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Engaging taught postgraduate students with science communication

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ABSTRACT

This case study presents "Kelvin News": a project to encourage and support taught postgraduate (PGT) students in the School of Physics & Astronomy at the University of Glasgow in communicating their passion for Physics and Astronomy during their studies. The context, rationale, and practical implementation of the project are described. We discuss the benefits of the project and the challenges that arose. We identify the conflicting demands on time experienced by PGT students as being the key factor negatively affecting the project. Other limiting factors such as weak writing skills among participating students can be addressed by peer-support within the project team. Despite these challenges, this type of initiative provides unique opportunities for the students to develop further transferable skills which have the potential to benefit them in terms of academic progression, sense of belonging, mental well-being, and employability. This project is well suited for use within other disciplines or universities.

Keywords: student engagement; writing skills; science communication

Introduction

Sharing our passion for science seems a natural thing to do for many active scientists, whether they are researchers, teachers, or work in the industry... But do students get the same opportunities to do so? While undergraduate students often have many opportunities to engage in science outreach activities during their time at university, it is much more difficult for PGT (postgraduate taught) students, who typically join their university for only one academic year, to find the time, resources, and support to engage in such activities.

The Kelvin News website (http://www.kelvinnews.org/) and magazine is a project which ran from 2015 until 2017 in the School of Physics & Astronomy (part of the College of Science and Engineering) at the University of Glasgow to offer an opportunity to all PGT students to engage in communicating their passion for physics and astrophysics. In this project, all resources are produced by PGT students. In simple terms, this initiative aims to showcase the successes of the students and the research carried out in the department, as well as covering news from the world of physics and astronomy.

This case study hereby presents lessons learned around the development of Kelvin News. In the next section we describe the practical implementation of the project since its start, including motivation and context. We then follow with a critical reflection around the benefits and challenges in developing the project. We conclude with practical recommendations to take this project forward. These recommendations are not specific to a discipline or institution and are therefore relevant to anyone interested in introducing a similar initiative.

The Kelvin News project

Motivation and organisational context

Outreach and public engagement in sciences are fundamental in engaging, informing, and nurturing the next generation of professionals in our disciplines. These activities provide a much-needed avenue to enhance the understanding of societal issues among the public and inform science literacy and policy (Arthur et al. 2021). Targeted public outreach initiatives are essential to increase the presence of underrepresented populations in all science disciplines to form more inclusive and diverse communities (Antón et al. 2018). Kelvin News is a project which aims to encourage and support PGT students in communicating their passion for physics and astronomy during their studies through a magazine and a website with social media. Its goals are aligned with our university's learning and teaching strategic objectives, specifically by shaping the university's learning community (preparing students for local and global employment and citizenship, and attracting students to engage in and successfully complete their studies), and by delivering an excellent student experience (promoting student engagement with learning and enhancing their success, and creating new opportunities for development of attributes which enhance their personal and professional development). Development of graduate attributes and engagement with outreach activities also figure prominently in the strategic objectives of the College of Science and Engineering.

The School of Physics & Astronomy, where the Kelvin News project was developed, maintains a healthy, successful and wide programme of engagement with the general public, schools, and the society: examples include, but are not limited to, talks and public lectures at events run by special interest groups or by the Institute of Physics, participation in science outreach events organised by the Glasgow Science Festival or by the Glasgow Science Centre, Twitter takeovers, Masterclasses in partnership with the Royal Society of Edinburgh, Café Scientifique, Work Experience Week for school pupils, and support for Advanced Highers (advanced qualifications taken in the sixth year in Scottish secondary education) projects in physics. As part of the school's portfolio of degree programmes, several PGT (one-year taught masters) programmes are offered, and typical cohorts will include students with a good first degree in physics or in a cognate subject from institutions anywhere in the world. The goal of the Kelvin News project is to enhance the PGT student experience, promote a culturally diverse community, forge a strong sense of community which will feed in the engagement with international alumni, and support the social, cultural, and economic local development through the international profile and reach of the school's taught postgraduate programmes.

These considerations provided the motivation to apply for funding from the Chancellor's Fund of the University of Glasgow. This fund, established in 1999, supports innovative projects that have an impact across the whole university. The award allowed us to plan for printing costs, as well as purchasing the domain name for the website. The project started in the second semester of the 2015-16 academic year.

