Evaluation Report Summary

Darwin Education Initiative
January 2011

wellcome trust

Evaluation of the Darwin Education Initiative: Summary report

January 2011
Richard Lloyd, Mark Dyball and Heather Rose

Submitted to the Wellcome Trust by GHK (www.ghkint.com)
In association with People Science & Policy Ltd and TNS-BMRB

1 Background

GHK Consulting with People Science & Policy and TNS-BMRB were commissioned by the Wellcome Trust to conduct an independent evaluation of the Darwin Education Initiative. The initiative featured the provision of materials to support practical experiments in primary and secondary schools across the UK. The evaluation aimed to provide *"a good quality evidence base and recommendations to inform future large-scale projects on unrelated themes"*, identifying transferable lessons to inform similar future initiatives delivered by the Trust and its approach to supporting schools more widely.

The evaluation took place between January 2009 and December 2010. The method followed featured a combination of qualitative and quantitative approaches, including:

- A literature and practice review focusing on previous large scale education initiatives;
- A programme of interviews with key stakeholders in the initiative;
- The review of the materials development process;
- A telephone survey of over 500 primary and secondary school teachers; and
- Case study fieldwork with ten primary and 20 secondary schools, featuring interviews with teachers and pupils, and the use of pre and post questionnaires, across three contacts to provide a longitudinal picture of materials use.

Two reports were produced over the evaluation period:

- The first interim report – produced in February 2010 and providing the main findings of the study, exploring the development process, the use of the materials and their impacts, and potential legacy effects; and
- The summary final report – produced in January 2011 based on final contacts with the case study schools, and exploring continued and potential future use of the materials.

2 The Darwin Education Initiative

The initiative was one of several celebratory activities marking the 200th anniversary of the birth of Charles Darwin. It aimed to stimulate interest in science

by offering pupils in schools across the UK the opportunity to participate in a series of specifically developed experimental activities, which in turn provided resources and developmental opportunities for teachers in primary and secondary schools. The initiative also aimed to provide an enjoyable and memorable experience for pupils, and leave a legacy which extended beyond 2009.

A series of age-appropriate Darwin-inspired investigative experiments were developed and distributed to all primary schools in the UK. The primary school element consisted of **The Great Plant Hunt (GPH)** – a resource filled travel trunk – delivered by the Royal Botanic Gardens (RBG), Kew. The secondary school element consisted of three experiments under the heading of **Survival Rivals (SR)**, provided by Philip Harris and made available by order to secondary schools and colleges. These were:

- 'I'm a Worm, Get Me Out of Here' (I'm a Worm) – which focused on principles of natural selection and was targeted towards ages 11–14;
- 'Brine Date' – an experiment using brine shrimp to investigate sexual selection, targeted towards the 14–16 age group; and
- 'The X-Bacteria' – which used antibiotic resistance in bacteria to investigate horizontal gene transfer, targeted towards the 16–19 age group.

Guardian Professional also provided support to both elements of the initiative, mainly in terms of marketing and supporting website design and development.

3 Levels of uptake and usage

The first stage of the study explored the initial take-up and use of the materials by teachers through a telephone survey of 502 teachers in primary and secondary schools and fieldwork with the 30 case study schools.

Primary schools
The GPH materials were dispatched to all state primary schools in March–April 2009. The vast majority of primary teachers responding to the survey had reviewed them on receipt, with 60 per cent reporting using the materials prior to the survey (a level of use which, if replicated nationally, would mean that pupils in an estimated 13 000 primary schools would have had some exposure to the GPH materials). The majority of teachers reported looking at or using the teacher notes, with the case study schools reporting them to be pitched at the right level for, and valued by, the teachers.

