good and interesting communicator; engaged with interviewers; responded well to questions; very articulate; ability to argue a point).

Marine Biology Research Experience Scheme

- (b) Rationale for seeking research experience - career exploration (3 = enthusiasm and understanding of qualities required for research; well thought out ideas for possible future career development).
- (c) Motivation for the specific project (3 = strong evidence of finding out about the project; strong answers to questions about underlying science).

Successful students (n= 17) were notified immediately and arrangements for the internship were agreed with the supervisor. Unsuccessful applicants were given feedback.

3.3 Evaluation

Students were asked to complete a questionnaire summarizing the methods and techniques learnt and responses to seven questions under the theme “How useful has the research experience been to you” and seven questions under the theme “How has the scheme changed your awareness of research?” They were also asked to comment on support from the supervisor, suggestions for improvement, an overall evaluation of the scheme, and the importance of the bursary payment. Students were also required to write a short reflective report of the project.

Project supervisors were asked to complete a questionnaire outlining the methods and techniques used and evaluating the performance of the student under eight criteria, commenting on the student’s strongest features indicating an aptitude for research and area that the student need to improve. Supervisors were asked to discuss this evaluation with the student. Supervisors were also asked “How useful has the placement been to your research?” using seven criteria and asked to provide an overall evaluation of usefulness, the importance of consumable funding (where appropriate) and suggested improvements.

4. Results

4.1 The value of the experience — the students’ perspective

All students were very complimentary about the support and help provided by the supervisor and all would recommend it to fellow students. The responses to the questionnaire about the usefulness of the scheme are shown in Figure 1. The majority of students scored very positive responses (useful or very useful) in all categories. This was reflected in many positive comments, with a small selection highlighted below.

“... a real eye opener in terms of designing a seemingly simple experiment and overcoming problems to achieve a desired outcome”

“... a massive insight into what it would be like to be a research scientist”

“... learned loads of new techniques and used equipment that would otherwise not have been available to me.”

“... learned the importance of keeping a proper lab book and how to present data”.

Marine Biology Research Experience Scheme

“... [gave me] the opportunity to meet other scientists and talk about science!”

“... improved my current skills in a practical and ‘real-world’ environment ... introducing new, up to date techniques”.

“... it seemed like every day I was learning new techniques, meeting new people and learning more”.

“I was able to improve basic yet fundamental techniques”.

