

cs4fn Final Evaluation Executive Summary

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1. Introduction

Computer Science For Fun (cs4fn) is an innovative initiative in public engagement seeking to engage students in “serious fun”. In so doing, it aims to help them to see computer science as intellectually compelling, multi-faceted, creative and a pathway to a range of interesting careers. At the end of a five-year span of significant funding (£661,645) for cs4fn from the Engineering and Physical Sciences Research Council, this Final Evaluation Report offers:

- a record of key accomplishments or outputs of cs4fn;
- analysis of a suite of different types of impacts of cs4fn; and
- a set of reflections on insights, issues and lessons learned.

cs4fn was initiated in 2005 as a joint effort between Professors Paul Curzon and Peter McOwan, who later became the Principal Investigators of the EPSRC grant awarded in 2008. Consisting of a magazine, a website (www.cs4fn.org) and live shows, cs4fn has sought to introduce the potential for fun in computer science to school students and to capture their imagination. It also aims to encourage school students to consider higher education and careers in computer science or indeed other physical sciences or engineering. By emphasising this sort of engagement, cs4fn has sought to complement more strictly pedagogical approaches to conveying information about computer science. Nonetheless, it has served as a resource for teachers, schools and other education-related initiatives, as well as for students.

To gain an idea of the way the parts of the project work together, imagine cs4fn as a growing tree: the trunk is the cs4fn magazine at its core. Robust branches growing from this have included:

- the cs4fn website;
- an extensive programme of school visits;
- a set of additional events (such as science festival presentations) and
- publications (from handbooks on the magic of computer science to academic articles).

The cs4fn tree has borne numerous fruits, or impacts, leading to a diversified legacy, with influences on:

- pupils,
- teachers and university colleagues (early career and established);
- other efforts in science communication;
- a zeitgeist change in views of computer science education and related policy changes;
- institutional change and spinouts;
- as well as sharing of lessons learned.

2. Accomplishments

Standing out among the accomplishments is the production of some ten issues of the cs4fn magazine, following earlier issues for a total of 16 by autumn 2013. In addition issues of other magazines with a similar flavour, ee4fn and Audio!, were produced as well as several special publications, in particular the books *Magic of Computer Science* and the *Magic of Computer Science 2*. Developed with high production values, and with writing that illuminates research and computer science topics through unusual angles, the cs4fn magazine is viewed very positively by both teachers and students. Now up to a print run of 31,000, it is distributed widely across the UK, and indeed also to subscribers in some 80 countries. The magazine seeks to reach diversified audiences, as exemplified by its extremely successful special issue in 2010, *The Women are Here*.

The magazine is presented on the cs4fn website, with additional elements; again the website places the characteristic cs4fn emphasis on fun. A variety of portals (e.g. magic, teachers) facilitate access for individuals with different interests. Between 2008 and the present, the website has received over a million visits (1,155,521 by mid June 2013) with over 890,000 pdfs downloaded. A website survey running since 2008 has generated very positive responses, not only as far as the website's quality, usefulness and enjoyable nature, but also as to its influences. Over two thirds of respondents:

- saw more ways in which computer science is used,
- think of computer science as more interesting and
- think of a variety of careers that would use computer science.

Since 2008, members of the cs4fn team have given talks to nearly 20,000 school students in some 270 visits to schools and universities and engaged with a further 10-15,000 at science festivals (such as the Royal Society Summer Exhibition). School talks reach a diversity of students, both in terms of ethnicity and in terms of reaching more girls than would be typical for computer science events. Feedback from both students and teachers is extremely positive. In a post-talk survey, 79% of teachers agreed that as a result of the lecture one or more students is now more likely to consider taking computer science at university.

cs4fn has provided teacher support, ranging from the magazines and the website's teachers' portal that includes descriptions of cs4fn classroom activities to invited talks at conferences and inset day workshops; the team contributes to continuing professional development (CPD) and is currently running CPD courses for ICT teachers shifting to computer science.

cs4fn contributes to colleagues in computer science and in public engagement, not only providing magazine copies for other universities to distribute, but also giving talks at other universities' engagement activities and giving advisory talks at other universities. The cs4fn team has continuously reflected throughout the grant period and has shared lessons learned, via vehicles including but not limited to academic presentations and articles.

3. Impacts

cs4fn has given rise to a rich portfolio of impacts, in different categories.

Conceptual impacts, changes in understanding or views, include:

- more positive perception of computer science (and studying computer science) among students;
- a deeper understanding of computer science and its potential among teachers; and

- contributions to a “zeitgeist” change, with educational policies now beginning to view computer science as more intellectual and creative than the past association simply with IT.

Instrumental impacts, more tangible, include:

- production of long-lasting publication and website resources;
- contributions to policy/curriculum changes,
- influence on teachers and teaching practices; and
- spinouts (a company developing cs4fn material into workshops and a text for teachers, and a creative new app, *Tunetrace*).

