Exploring science locally and sharing insights globally

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Science Across the World offers students in thousands of primary and secondary schools all over the world the opportunity to exchange information, opinions and ideas on a variety of science topics

Motivating your students is often half the battle in delivering a successful learning experience. But it can be quite difficult to identify what motivates different students in different environments to engage actively in the learning process. This article explores aspects of the Science Across the World programme that both teachers and students find motivating and rewarding in developing a global dimension to their understanding of science issues:

> *The anticipation of receiving information from foreign schools even got the least motivated students involved.* (Trainee teacher, Ireland)

> *Completing the topic successfully depends greatly on students' motivation and involvement, which is not difficult because all Science Across the World topics deal with current issues and raise awareness on certain aspects of science and life.* (Teacher, Bulgaria)

> *I have observed their reactions to the topics, everybody is interested, they are eager to do it.* (Teacher, Latvia)

ABSTRACT
Issues such as diet and health, energy and climate change affect people all over the world, but not always in the same way. It is increasingly important that young people appreciate the science behind these issues from a global perspective as well as their own local perspective if they are to participate fully in our global society. This article explores how the Science Across the World programme can help young people to gain a global perspective on contemporary science issues by communicating with other young people across the world and developing their key skills.

Designing Science Across the World topics

Science Across the World topics and their Exchange Forms constitute the heart of the programme. Box 1 outlines how it works. Each topic is primarily designed to cover a subject that is interesting and relevant to young people whatever their cultures and wherever they are living in the world (see Box 2). Of course any topic must also relate to the science curriculum in a broad range of countries; it cannot be too specific but concentrates instead on the broader issues, such as diet, health and genetics that all young people will be covering to some degree in their science lessons.

Most importantly, the topics must give scope for exploring science issues that might differ from one region or culture to another or from one country to another. So Science Across the World goes beyond finding facts: it explicitly explores science in its social context and that makes for interesting exchanges of information, ideas and opinions between students from different countries. Topics involving exchanging views on road safety and methods for encouraging it in different parts of the world, or comparing findings on sources of acid rain and how this problem is dealt with in different countries and regions, are motivating and provide a context for understanding Newton's

Box 1 How Science Across the World works

1 **Join Science Across the World through www.scienceacross.org**

Lifetime membership for schools enables the students to communicate with other schools worldwide on a variety of science topics.

2 **Go to 'MyZone'**

Schools use their email address and password to enter MyZone, a personalised area that enables them to:

– set up exchanges with schools across the world;

– send Exchange Forms via the website in different formats;

– keep up to date with our latest news and features;

– access and edit their school membership information.

3 **Choose and sign up for your topic**

The school chooses a topic from the list on the website. Each topic includes teachers' notes, student pages and an Exchange Form.

4 **Study the topic**

Students work through the student pages, gathering ideas and information they need to share with other schools. This can be part of classroom work or an extra-curricular activity. Research takes approximately 3–6 hours, which may include a homework assignment.

5 **Complete the Exchange Form**

Students complete a single version of the Exchange Form that can be downloaded as a *Word* document, to share with other schools. Students need to compare notes and agree on the entries they make on the form.

6 **Select schools to exchange with**

Schools select schools from the online database that are working on the same topic, at the same time, and with similar-aged students. Students may communicate in one or more languages.

7 **Carry out the exchange**

Schools send their Exchange Form to their selected schools and to schools wanting to exchange with them.

8 **Discuss and report findings**

Once a number of Exchange Forms have been received students explore the different responses to the topic issues around the world and display and report their findings. The student pages for each topic suggest discussion points.