The website and social media

The Internet offers almost unlimited possibilities to reach out and communicate with people across the world. The Kelvin News web site, and associated social media (Twitter @kelvin_news), is an excellent way for the participating PGT students to contribute to the success of the project by publishing an online version of the Kelvin News magazine, as well as sharing short news, articles, activity reports, or podcasts related to

their studies and their experience in Glasgow. The web site has been developed using WordPress and is hosted on the School of Physics & Astronomy servers, with the appropriate domain name purchased.

The magazine

The magazine was intended to be produced and printed for dissemination to a wide readership in Glasgow and beyond. The main target audience are undergraduate and postgraduate students studying for a Physics or Astronomy degree at the University of Glasgow as well as in other institutes across Scotland (we used the Scottish Universities Physics Alliance network to advertise this). Other potential readers include staff from the School of Physics & Astronomy, as well as everyone else with a broad interest in science. Although students' contributions appear first on the online version of the magazine, it was considered that hard copies stay more visible to many readers for a longer time than online issues, as online material can be quickly forgotten and replaced by other material.

The process

Meetings between student participants and a facilitator were organised as required, on average once per month, to work on the contributions from the PGT students. Typically, contributions can be:

- Profiles of other PGT students who share their experiences and stories with a broad geographical perspective;
- In-depth articles related to research undertaken as part of the MSc project (a three-month long research project in one of our research group or in a company);
- Interviews of PhD students, staff members, or former graduates, describing their background and their work;
- Stories around research or teaching achievements within the School of Physics & Astronomy; or
- Opinion pieces and analyses around hot topics in the world of Physics and Astronomy.

The role of the facilitator is to steer the group of students who participate, keep them motivated, ensure they actively support each other when developing their own contribution, help them to find solutions when they face difficulties, and comment on their input to the project as required. To help with this, a mailing list was created and updated as required with the names of those starting or leaving the project. We also set up a network drive folder with shared access to all contributors. The shared folder was used to communicate, exchange documents, and provide rapid feedback using the commenting feature of the platform. Team meetings were organised to offer support and advice on how to develop original ideas into full contributions that would be published on the web site or in the printed issue.

Project history

The first call for participation went out to PGT students in February 2015. The first meeting was held in March, with the coordinator (NL) being the academic staff member present as coordinator. Seven students joined at that time. It was agreed that students would write a mixture of short (800 words) and long (1600 words) articles at the level of New Scientist or equivalent, which would then be reviewed and copy-edited. A deadline falling six weeks after the date of that first meeting was given. Unfortunately, the first two article

drafts were delivered a month late, with a significant amount of work remaining at the review and copy-editing stages before publication could be envisaged. It became quickly clear that the participating students faced significant difficulties in coping with conflicting demands on their time, and eventually chose to prioritise academic deadlines and revisions for written examinations over their contribution to the Kelvin News magazine.

By August 2015, five contributions were under review and being edited, and initial work on the creation of the website was taking place. The first article was published on the website in September 2015. By then, all the students who had joined this first team had completed their taught masters and left the university. The remaining four contributions did not make it to a publishable form at that stage.

The Kelvin News project stayed dormant for a year due to the coordinator (NL) not being available. Later, JB (who was then a postgraduate researcher in the College of Science and Engineering) joined in August 2016 to support further development of Kelvin News. She brought her experience of working with The Glasgow Insight into Science and Technology (https://the-gist.org/) as Board member and Head of Copy Editing, as well as Let's Talk About [X] (http://www.talkaboutx.net/). We wrote a how-to resource to provide clear guidance to Kelvin News contributors. At the same time, NL and JB were working on a separate project to study the factors affecting PGT students' transitions in the College of Science and Engineering (Bownes et al., 2017), and it was felt that Kelvin News could contribute to helping PGT students in their transition to taught master's study.

We hence issued a new call for volunteers in October 2016, and by February 2017 five new students got involved and began to work on new contributions as well as on reviewing some of the outstanding articles written earlier by the previous student team. Eventually, new articles appeared online, and our first issue of the Kelvin News magazine was printed in June 2017. The participating students were proud of this achievement, and we received requests via Twitter to send out a few hard copies. A new team of PGT students joined the project in October 2017, and new articles were being worked on. However, similar issues as the ones previously described arose: article drafts required a significant amount of editing, the students prioritised graded coursework and exam preparation, and the draft contributions never made it to publication.

