Design, implementation and evaluation of transnational collaborative programmes in astronomy education and public outreach

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Closing Remarks

This thesis has presented a study of several aspects of the design, implementation and evaluation of transnational collaborative programmes in science education and public outreach (EPO). The study is based on experiences with two large transnational innovative astronomy EPO programmes, the International Year of Astronomy 2009 (Chapter II.11) and Universe Awareness (Chapter II.2). Taken together, these projects allow several conclusions to be drawn about optimum approaches to massive science communication projects (MSCPs).

1. Summary of Results

Massive science communication projects should be based on strong and relevant science cases. They should engage with a large number of stakeholders, not only in research, academia, policy, funding and governance but also in less traditional communities, such as the arts field. It is important that the organisers of the projects at local level — usually volunteers — be given a sense of ownership and pride and appreciate the importance of the MSCP. The establishment of a centralised coordination body is essential to design, implement, manage and evaluate the MSCP and manage the volunteers. This centralised coordination body should establish a framework that can be standardised globally to gain economies of scale and scope, but should also be localised to meet local requirements and needs. Planning (including evaluation) should start as soon as the concept for the MSCP is developed. Experts in the evaluation of science communication programmes should be included in the global coordination team from the start and provide input to the MSCPs. New sources of funding also need to be sought, for example crowd funding. Crowd funding campaigns should aim to build awareness among the public, as well as to raise funds. An additional aspect of the UNAWE project has been the development of a robust framework for the relevant educational resources that incorporates peer review of both scientific accuracy and educational quality. The principles described above can usefully be extended from astronomy to other scientific disciplines.

2. Changing Aspects of Science Communication

As mentioned in the introduction to this thesis, communicating science and the results of scientific research with the public has become increasingly important for scientific researchers. We have demonstrated that the International Year of Astronomy 2009 (IYA2009) provided a new standard for transnational collaborative science EPO programmes and gave a substantial impetus to astronomy EPO activities throughout the world. The field of astronomy education and public outreach has evolved rapidly since 2009, and new techniques and technologies continue to be exploited. The community has become more organised and connected. Global programmes and projects, such as Universe Awareness have grown. The collaborative approach laid out in the IYA2009 project has persisted and the astronomical EPO community continues to cooperate in tackling important issues regardless of nationality, culture or language, mimicking the internationalisation of astronomical research.

A dramatic change of the media landscape has qualitatively changed the connection between researchers and the global public. The number of available communication channels, social media networks like Facebook, Twitter, Instagram and other similar networks are proliferating. Not only do these new media channels provide effective tools for science communicators, but they have also resulted in increased interest and a degree of active participation from large numbers of non-expert individuals (the "crowd') throughout the world and distribution of scientific results to the public at an unprecedented speed. Further research is necessary to understand the impacts of these changes (boyd 2015). While these media channels are not the first genre of technology used to engage large groups of the public, they have grown from obscurity to near ubiquity rapidly in the last years. Social media has become the favoured knowledge-sharing tool among these new information "gatekeepers", particularly young people. Furthermore, the advent of crowd-support and –funding (as discussed in chapter III.2) has opened new venues through which the public can directly engage with, and influence research.

As astronomy education and public outreach has grown and become professionalised, it has also become more diverse. It now includes such topics as teacher training, citizen science, content for science centres and museums, as well as the development of online resources. Many innovative projects presently carried out at a local level have great potential for global dissemination, but are presently limited for wider dissemination by language issues and cultural boundaries.

Although English is the lingua franca of research, it is not the dominant language of EPO. The availability of resources and training in local languages is particularly important for activities with pre-university students or the training of primary school teachers. Yet another challenge is adapting courses and resources to fit within sometimes highly rigid national and regional school curricula. This requires considerable intervention at a local level to ensure that global programmes and resources are most effectively delivered at a local scale. To overcome these problems, a balance between local and global input is needed in the development of suitable educational materials. This has been demonstrated to work effectively in the production and distribution of the Universe Awareness Universe in a Box (as discussed in Chapter III.2).

There are different levels at which to meet these challenges. One is the creation of global-wide “light-house” projects, to provide a framework for both content and activity development based on a common standard, and to address adaptation and dissemination needs. The other strategy would be to create service structures, to support the numerous individual projects taking place at a local level, with translation, adaptation, and dissemination, enabling such local projects to have a global impact. Examples of these approaches include the UNAWE educational programme (discussed in chapter II.2) and the IAU platform for peer-reviewed resources, astroEDU (discussed in chapter III.1). Service projects — particularly repositories like IAU astroEDU — need long-term support to gain long-term acceptance in the target community and achieve the desired reach.

An important goal of the IAU Office of Astronomy for Development for the next few years is to select and adapt the most innovative local astronomy EPO projects to a global scale. The potential, visibility and effectiveness of such programmes in demonstrating the social relevance of science are high and it is likely that the lessons learned by astronomers will be extended to EPO in other research fields.

Recent initiatives from the European Commission (EC) have advocated stimulating an open and flexible learning experience through the use of information and communications technology to improve education and training systems (EU Open Education Initiative), aligning them with the current digital world. In parallel, the EC has (justifiably) been demanding a more open publication process for research (Open Access) and for the production of educational resources (Open Educational Resources). These initiatives will provide easy and open access to resources and training aids, such as Massive Open Online Courses (MOOCs) and will have an impact on future science education initiatives. As discussed in chapter III.2, the development of “glocal” physical educational resources – ones that could be globally standardised to gain economies of scale and scope, but localised to meet local requirements – can also improve science education.

The need for coordination and consolidation of efforts in education and public outreach is stronger than ever before. It is important to create opportunities, and find sufficient funding, to enable key aspects of science EPO to be implemented. These include: (a) the creation of an integrated approach to science education, with joint high-level science-related literacy goals; (b) the consolidation of experiences, lessons and best practices for pre-university education in astronomy and other sciences; (c) the creation of standardised open-access science-related educational resources, including kits that can be mass-produced and localised with images, videos, educational activities, presentations and content for exhibitions and planetariums. Among possible measures that can be taken to stimulate such activities are (a) devoting a small fixed percentage of science research budgets to public education and communication; and (b) extending the one-dimensional measure of publication impact in citations to a second dimension for the measurement of EPO activities in the career development of researchers.

In summary, public engagement is critical to the future of research: a society that does not care about science will not fund it, and society will not care about science unless it engages with the subject matter. In the vision document, Vision for Science Choices for the Future – 2025, the Dutch government set the tone for the importance of public engagement for research:

A fascination for science should not be confined to scientists themselves. Appropriate communication about science and technology will keep the general public in touch with the field and abreast of developments. It will promote an understanding of the scientific process. Everyone, young and old, will be well-informed and enthusiastic about all aspects of science and technology. Science must be visible."
— Vision for Science Choices for the Future – 2025, Ministry of Education, Culture and Science, Government of the Netherlands, 2004

The astronomy community, like other research communities, must engage with the public, not only by communicating knowledge of our Universe that they derive from research, but also by contributing to culture, philosophy and economic growth through scientific and technical innovation. It also needs to promote the processes and values of science — including rational inquiry, scientific method, global citizenship and the paramount importance of evidence.

References

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