Data provided by RBG Kew showed that over 156 600 visits were made to the GPH website between February 2009 and January 2010. Two-thirds of these (65 per cent) were unique visits, i.e. a total of 102 775[1] people had visited the site. Use over this period ranged from 2245 non-unique visits in August 2009 to a peak of 38 271 non-unique visits in May 2009 – coinciding with the arrival of the materials and the GPH Week in May. The data also showed that 102 367 material downloads were completed, with the introductory video being downloaded over 60 000 times to

[1] Although it is not clear what share of individuals visiting or downloading materials from the site were primary school teachers, given the expected interest in the initiative across the wider education community and beyond.

the end of November 2009. In addition some 3021 photos were uploaded to the website by over 260 schools, most of which were uploaded in May 2009. Data to the end of December 2010 showed that a total of 250 591 visits were received, 169 565 of which were by unique visitors.

Of the schools responding to the survey, almost one-third (32 per cent) described using the GPH website as a source of additional information and guidance, with 26 per cent also using it for other purposes (such as watching videos, downloading materials and playing games). Reported use of the website was concentrated amongst teachers rather than pupils, with at least 10 per cent of the primary respondents downloading teaching materials from it. Again, if this figure was replicated across the UK, it would suggest that approximately 20 000 teachers downloaded material and almost certainly many more visited the site.

All the primary respondents who had looked at the content of the kits were asked if there was any additional guidance or support that would help them make best use of the GPH materials. The large majority (86 per cent) of respondents answered no to this question.

Secondary schools

Data to January 2010 showed that 66 per cent of all state secondary schools (i.e. approximately 3500 schools) had ordered and received at least one of the SR kits. By the end of July 2010 the penetration rate had risen to 67 per cent of all eligible schools.

A total of 9222 orders were taken to the end of July 2010, comprising:

- I'm a Worm – 3469;
- Brine Date – 3363;
- The X-Bacteria – 2390.

As with the primary schools, the vast majority of secondary survey respondents (91 per cent) described looking through their kits, including reviewing the teacher notes that accompanied them, which the case study schools suggested were pitched at the right level, highly valued by teachers, and seen as a core part of the kit.

At the time of the interim report, secondary schools' initial interest in the SR materials had converted into actual use in 41 per cent of cases (82 schools of 202 receiving the kits). Again, if this level of usage was replicated nationally it would equate to use in over 1400 schools, and it would appear that the original aim of a 25 per cent usage rate had been exceeded at the time of the interim report. In terms of frequency of use, the survey identified Brine Date as the most used kit (59 per cent of eligible schools responding), with nearly half (49 per cent) using I'm a Worm and 40 per cent The X-Bacteria.

Data provided by the Wellcome Trust show that in the 15 months between November 2008 and January 2010 over 31 000 visits were made to the SR website. Of these 76 per cent were unique visits, i.e. 23 936 people visited the site in total. Website use peaked in February, March and June 2009, with 41 per cent of visits being direct traffic, 40 per cent being referred from other sites (including 8 per

cent from the Wellcome Trust website); and 20 per cent from search engines. On average four pages were viewed per visit, with the average time spent on the site being 3.35 minutes. The I'm a Worm pages were viewed 8439 times and the X-Bacteria pages viewed 6267 times, although no data were recorded for the Brine Date pages.

The survey of teachers identified that 26 per cent of secondary teachers used the website as a source of additional information and guidance, while 28 per cent reported using it for other functions. As with the GPH website, the share of hits by secondary school teachers, as opposed to other types of users, is unclear, but the level of downloads reported in the survey was considerably lower than for the GPH site – as expected, given the smaller amount of downloadable material.

Additional support requirements, on the basis of data on the use of the telephone helpline provided by Philip Harris, appear to have been fairly minimal. This is reflected in the survey and the case study findings, where teachers reported finding the kits to be self-contained and not necessarily requiring additional support. The large majority (89 per cent) of secondary survey respondents who had looked at their kits also considered that the guidance provided with the materials was adequate, and could not identify any support that might be required.

4 How the materials have been used

The vast majority (98 per cent) of the primary and secondary schools responding to the survey who had looked at the materials found their overall quality to be good (29 per cent) or very good (69 per cent). The primary and secondary case study schools reflected this view, with all 30 being overwhelmingly positive about the materials' content and quality. Key strengths of the materials noted included: their superior quality; the provision of all the kit required within a single box; being accessible, practical and user-friendly; providing a good fit with the curriculum; and being flexible and adaptable.