Reflection

Ten students (five each year) regularly took part in the project over its lifetime. As no formal evaluation has been undertaken, the following is a critical reflection from our perspective as the originators of the Kelvin News initiative.

Benefits

Kelvin News was developed with the aim of delivering multiple benefits to the department and, more importantly, to the students who engaged with the project. It was important that students who were involved in Kelvin News were able to develop a variety of relevant skills because, as postgraduate taught students, their transition through their degree is far shorter than that of an undergraduate student who may take three or four years to complete their degree (Bownes, et al., 2017). This means that PGT students have less time than their undergraduate counterparts to develop important graduate attributes that are essential for successful careers. There were five high value gains, linked to the students' academic development and their post-university employability that were built into the project during its conception:

1. Developing teamwork skills;
2. Fostering a sense of community and belonging;
3. Enhancing academic writing abilities;
4. Enhancing engagement with their degree subject; and
5. An in-depth understanding of the importance of public engagement in STEM research and industry.

By taking part in the magazine as authors and editors, the students benefit from these gains and the department benefits from the development of a student-staff collaborative working environment. These benefits, rooted in academic research, can then be seamlessly transferred from the volunteer project (Kelvin News) to the student's academic work and further applied in their chosen career path.

One of the aims of Kelvin News is that participants would develop their teamwork skills so that they would be better equipped to carry out summative and formative group assessment activities during their degree, and more able to effectively contribute to a team in a work environment. Research has shown that engagement in extra-curricular activities promotes the acquisition of teamworking skills (de Prada Creo et al., 2021), and that effective teamworking amongst student cohorts results in better academic performance and more employable graduates (Sobral, 1997). These are obvious benefits to the PGT student experience and are also closely aligned to the University of Glasgow's (n.d). learning and teaching strategy 2021-25.

Worryingly, it is commonly perceived by employers that graduates often lack teamwork skills (CBI/Pearson, 2017) and these skills, along with other transferable skills, are becoming increasingly valued by employers (Succi & Canovi, 2020). Higher education (HE) institutions are becoming aware of this skills gap and are making efforts to mitigate this. There have been examples of high-profile companies working in collaboration with universities to attempt to bridge this skills gap. Dunne and Rawlins (2000) reported on a programme funded by BP to run teamwork programmes across ten HE institutions to encourage teamwork and employability, and Aizpun et al. (2015) was successful in instigating a collaboration between Tecnun School of Engineering and adidas that resulted in their students advancing their teamwork skills. While effective in increasing teamworking skills for the participants, the programme only catered for undergraduate students and there are fewer examples of similar opportunities that are open to PGTs. Kelvin News aimed to help PGT students to develop their teamworking skills by forming an author/editor team that would manage the production of articles for the magazine. The magazine was designed so that the team worked together to choose article titles, peer review draft papers, and manage deadlines for publication; thus, developing and improving their ability to communicate and negotiate fairly with their colleagues as well as solve problems as a cohesive team. Different roles within the team (e.g., copy editor and web editor) encouraged specialisation, ownership and cross-specialist communication, all of which are crucial to working effectively within a team.

Closely related to developing teamwork skills are the benefits that are associated with fostering and belonging to a community. Integration into a university community has been shown to be conducive to successful transition into and through a new degree programme (Maunder, 2018). Belonging to a community provides a mutual support network that can be crucial to student retention and resilience. In addition to the benefits of belonging to a community of peers, productive relationships between students and their department often results in an increase in students' willingness to seek support from academic staff, as well as an increased ability of staff to be able to identify when students require academic intervention (Bovill et al., 2011). Compared to their undergraduate or postgraduate research peers, PGT

students can find it difficult to integrate meaningfully into their university community (Coneyworth et al., 2020). In addition to the relatively short transition period through a PGT programme (one year compared to four years in Scotland and three years in the rest of the United Kingdom), PGT cohorts are a minority in the student body, constituting only 25% of the UK HE student population in 2021/22 (Higher Education Statistics Agency, 2023). These factors present a barrier to building and sustaining a supportive student community. Despite PGTs being a minority group in the students' body, the UK HE PGT population is disproportionately growing year on year: from 19% in 2017/8 to 25% in 2021/22 (Higher Education Statistics Agency, 2023). This signals a growing need for opportunities and initiatives that are specifically tailored for PGTs, such as Kelvin News, to sustain the academic and personal wellbeing of this community.