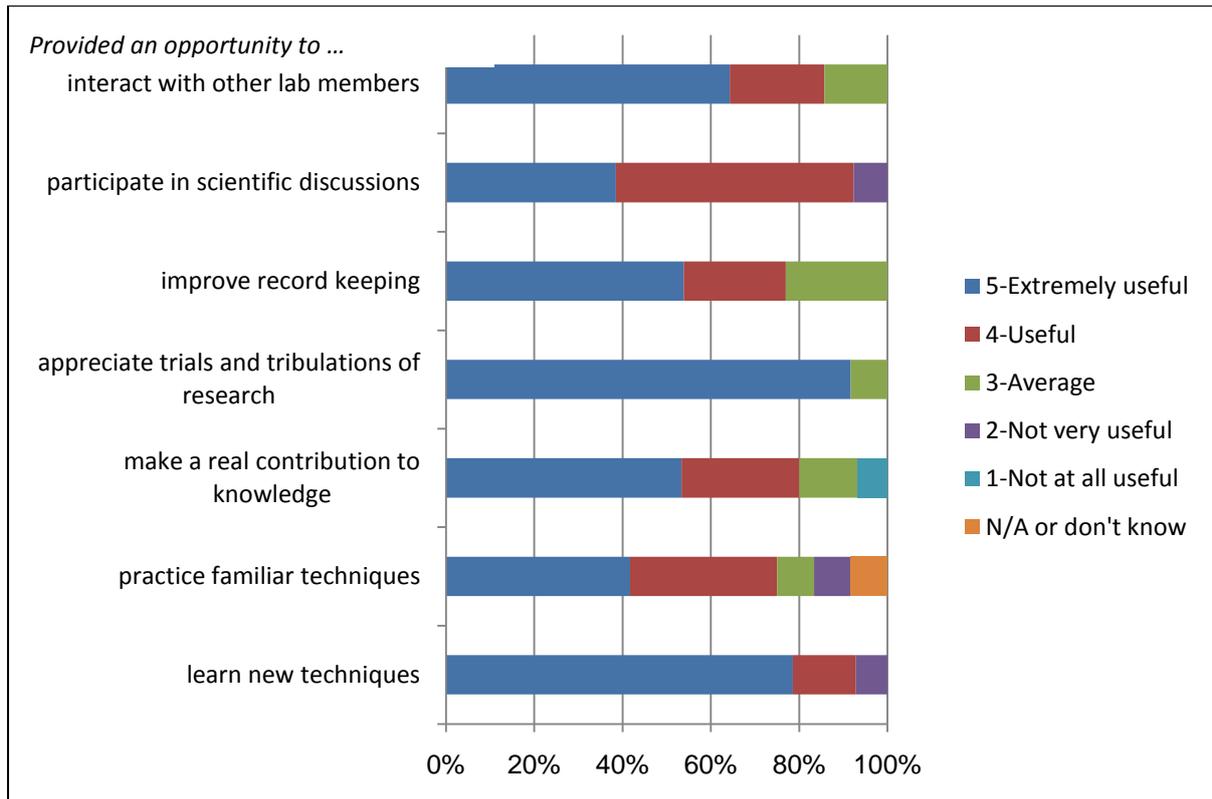


Figure 1. Students’ responses to the question “How useful has the research experience placement been to you?”

4.2 How the scheme changed students’ awareness of research

We were interested to know whether the scheme changed the students’ awareness of research. Results (Figure 2) again show very positive responses, with the majority of students ranking all categories useful or very useful. The selection of typical comments below illustrates these positive experiences.

“... I was embraced as part of the team working in MBERC”

“... I have definitely gained more confidence as a scientist”

“... Working alongside other researchers has enabled me to gain a real insight”

Marine Biology Research Experience Scheme

“... I have learnt to make my own decision and to plan in advance exactly what is needed to be done”

“... highly beneficial in understanding the process of setting up, planning and beginning a research project”

“... I know a lot more of the staff and postgraduates now ... it feels like a pleasant community environments, which I feel is important”

“... the close relationship with other postgraduate students enabled me to feel what it is like to be a researcher. This scheme has made me decide to continue my studies and go into research”

“... has given me an insight into carrying out research and the expectations of studying for a PhD and pursuing a career in research ... has given me a lot more confidence”

“... I got to learn about what a career in research would really entail and how scientists operate.”

