Citizen Science on the Rocky Shore

Nathan Sime
Kieran McKewen
Adrian Cross
Hamish Smith

Samuel Mann
Information Technology
Otago Polytechnic
Dunedin, NZ
samuel.mann@op.ac.nz

EcoExplore is an application for mobile devices to encourage members of the public to explore the natural environments of New Zealand and to share their discoveries with others. Our project will bring the scientific community and the public together in collaboration by enabling participants to record, share and discuss observations and questions while also facilitating the collection of scientific data. This will result in a greater understanding of, and involvement in, the management and conservation of natural New Zealand environments by all parties involved.

Root-Bernstein (2008) argues that science is not a search for solutions but a search for answerable questions – it must become acceptable to say "I don't know":

> *Science is a way of asking more and more meaningful questions. The answers are important mainly in leading us to new questions. So try to learn some answers, because they are useful and interesting, but don't forget that it isn't answers that make a scientist, it's questions.*

Bernstein challenges educators to train student to raise answerable questions that no one has ever asked (and we're not going to achieve that by always getting them to answer questions to which we already have answers).

Imagine this: You and the family are down at the beach exploring the rock pools when the kids discover a group of seals you haven't seen before. The kids want to learn more about the seals so you take out your smart phone, open the *EcoExplore* application, take a photo, and identify the species. Within a minute you've learnt about the seals' feeding and breeding behaviours. Through *EcoExplore* you discover that others have sighted seals in your area and have been discussing their sudden appearance. A scientist has also been following the seals and has asked people in the area to take part in a seal population survey to help discover an answer. You submit your sighting – the photo, location and time are all uploaded, you add some environmental information – sea state and weather. Further down the beach you see a pile of storm-tossed krill and wonder if the krill is related to the seals. *EcoExplore* helps you formulate this into a scientific question and it is posed as a community question – next time someone sees seals or krill they will be prompted to contribute evidence to help both answer your family's science question and contribute to wider understanding.

The above scenario describes one possible use of *EcoExplore* which is being developed in association with the Portobello Marine Studies Centre as part of Project Chiton (Coastal Habitat and Intertidal Observation Network). The *EcoExplore* citizen science application on your smartphone will be multi-faceted: a visual field guide; helping your family contribute to discussions; enabling contribution to science through collection of field data; and helping your family formulate scientific questions – developing a healthy curiosity and a community level science programme.

EcoExplore brings together observations, questions and scientific data together in open discussion, members of the public and members of the scientific community will be able to work collaboratively in designing and implementing scientific projects all through the use of our application. The concept of citizen science, members of the public participating in the large scale collection of scientific data, has been used by many mobile applications to encourage the exploration of natural environments, but few have facilitated true collaboration between the public and the scientific community (Aoki *et al.* 2012, Rotman *et al.*, 2012). *EcoExplore* is then more than a database of rocky shore plants and animals.

The collection of scientific data will take the form of users identifying organisms they discover during their exploration using identification and population surveying tools provided by our application. This will provide a growing record of organism distributions across New Zealand for use in research and population trend reporting. To further the user's understanding of an organism and its role in the environment, the application will provide information on the organism following its identification, information that would otherwise be inaccessible while exploring, such as its breeding behavior, feeding habits, threats, and temporal and spatial population trends calculated from user collected data.

REFERENCES

Aoki, P. M., R. J. Honicky, A. Mainwaring, C. Myers, E. Paulos, S. Subramanian and A. Woodruff (2009). A vehicle for research: using street sweepers to explore the landscape of environmental community action. *Proceedings of the 27th international conference on Human factors in computing systems*. Boston, MA, USA, ACM.

Root-Bernstein, R. (2008). I Don't Know! *The virtues of ignorance: complexity, sustainability, and the limits of knowledge*. W. Vitek and W. Jackson. Lexington, University Press of Kentucky: 233-250.

Rotman, D., Preece, J., Hammock, J., Procita, K., Hansen, D., Parr, C., Jacobs, D. (2012). Dynamic changes in motivation in collaborative citizen-science projects. *Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work*, Seattle, Washington, USA.