



Development of Reading Competences in Inclusive Primary Schools

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Abstract

It is becoming ever more important for scientists to be able to convey their research to a broad range of audiences. This paper will describe the development of a pilot postgraduate module on communication and outreach for students of science and technology in University College Dublin which aims to address this issue. The overarching rationale behind developing such a module is the premise that if a scientific concept can be broken down in such a way as to be explained to a 10 year old child, then the scientific concept can be explained to anyone. With this in mind, a dynamic course was developed which guided participating students in the skills necessary to present various scientific topics to a variety of audiences, using primary school pupils as the starting point. The course was delivered through seminars, workshops and tutorials. Students were given two opportunities to perform science outreach activities with primary school students from senior primary school classes. Eight postgraduate students participated in this pilot which took place in autumn 2010. Feedback from the students was very positive with one student commenting how the module "helped improve" communication skills. The primary school students really enjoyed the outreach sessions, one student stating that he "would give up a Saturday or Sunday to go". Future iterations of this course will be improved through comments given in the student final reports.

1. Introduction

In the current European and International economic climate, it is becoming increasingly apparent that in order to justify their research, scientists need to be able to explain their work to a wide range of audiences such as the lay person on the street or funding bodies, as well as to their peers in their specialist and non-specialist subject areas. In a recent Eurobarometer survey, a majority of European citizens agree that scientists do not put enough effort into informing the public [1]. With this in mind, it was decided to set up a communications and outreach module for postgraduates that would bridge the gap between science and the public. This would serve to advance a general public understanding and appreciation of current scientific research and encourage scientists to actively engage with the public. The rationale behind this module is to train students in science outreach thus improving their communication skills to all audiences. In this case the audience targeted were senior primary school students aged 10-12. This group was selected because if you can explain a complex science concept to a child of this age, then it is reasonable to believe that you should be able to explain it to anyone. From reflections of being a volunteer school teacher Waksman [2] concluded that it is essential to arouse interest in science at a young age, preferably at primary school level, as the most number of new brain synapses are formed between ages 10 and 13. The ROSE report which investigates the experience of secondary student's opinion of school science and science in general suggests that it may be too late at secondary school level to acquire an interest in science, as too many things are vying for students' notice. It is therefore essential that an underlying interest, motivation, respect, curiosity in science be fostered at a young age, before secondary school, when they still can be fascinated by the wonders of science [3].



1.2. Description of module

The communication and outreach module described in this paper was developed with a view to providing postgraduate students of science and technology with the tools to describe their research, along with general science themes to everybody ranging from primary school children to the general population. Postgraduate students from CLARITY and Systems Biology Ireland (SBI), research centres in University College Dublin where the authors are based, took part in this pilot module which took place in semester 1 of the 2010-2011 academic year. Throughout the duration of the module, students were given an opportunity to perform science outreach activities with primary school students, and to develop and perform their own outreach activity for a primary school audience based on a topic that interested them. This module was very dynamic, with 70% of the material developed prior to the course starting, and 30% material decided in conjunction with students. At present, no similar postgraduate module that combines communication and outreach exists in Ireland.

2. Methodology

The module consisted of seminars, workshops, outreach sessions, review sessions and a final report, all described below.

2.1 Seminars

Seminars were given by the authors and selected guest speakers who were specialists in the particular area.

- Seminar 1 consisted of an introduction to the module including objectives and learning outcomes with ice-breaking and team building exercises. Students were also asked of their expectations of the course, outlined in Figure 1.
- Seminar 2 was on presentation skills and covered best practices in giving presentations such as keeping the audience in mind and tailoring the presentation to suit
- Seminar 3 outlined peer review practices, which enabled students to self-evaluate their progress
- Seminar 4 dealt with teaching and learning topics relating to different audiences

2.2 Workshops

In the workshops students and lecturers presented video samples of their favourite presenters, and discussed the reasons why the presenters were so effective. Examples of ineffective speakers were also shown to highlight potential pitfalls that may be avoided.

2.3 Tutorials

Tutorials were arranged to assist the module participants in becoming familiar with prescribed outreach sessions as well as developing new outreach activities suitable for primary school students.

2.4 Outreach Sessions

There were two class visits from primary schools, both classes consisting of about 30 students aged between 10 and 12 years old. For both outreach sessions the primary school pupils were broken up into groups of 5-6 and brought to workstations with a range of different experiments. Each workstation consisted of two students with two experiments to demonstrate, with the children actively involved. The first outreach session consisted of experiments which were designed by the module co-ordinators and led by student participants. The second outreach session consisted of experiments which were developed and led by student participants. During both of these sessions course participants peer reviewed each other and gave feedback post session.