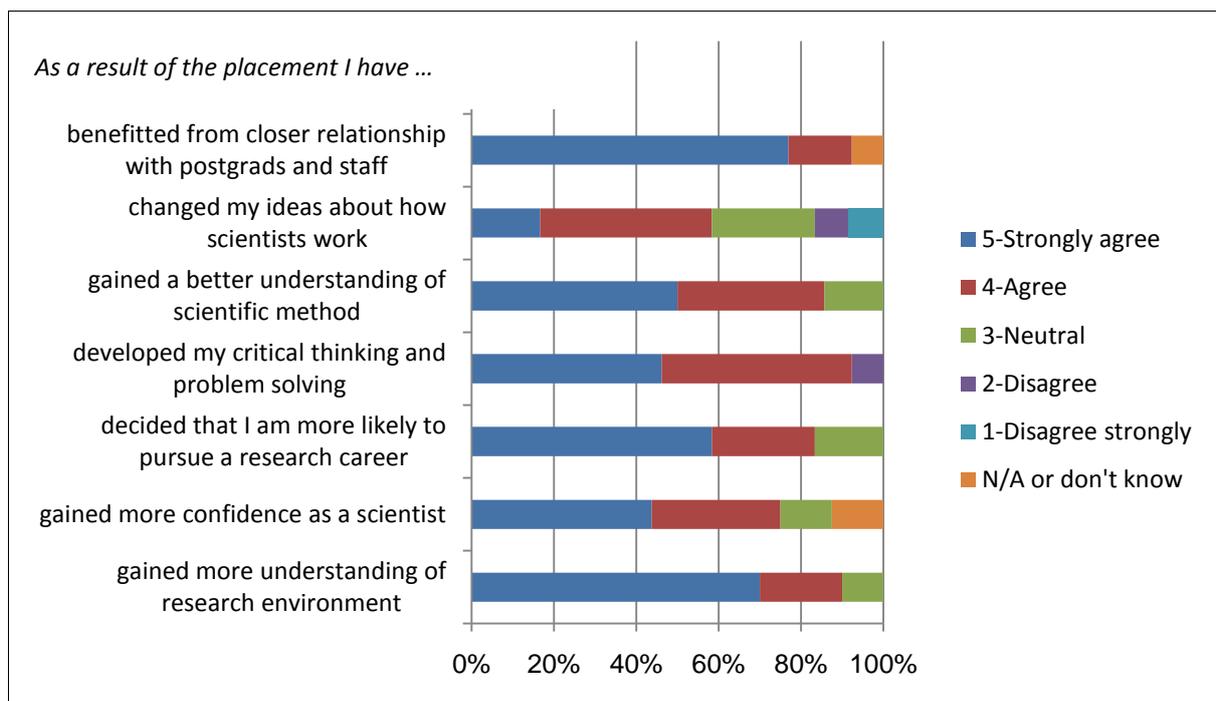


Figure 2. Students' responses to the question "Has the scheme changed your awareness of research?"

4.3 Overall evaluation by the students

All of the students would recommend the scheme to other students and all but one gave very enthusiastic overall evaluations. Notable comments included

“ ... ideal for someone who isn't 100% sure about whether academic research is the route they want to pursue”

Marine Biology Research Experience Scheme

“... extremely useful as I hope to pursue a career in this area”

“... one of the best experiences of my life. It has changed how I view my degree and opened new career windows for me”

“... one of the most useful parts of my time at the University so far”

The only negative comments came from one student who “did not empathize with the importance of the project” and felt that the work in the project was very repetitive

4.4 Importance of the bursary payment

For students undertaking a 4-6 week internship during the vacations, 70% commented that it was an essential factor in taking part. This was especially important for those undertaking placements in Cambridge or Germany, who said that it would not have been possible to attend without support for travel and accommodation. The remaining students said that it was very useful as it allowed them to undertake research rather than having to do paid work, but they said they would have done it without payment. Among the students undertaking part-time placements during term time, 50% said it was essential and 50% said it was useful, but not essential. We did not question the financial status of the students, but it was clear from their responses that many of them had part-time paid work during term time and especially in the vacations.

4.5 Supervisors' views on participation and performance of the students

As shown in Figure 3, over 75% of the student participants were rated by the research supervisors as good or very good in relationships, discussions, record keeping, initiative, organization of work, technical ability, and productivity. In terms of knowledge, 58% were rated as good or very good and 42% as average. Supervisors recorded strengths and areas for improvement, which were fed back to the students.