The Darwin materials compared well to other practical materials generally used for science, with 69 per cent of the primary and secondary survey respondents describing them as better than other materials they were aware of. The case study schools also explained that while a wide range of science resources are available, they do not generally receive anything comparable in terms of comprehensiveness and quality.

Few of the schools responding to the survey made suggestions for ways in which the materials could be improved, with the main issue for both primary and secondary schools being the need for more materials to enable whole school or multiple class use. Other suggestions raised by the case study schools included:

- Primary schools – more engagement/support from education professionals such as regional advisors, and the use of a wider range of (pre) marketing activities, including working prototypes;
- Secondary schools – clearer and more user friendly guidance (especially for pupils), more explicit links to the core syllabus and to assessment

processes, and ensuring the continued availability of materials, including complete kits, at a subsided cost.

The survey results showed that the primary and secondary materials had been used mainly in the delivery of practical lessons (Brine Date – 92 per cent of users; I'm a Worm – 73 per cent; The X-Bacteria – 91 per cent; and GPH – 71 per cent), with I'm a Worm (83 per cent) and the GPH materials (93 per cent) specifically encouraging practical outdoor lessons. The most common curriculum area in which the Darwin materials were used by both primary and secondary schools was science (68 per cent) followed by biology (20 per cent), environmental studies (10 per cent), maths and numeracy (9 per cent), history (6 per cent), geography (6 per cent) and the arts (5 per cent).

In many cases it had taken time for schools to start to use the materials and become engaged with them. The case study fieldwork suggested that initial interest in the materials did not always translate into immediate use, and that in some cases implementation changed from the schools' original plans. In most cases implementation had been phased, with teachers using the materials on a trial basis with small pupil groups before using them more widely. This was due partly to the timing of receipt (coinciding for some with exam time in the summer term), and partly to teachers wanting to test the new resources to find out how they worked and what resources were required for their wider use.

The schools used the materials in different ways, with the survey showing that over half (57 per cent) of the primary schools using the GPH materials did so with a specific year group/groups, with 27 per cent following a whole school approach. In both primary and secondary schools the materials had been used flexibly across different year groups; in different settings and – specifically in the primary setting – with some being adapted and incorporated into other non-science curriculum topics.

As described previously, the teacher notes accompanying the primary and secondary materials were well received by the teachers using them. The survey found that teachers in both primary and secondary settings found the notes to be clear, easy to understand and useful in helping them decide how to best use the materials. This was also emphasised in the case study fieldwork, where they were also described as being particularly user friendly and generally well-pitched, although some concerns were raised over the secondary notes providing too much detail in describing the experiment – particularly for pupils.

5 Pupil and teacher impacts

The interim report showed that the vast majority of the primary and secondary schools responding to the survey and participating in the case study fieldwork were able to provide examples of positive impacts resulting from the use of the materials.

Impacts for pupils

The primary and secondary schools were equally positive about the impacts of the use of the materials for their pupils. Impacts reported in the survey by both groups of schools included an increased engagement with, and enjoyment of, science

teaching, with the materials contributing to their scientific understanding. The vast majority of teachers (93 per cent) reported positive effects on their pupils' engagement with science – most (58 per cent) reporting "a little" effect and 35 per cent "a great deal" – with 3 per cent considering it too early to say either way.

The case study fieldwork also identified that the materials had both inspired and enthused the pupils using them, with the follow-up questionnaires used with pupils in the case study secondary schools showing that over half felt that the kits had made them more interested in science. For example, use of the GPH materials by primary pupils had increased their interest in plants and the natural world; and the impacts for secondary pupils included learning new skills and techniques, making experiments fun, and supporting more independent learning.

The pre and post pupil questionnaires also suggested that the pupils enjoyed the activities, with the great majority (80 per cent) of the primary school students enjoying the GPH. The secondary students were offered a scale of responses, and while 84 per cent enjoyed the activities, this was split between those who enjoyed them "a lot" (36 per cent) and those who enjoyed them "a little" (48 per cent). However, the pre and post questionnaires provided little evidence of impacts (either positive or negative) on primary or secondary pupils' attitudes, or of improved knowledge amongst secondary school pupils.