2.5 Review Seminars

Each outreach session was followed by a review seminar, which served as a cool down process highlighting issue that arose. These seminars were also used to highlight positive features independently developed by the students. A final review seminar was organised with a view to getting feedback and suggestions as to how future iterations of the module could be improved in the future.

2.6 Student Report

To gain the 5 ECTS credits for this module, students were asked to submit a ten page report outlining not only their expectations and experience during the module, but also what they would like to see improved. Each of these reports was structured under the following headings:

Introduction: motivations for doing this course, how it will enhance your profile, etc.

Introduction to first outreach activity- how it fits in, why it is relevant for chosen audience

Description of first outreach activity

Observations and peer review of first outreach activity

Introduction to own outreach activity, how it fits in, why it is relevant for chosen audience

Description of own outreach activity

Observations and peer review of own outreach activity

Discussion and Conclusions

Recommendations for future iterations of this course

3. Discussion

The communications and outreach postgraduate module was designed in order to give the participants the skills needed to present their research to a wide variety of audiences. The transferable presentation skills honed here, enabled the students to realise their talents in explaining complex ideas to a lay audience. This effort also provided them with a perspective on their own thesis research and an ability to contextualise it in a manner suitable to their audience. These presentation and communication skills will allow the students to tailor their future presentations to a variety of audiences.

One of the key objectives for most scientific outreach sessions is to encourage people to foster scientific curiosity at a young age, which ideally would lead to an increase in individuals choosing a science career. During these outreach sessions, a particular science demonstration may impress the children, but they may not be able to relate to the concept or to the demonstrator. Previous studies have shown that there is a common belief that one needs to be a genius to work in a science field [3]. So, a key focus for such a session should be to introduce the face behind the science, as this approach will help to debunk the myth the certain children have that a science career is unobtainable for them.

At the beginning of the outreach sessions given by the postgraduate participants of the communications and outreach module, children were asked to describe what a scientist looks like, which returned a stereotypical Einstein figure with a white laboratory coat, similar to what Chambers found in his “draw a scientist paper” [4]. When the outreach sessions were over, the children were asked the same question again and described scientists as looking like “normal” people who they could identify with. Further feedback gathered from conversation with the teachers indicated that these sessions put a face to the science, and portrayed science as an interesting prospect and a career choice that could be looked up and aspired to. Pictures of the outreach session are shown in the images below.





In Ireland, CSETs (Centres for Science and Engineering Technology) such as SBI and CLARITY all have requirements for education and outreach activities. School visits as part of teaching this module count toward target numbers of school children reached and also any student who takes part in the module is fully trained for future events involving outreach. This serves as an added bonus for the institute as it provides a highly capable trained team of people ready to engage and themselves with other groups as needed.

This pilot module was very successful and has received very positive feedback from all parties involved whether they were students, school children or teachers, and comments received are outlined in Figure 1 (Student expectations of the module), Figure 2 (Comments from primary school students who took part in the outreach sessions) and Figure 3 (Comments from participating postgraduate students). Issues and suggestions highlighted in reports will be taken on board and will lead to the module being improved upon each semester.

To learn presentation skills and to be more relaxed when talking to many people
 To learn how to explain my work clearly to a wide audience
 To learn to be a better writer
 To get some teaching experience
 To have some Fun
 To improve my communication and presentation skills
 To experience a different type of learning environment
 Fancy pop science experiments
 Get kids involved in science
 Get a feeling for teaching science to non-scientists
 Be more sociable and interactive
 Think of my research in a different way

"I think you guys are all geniuses. But especially Brendan"
 "Both my parents love science, so now I can show them all the cool stuff you showed us"
 "it was so intriguing and fascinating, of all our mini school tours this was the best"
 "Don't tell the other classes to go because I want to go again"
 "I had lots of fun and would have given up a Sunday or Saturday to go"
 "If I could I would go back again for another visit"
 "I would like to go again and I recommend it to other schools or classes of our school"
 "The DNA experiment was weird because it said everyone shares 50% with a banana"

Figure 2. Comments from primary school students who took part in the outreach sessions



The module "helped improve my own communication and interpersonal skills"
This module "helped me appreciate how developing my communication skills to become a better speaker can enhance my own profile"
"It was great to have the opportunity to take part in outreach activities, which were the highlight of the module and I found them to be very rewarding"

Figure 3. Comments from participating postgraduate students

5. References

- [1] Special Eurobarometer report "Science and Technology", June 2010.
- [2] Waksman, H. "The Scientist as School Teacher", Journal of Science Education and Technology, 12, 51-57. 2003
- [3] Matthews, P. "The Relevance of Science Education in Ireland", The Royal Irish Academy, Dublin 2007
- [4] Chambers, D. W. "Stereotypic Images of the Scientist: The Draw a Scientist Test", Science Education, 67 (2), 255-265. 1983