Capacity-building impacts include

- influences on teachers, brought about through a range of activities, CPD and presentations;
- teachers have picked up on both content and the cs4fn “style” of learning.
- Although primarily connecting with teachers in the UK, cs4fn has contributed to international capacity-building as well, for example sharing with individuals involved in the Genoa Science Festival and, most recently, leading to leadership by McOwan of a large EU-funded project to support science teachers in innovative enquiry-based teaching.
- Another dimension of capacity-building has been the cs4fn team’s mentoring of next-generation researchers, introducing some 45 individuals to public engagement.

A significant **Attitude/Culture Change impact** has taken place in the home institution, Queen Mary University of London, which has elevated the status of public engagement, for example through establishment of a Centre for Public Engagement, a new Vice Principal post, and new academic promotion criteria that recognise public engagement.

While all of these impacts represent legacies of cs4fn, cs4fn’s legacy of influence is perhaps especially clear to see in its **Enduring Connectivity impacts**, with various onward “ripple effects” occurring through continuing uptake of available cs4fn materials, approach and practice by: university colleagues, teachers/related organisations, and other outreach initiatives, along with the media. In this report itself, cs4fn team members have distilled highlights of their rich understanding of public engagement into succinct advice for: researchers becoming involved/ carrying out science outreach activities; leadership of public engagement initiatives; and funders.

4. Concluding Thoughts

Early on in the era of national bemoaning the lack of interest in computer science among bright young people, the cs4fn team decided to convey consistently but in often off-beat ways the message that computer science is/can be ‘serious fun’, that computer science is inherently interesting as a rich multi-faceted subject and that it underpins a wide range of attractive careers. This approach has worked. Vast numbers of students at UK schools, and abroad, have been exposed to the magazine, the website and/or presentations at school visits or festivals. Teachers too have used the various cs4fn deliverables (products or activities) as a resource; now more than ever as the curriculum shifts occur cs4fn is contributing directly to teachers through a website portal, workshops and CPD. Colleagues at various universities and different science outreach initiatives have made use not only of cs4fn materials but also its learning about good practice. The innovative juxtaposition of magic with computer science, in live presentations and in cs4fn publications, exemplifies the initiative’s success in creativity. Through five years of EPSRC investment, and above-and-beyond effort by a deeply committed team, cs4fn has led to a diverse portfolio of important impacts on a full range of scales: from sparking excited interest in individual school students,

to mentoring next generation researchers in science outreach, to supporting numerous teachers with accessible and distinctive resources, to helping to bring about a zeitgeist change as to how computer science can best be viewed and taught.

While full financial sustainability has not been achieved in the sense that the activity of cs4fn will not be able to continue at the same scale, the team have recently been awarded a major new grant from the Greater London Authority's London Schools Excellence Fund to continue the work. This will have a specific focus on supporting teachers in London. Although it is thus likely to produce 'fruits' that may be disseminated somewhat less widely, the cs4fn 'tree' has still sown multiple seeds that will continue to grow. With ongoing uptake of cs4fn materials and practices by those who have come to have deep respect for the cs4fn brand, cs4fn will continue to have influence – a living legacy.

In summary, several key points emerge distinctly, in particular as seen through the evaluator's 5-year role as critical friend/evaluator:

- Accomplishments have effectively matched – and often surpassed – targets. In some cases, targets have evolved (e.g. producing special issues in place of an annual). Very often, additional deliverables have been generated.
- Satisfaction with cs4fn deliverables (publications, talks, etc.) seems in general to be very high – among teachers and students. Other colleagues and organisations have a high regard for cs4fn as well.
- cs4fn has successfully reached a diversity of students, from different sorts of schools and backgrounds. The issue *The Women are Here* is particularly commendable in tackling disparities in genders' interest in computer science.
- cs4fn has created a special brand, a “unique selling point”, by emphasising the potential for fun – curiosity, puzzles, intellectual play – in computer science, a dimension that students might otherwise seldom encounter.
- The team members have remained alert to a wide-ranging arena of computer science and related interdisciplinary research, and interesting applications. For many, this has illuminated uniquely the multiplicity of careers related to computer science.
- With implementation of its early and distinctive vision made possible by EPSRC support, cs4fn has made a difference. While lines of causality between individual students and individual university subject choices are impossible to prove, the combination of indicators available convey a range of impacts generated by cs4fn, in a full portfolio including conceptual, instrumental, capacity-building, enduring connectivity/leverage and culture change impacts.
- Financial sustainability for cs4fn continues to be dependent on external funding. Its future through autumn 2015 has been guaranteed by the Greater London Authority's London Schools Excellence Fund. Reflecting the priorities of its funders, cs4fn's activities now include more direct teacher training in addition to resource production. As long as cs4fn is not self-sustaining, it will need to adapt to funders' desires. But already cs4fn has generated a rich and multi-faceted legacy, so that its influences will continue to ripple outward and be felt.

The members of the cs4fn team are notable not only for an unusual breadth of understanding of computer science but also for outstanding personal commitment and continuing creativity.

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