In addition to fostering community belonging through inclusion in a supportive and effective team, we wanted to offer PGTs an additional opportunity to develop their academic abilities. We therefore designed Kelvin News to help students increase their academic writing ability in two ways. Firstly, there is the clear benefit of practicing writing about an academic subject in a low-stakes (unassessed) context. The effect of low-stakes writing has been well studied and shown to benefit student engagement in their subject (Beam, 2021), encourage progression and retention in non-traditional students (Sambell & Hubbard, 2004), and develop writing and research skills (Stewart-Mailhiot, 2014). Kelvin News authors were able to practice constructing relevant, concise and well-structured writing, as well as developing audience awareness – all of which are skills and abilities that can be easily transferred to formal assessment in their academic programme. This project aimed to champion students to become even more investigative, independent, and critical thinkers.

Effective low-stakes writing must also be well scaffolded by a feedback process, and in the case of Kelvin News, this was achieved via the peer review process (Frietas, 2022). Articles were reviewed by peer reviewers from the magazine team who provided constructive feedback to the writer. This has benefits for both the reviewer and the author as the former is asked to critically analyse and give feedback on academic writing and the latter receives personalised suggestions on how to improve their work (Huisman et al., 2019). These benefits have been evidenced in the literature by Topping et al. (2000) who demonstrated that peer reviewing improves writing performance in psychology students. Their paper cautioned against generalising the results; however, the writers of Kelvin News share many demographic features with the group in the study. Both Topping et al. (2000) and Kelvin News involved a small, cohesive group of students undertaking the activity outside of their formal academic assessments, so the view was taken that their study effectively underpinned the aims of Kelvin News.

While improving students' academic abilities were foremost when designing the Kelvin News project, it was articulated around a desire to enhance the students' satisfaction by offering an activity that is related to, but not directly part of, their degree. Co- and extra-curricular activities are a fundamental part of the student experience particularly with respect to the sense of belonging to a community. Thus, it was also important that the magazine would help students to engage with their degree subject (physics and/or astrophysics) in a novel and meaningful way. Student engagement is one effective way to stay away from viewing students as consumers of higher education. Students and their chosen universities "study, learn, research, and grow together" (GuildHE, 2015), and this is something that was made very clear to students taking part in the project. Furthermore, the benefits of interleaved study practice, where students approach a subject in several different ways, is well known (Dunlosky et al, 2013; Taylor & Rohrer, 2010) and, recently, a critical study of student-run magazines show that these types of projects have specific academic benefits for science students. Tatalovic (2008) noted that academic discussion about the benefits of student-led publications is sparse, despite the large range of skills that are acquired by students who engage with such

projects. By asking the authors of Kelvin News to write about physics or astronomy topics that interest them, we encouraged a wider engagement with their subject, as well as fostering independent study and the development of academic research skills.

Finally, Kelvin News aimed to increase awareness amongst PGT students of the importance of wider public engagement and dissemination in science. Public engagement and dissemination is an increasingly pertinent issue in academic science; much of the research carried out in HE institutions must be communicated outside of the academic community to maintain credibility and validation. The debate about how we can improve public engagement in science has been an issue for decades (Funkhouser & Maccoby, 1971). Kelvin News both improves public engagement with a specialist and (often perceived) inaccessible subject, while also educating students about the importance of science communication. It was a key aspect of the project that the newsletter be published in an open access format and that articles are written using accessible language to benefit both the reader (by making engaging and accessible physics educational content freely available) and the magazine team (by encouraging students to consider how they might communicate their subject to non-specialists).

In designing the Kelvin News project to deliver five benefits (teamwork, sense of belonging, improved academic writing ability, improved engagement with a degree subject, and increased awareness about science communication), we were able to direct the project in a way that was founded upon evidence from academic literature. This resulted in a well-defined, and attractive scheme for PGT students that had a strong potential for multiple high-impact benefits to their academic progression, their employability, their social wellbeing, and their relationship with their subject and the department. Furthermore, this type of initiative contributes to commitment balance: "when a student's commitment to their university is perceived to be reciprocated by the university's commitment to the student" (Cownie, 2017, p. 674).