Marine Biology Research Experience Scheme

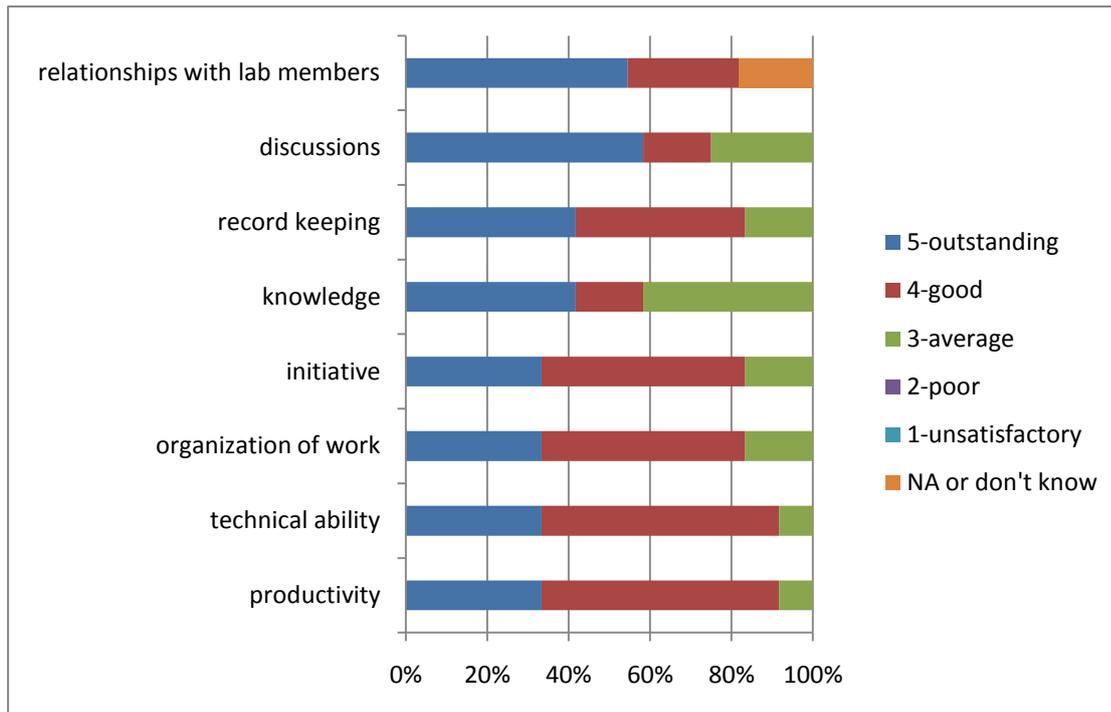


Figure 3. Supervisors' evaluations of the participation and performance of students

4.6 The value of internships to the research supervisors

Figure 4 shows the responses of project supervisors to the question "How useful has the placement been to your research?" As expected, the most common value was perceived as 'an extra pair of hands' or assisting with routine tasks, but 62% of students were useful or extremely useful in helping with analysis and interpretation of data and 50% helped consolidate data for publication. Responses to other aspects were more variable. In their overall evaluation of them scheme, all but one of the supervisors were very pleased with the experience and would recommend the scheme to others. A selection of comments is given below

"... improves one's teaching abilities"

"... extremely useful to have this time to set aside to develop data for a forthcoming [grant] proposal"

"... one of the most important parts of the scheme is the selection process"

"... to be part of the interview process was valuable experience"

"... the project would not have been possible without support because it was very labour intensive ... will form the core part of a paper"

"... gave me valuable experience of teaching my topic area to a new student"

Marine Biology Research Experience Scheme

“... consolidated my collaboration with PML ... which will help applying for PhD cases and grants”

“... allowed me to work with an undergraduate genuinely interested in science”

“... allowed me to process a much greater number of samples than would have been possible on my own”

“... allowed me to explore an aspect of [my research] I would have been unlikely to investigate ... as a results of his findings, I will probably investigate this further”

One researcher (an external provider supervising a part-time internship during term time) would not recommend the scheme based on his experience, as the contribution was felt to be too fragmented and would need to be over a longer period.