Benefits for teachers

The primary and secondary survey responses also described benefits for the teachers resulting from the materials. While primary respondents were slightly more positive than secondary, in both cases over half reported increased confidence in teaching practical sessions and almost 60 per cent an improved knowledge of evolution. Around two-thirds of the teachers also reported changing their practice – either doing something differently in the classroom or by changing the way in which they deliver practical activities.

The influence on practice was also reinforced in the case studies, where the materials were found to have helped secondary teachers deliver the curriculum differently and encouraged them to undertake more practical sessions. The primary teachers described learning new approaches to teaching science, including making use of school grounds.

Finally, an impressive 97 per cent of teachers responding to the survey considered that the materials had the potential to support the teaching of the science curriculum, and most considered that the materials would be a valuable asset in the future.

6 Expectations for continued and future use

The interim report explored the likelihood of the future and continued use of the materials throughout the 2009/2010 academic year and beyond. Responses to the survey suggested that almost all (97 per cent) of the schools already using the materials would continue to use them in future, with two-thirds (66 per cent) being "very likely" to do so. The secondary schools ordering the materials but yet to use them were also very optimistic about future use – although few had scheduled their use in the 2009/2010 academic year at the time of the survey.

Many schools saw the kits as an on-going resource, with a key factor in determining their use being their fit with the curriculum in the future. This was particularly emphasised by primary schools using the new skills-based curriculum, where the topic themes selected for study determined the planned use of the GPH materials.

Where schools were yet to use the materials, the reasons for this, and what might make them use them in future, were explored. The responses suggested that having more time to plan into the school timetable would make their use more likely, with the need for sufficient notice of the arrival of the kits to allow for planning and preparation. The May to September period seemed to be the key time for planning lessons for the following academic year, with the case study fieldwork suggesting that on the whole teachers needed at least a half, but ideally a full, term to plan lessons and schemes of work when using new materials. This would suggest that any new materials for teachers need to be available some time prior to May if they are to be used in teaching from September onwards.

Where a small minority of schools described being unlikely to use the materials again, this appeared to be due to either not being able to get the experiment to work correctly, the time taken to set up the experiment (relating exclusively to the Brine Date kit), the cost, the requirement for more materials, and waiting for the appropriate time of year. In the case of the secondary schools, the survey suggested that the need to order replacement or new kit was seen as a barrier to continued use. However, the case study fieldwork suggests that this has in practice been less of a key determining factor for on-going use, with issues being more about ease of use and fit with the curriculum.

7 Findings from the follow-up research

Following the production of the interim report, each of the case study schools were re-contacted between September and November 2010 to explore the extent to which they had used the materials in the 2009/2010 academic year, and their intentions to continue to use them in the 2010/2011 academic year and beyond.

Interviews took place with teachers in 26 of the case study schools – nine primary and 17 secondary, with continued use by the case study schools being described below.

Primary schools
Six of the nine primary schools reported continuing to use the GPH materials in the 2009/2010 academic year, comparing well against the schools' expectations as identified in the previous stages. The flexibility of the materials was reflected in the patterns of use identified – which ranged from use with small groups of pupils (on a trial or a targeted basis) to whole class and whole school activities.

The schools using the materials continued to report a similar range of impacts for pupils and teachers, with additional opportunities for hands-on and outside the classroom experiences being particularly welcomed. Examples were identified where the materials had been used alongside other 'environment'-based learning,

such as Forest Schools and in gardening clubs. The schools continued to view the materials positively – with their quality and the clarity and comprehensiveness of the guidance materials being reflected in the limited use of, and need for, the additional support available.

The primary schools not continuing to use the materials cited a number of reasons for this, including changes in the curriculum and resulting option choices by teachers making the materials less relevant, the loss of previous outdoor space and changes in teaching staff – which emerged as a key issue for both primary and secondary schools. The use of 'additional resources and activities' – namely the GPH website and involvement in the GPH Week – were found to be limited amongst the case study schools.