Challenges

The potential benefits of this type of project have been discussed in detail. But as the description of the project history illustrates, there remains challenges: How to overcome conflicting priorities? How to grow the size of the group? How to share knowledge and experience gained by contributors with newcomers? The time required to obtain original contributions which can be published online or in the magazine was underestimated. Students often sent their articles after the agreed deadline. Once an article was sent to reviewers, reviews – if completed – were delivered later than anticipated. The most significant challenge was subsequently to get the authors to review their original articles in response to reviewers' comments. These hurdles occur because of the students' need to prioritise their studies and focus on curricular activities contributing to their course grades and overall degree success.

We are now considering the future direction for this project, which has remained inactive since 2017 due to the evolving nature of the roles of the staff who led this initiative. Our recommendations, detailed below, are informed by the relevant literature and how others have designed similar projects and conceptualised similar ideas. For example, Wilmot (2016) describes how challenges were analysed and approaches were developed to design a writing group to support research postgraduate students' academic writing. While their work is therefore not directly focused on PGT students, their conclusions arguably are relevant to our work here. The "valuable role writing groups can play in providing a transformative space for postgraduate students to learn, question and challenge" has been evidenced (Wilmot & McKenna, 2018, p. 880) – this is a sentiment that we wholeheartedly share.

Recommendations for the development of similar initiatives

From our reflection on Kelvin News' benefits and challenges, we suggest the following recommendations:

- Ensure sustainability of the project by constituting a staff coordinators team comprising at least three individuals with clear responsibilities, as well as shared knowledge and experience. This is to avoid single points of failures and situations where changes in the roles of all coordinators jeopardise the continuous running of the project.
- Recruit at least two PhD students who are enthusiastic and knowledgeable with science communication to manage and coordinate the group. This will enhance the connection between the two postgraduate communities and empower the PGT students to take ownership of the project, as they otherwise may rely on the academic coordinator to move the project forward. The staff coordinators can still oversee the effective running of the project but be less involved in the routine operations. This also provides valuable professional development opportunities for the PhD students involved.
- Hold regular and frequent meetings (e.g., every two weeks) to keep the students motivated and focused on the writing. At these meetings, writing support can be provided. One way to support students in delivering their contribution is to encourage them to identify a topic that they are really interested in and to write about it, first ‘in small chunks’, and progressively including more breadth, more depth, images, references – while keeping a personal connection to the chosen topic from the very beginning.
- Establish a clear schedule of contributions and authors with agreed objectives and deadlines from the start of the year for the next twelve months. At each meeting, someone's work will be critically reviewed and discussed by the group, who will make suggestions to the author. The status of any outstanding contribution will be reviewed, and practical help and support will be offered as a group to each author. This is distinct to the scheme that we have adopted so far of author/reviewer pairs which, despite the potential advantages exposed earlier, are not as effective as anticipated because often the two students do not take the time to engage with the required work outside the group meetings.
- Focus activities on a website and social media to have articles published more quickly and more frequently. This will keep students motivated and will be more in line with how the target audience accesses their news. The goal of this project remains to first and foremost communicate about the subject in a fun way that allows for academic and personal development of the student participants, not to develop publisher's skills. Editing and publishing a magazine in print requires resources that are not sustainable on the long term in terms of finances (printing costs need be met for each issue); environment (to save paper and ink); and availability of required skills (students come and go usually on a yearly basis and publishing skills among the student participants are less likely to be found and available on a recurring basis).

Conclusion

Initiatives such as that described in this case study, aiming at supporting PGT students to engage with science communication, are highly beneficial in several areas. From our perspective, the five key benefits

that we identified are 1. developing teamwork, 2. fostering sense of belonging, 3. improving academic writing ability, 4. improving engagement with a degree subject, and 5. increasing awareness about science communication. Participating PGT students gain from developing graduate attributes such as: subject specialists, investigative, independent and critical thinkers, resourceful and responsible, effective communicators, confident, adaptable, experienced collaborators, ethically and socially aware, and reflective learners[1]. This enables students to develop transferable skills that will benefit them in terms of academic progression, sense of belonging, mental well-being, and employability.

Although the Kelvin News project was developed in the School of Physics & Astronomy at the University of Glasgow, its concept and surrounding context are not discipline- or institution-specific. This article presents recommendations for academics looking to implement similar initiatives within other disciplines and other departments or universities.

Biographies

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