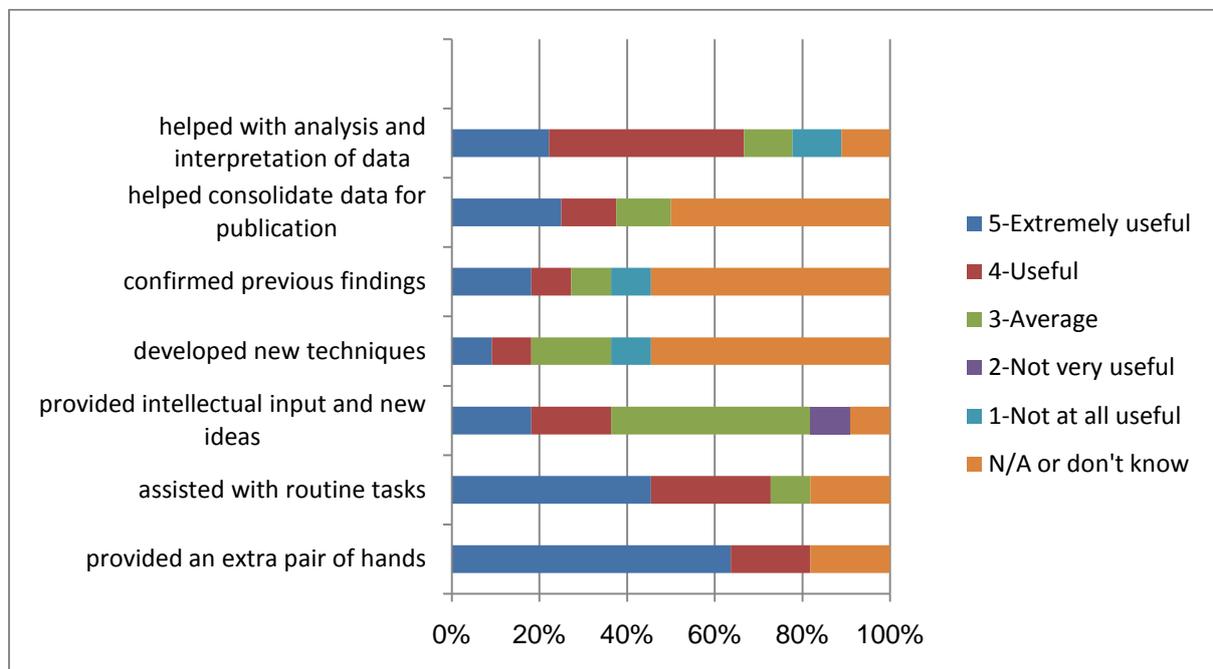


Figure 4. Supervisors' responses to the question "How useful has the placement been to your research"

4.7 Importance of allocation of consumable funding

Supervisors of three of the first set of internships vacation in summer 2009 were allocated consumable funding of £250 to purchase essential items or fund travel. Although the supervisors commented that this was very important to them, the project team decided not to offer this for the later projects in order to maximise the funds available for student support. This did not seem to affect proposals for projects.

Marine Biology Research Experience Scheme

5. Plans for continuation

We consider the scheme to be highly successful in providing opportunities for very highly motivated students to experience working alongside researchers. The experience has clearly had a very beneficial effect on almost all of the students taking part. By introducing a competitive element and 'formalizing' the selection of students for specific projects through the application and interview process, we were successful in identifying highly motivated and dedicated students at an early stage of their course. This resulted in genuinely useful research support and an enjoyable experience for the project providers. We are intending to continue the scheme in spring term and summer vacation 2010. However, at present, we have not identified funds to provide bursaries for student support. In view of the students' comments, we consider this to be highly desirable, especially to ensure equality of opportunity. It is possible that some funding may be available from teaching budgets and research leaders have been asked to consider whether it is possible to build in an element of funding for undergraduate research assistants into grant proposals; this may be acceptable to research council as 'outreach'. Other external sources are being pursued, especially to promote the highly valuable links that we have forged with the BAS and MPI-Bremen. However, in the current economic circumstances significant funding for bursaries seems unlikely. Nevertheless, we propose that there are many benefits of adapting this scheme to organize purely voluntary internships.

6. Dissemination

The findings will be presented as a short talk in The Atrium @ 3 Endsleigh Place and we plan to submit an article to the Biosciences Centre Newsletter.

Acknowledgements: We thank Karen Gresty for help in design of the evaluation questionnaires and Jennie Winter for useful discussions.

Marine Biology Research Experience Scheme

APPENDIX: SUMMARY OF STUDENTS SUPPORTED AND EXPENDITURE

STAFF	STUDENT	FT/PT	BURSARY AWARDED	EXPENSES AWARDED	RIT GRANT
					10000
CALOSI	DONOHUE	FT Summer 2009	900	250	
N'SIALA	GRIFFITHS	FT Summer 2009	900	250	
DE AMICIS	WATERHOUSE	FT Summer 2009	900	250	
SIMS	VRETELOVA	FT Summer 2009	600		
HALL-SPENCER	BULLIMORE	FT Summer 2009	600		
LEEMING	MAXWELL	PT Spring 2010	250		
MARLEY	LECLERC	PT Spring 2010	250		
MARLEY	KIRSYS	PT Spring 2010	250		
TILLS	MCCONVILLE	PT Spring 2010	250		
SOMERFIELD (PML)	YULE	PT Spring 2010	250		
KARDER (MPI)	RJENTES	FT Summer 2010	900		
BILTON	FOX-POWELL	FT Summer 2010	600		
CALOSI	GREENWOOD	FT Summer 2010	450		
MORLEY (BAS)	NANCOLLAS	FT Summer 2010	600		
MARCHANT (MPI)	MESSER	FT Summer 2010	900		
BOYLE	CHINNEGADOO	FT Summer 2010	600		
TILLS	WALL	FT Summer 2010	600		
		TOTAL	9800	750	10550
		BALANCE			-550

(Overspend funded by School of Marine Science and Engineering)