Seven of the nine primary schools felt they were likely to continue to use the materials in the 2010/2011 academic year and beyond – with two already scheduling for the materials' use into their 2010/2011 teaching plans. The two remaining schools were less clear of their intentions for future use – in one case due to the loss of their external space.

Secondary schools

Ten of the 17 secondary schools described using at least one of the SR materials, with many reporting trying 'new' kits out on a trial basis as well as extending previous use in terms of pupil coverage. The trial prior to wider adoption approach identified in the interim report appears to have been continued.

The I'm a Worm experiment continued to be the most commonly used, largely due to its simplicity, ease of application and flexibility, but also as replacement materials could be easily sourced to allow experiments to be repeated. However for some the other two experiments posed challenges – notably Brine Date, where problems getting the shrimps to grow had put many teachers off using it again. With The X-Bacteria the effort required for its use, and concerns over the capabilities needed to undertake it, had put some teachers off – although where it was used it was found to work well.

Changes in teaching staff was again cited as a key reason for the use of the materials not being continued in the case study schools, with a shortage of time to plan and deliver the experiments and difficulties using specific experiments being the most commonly reported reasons for use not being continued.

In common with the primary schools, very limited use was made of the telephone helpline by the secondary schools, which was again seen as an indicator of the quality and coverage of the guidance provided. Less positively, just one school reported participating in the SR competition, reflecting the low level of involvement nationally.

Finally, 12 of the 17 secondary schools reported planning to use at least one of the SR kits during 2010/2011, and expectations for continued use beyond this were high.

8 Lessons for future initiatives

The study provided a series of lessons for the design and delivery of future large scale education initiatives, based on the conclusion that the Initiative had set new standards for the quality of materials produced which could be built upon further. Key lessons included:

- From the Darwin experience:
  - The importance of strong project management, with both in-house and contracted out models being shown to be equally effective;
  - Allowing sufficient time for embedding in schools – key to large-scale roll-out and building legacies, while considering the strengths and weaknesses of association with an anniversary or event;
  - Ensuring that the materials produced are fit for purpose and for use in schools, provide explicit links to the curriculum, are self-contained for use 'straight out of the box', and include clear guidance for teacher and student use; and
  - Ensuring that promotion activities start as soon as possible and that detailed information is provided to allow schools to plan. While different views were expressed on the best time for materials to arrive in schools to ensure their use, the summer term was most commonly suggested.
- The follow-up activity also emphasised the importance of:
  - The use of 'champion' teachers to engage with new materials in the first instance, followed by the distribution and ownership of the materials more widely across the teaching staff to ensure continued use;
  - The design of experiments avoiding the use of 'time limited' materials, and considering the variable capacities in schools regarding technical support;
  - The guidance materials being informed by, and featuring examples of, actual use by schools – both to allow robust piloting and to reinforce messages around ease of use, replication, etc.; and
  - Targeting any future initiatives and their content towards parts of the curriculum where practical activities are less prevalent – to help ensure their use and maximise added value.
- For planning future initiatives, allowing:
  - For an 'end to end' planning cycle of at least three years for a similar approach to the Darwin Education Initiative;
  - At least one year between the final materials specification and delivery of the first sets of kit;
  - Time to produce full working prototypes of any materials, to be used in early marketing and promotion activities; and
  - Sufficient time and resources to identify single, or more realistically consortia, of suppliers – with the Trust being prepared to act as a broker to establish partnership arrangements.

Wellcome Trust

The future of science depends on the quality of science education today.

We are a global charitable foundation dedicated to achieving extraordinary improvements in human and animal health. We support the brightest minds in biomedical research and the medical humanities. Our breadth of support includes public engagement, education and the application of research to improve health. We are independent of both political and commercial interests.

Wellcome Trust
Gibbs Building
215 Euston Road
London NW1 2BE, UK
T +44 (0)20 7611 8888
F +44 (0)20 7611 8545
E contact@wellcome.ac.uk
www.wellcome.ac.uk