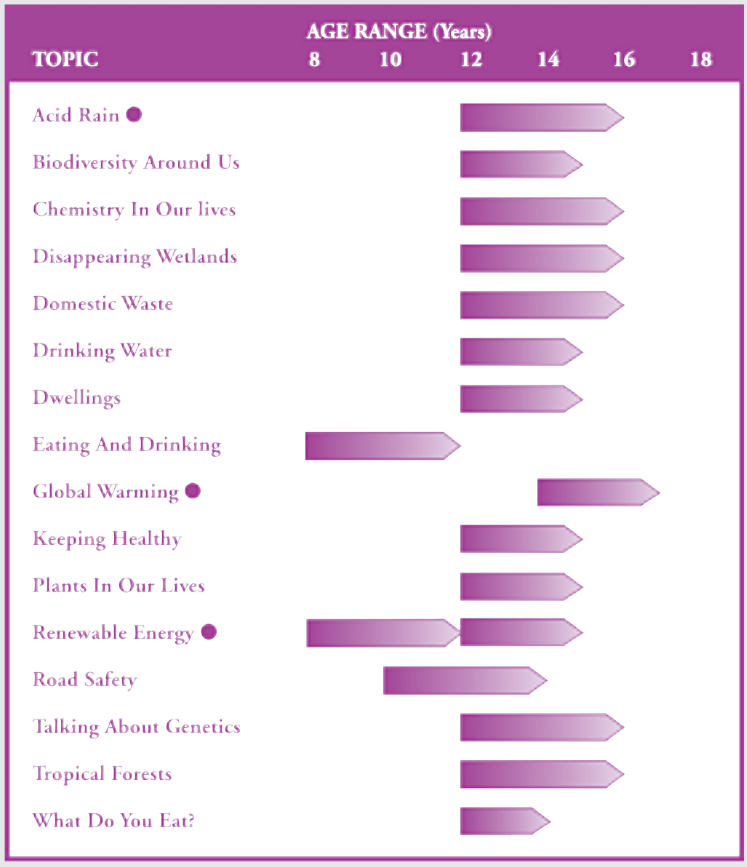
laws of motion or the Periodic Table. The topics are structured flexibly to suit adaptation for a wide range of curricula, ages and abilities, stretching the more able and encouraging those with difficulties in attainment or lacking in motivation.

Ensuring that all these criteria are met is not easy. It can take many months to develop a new topic, pilot it in a broad range of schools around the world and finalise it in the light of the pilot feedback. An enthusiastic and dedicated team of educators from around the world facilitates the development process. Frequently we unearth some surprises: for example, there is no exact equivalent word to 'chemical' in some languages and some of the English words used in ethical discussions in genetics have no meaning in other languages. All these have to be taken into consideration in designing the topics but of course this makes the whole process interesting and rewarding.

Developing key skills and thinking skills

In many countries the emphasis of the science curriculum is moving towards teaching knowledge and understanding of how science works through developing key skills and thinking skills. These skills, including communication, working with others, reasoning, enquiry, creative thinking and evaluation are natural components of classroom teaching and learning when working on Science Across the World

Box 2 List of Science Across the World topics and student age ranges



● These topics are available online only

topics. They also link to a global trend of developing and assessing 'scientific literacy'.

Students generally work through the students' pages of their topic in small groups. This can be done as part of classroom work or as an extra-curricular activity. Through a broad variety of activities students gather the ideas and information they need to share with other schools through the Exchange Form.

Topic activities involve some **active research** into questions such as '*Are there any renewable energy resources in your country which people use but which do not get counted in the official statistics?*' and '*How is renewable energy used on a small scale in your neighbourhood?*' Both of these involve surveys of energy use and sources in homes, farms, and small businesses, etc. In the *Biodiversity* topic, students interview older people in the local community to explore changes in land use and natural habitats during their lifetimes. In the *Genetics* topic, students investigate GM crops and foods by researching regulations on their use and how the media reports GM issues in their country. Younger pupils, working on the *Eating and Drinking* topic, survey the food they eat during a typical school day, investigate the role of labelling from foods in their kitchen cupboards, and analyse different advertisements for food.

For many students, conducting their own research is not a regular part of their science lessons but they often find it challenging and rewarding:

> *Including myself, we did not know much about GM organisms at all. We learnt a lot and since many people don't know much about them, my students loved explaining to people all about it.*

Figure 1 South African students working on the *What do You Eat?* topic in a Durban fruit and vegetable market.

> *They found the topic very interesting and used their creativity.* (Teacher, Turkey)

Topic activities can involve 'traditional' **practical work**, but it is always designed to require minimal specialist equipment so that schools in a wide range of situations can take part. For instance in the *Chemistry in our Lives* topic, students prepare their own chemical product and share their methods with others. For many of the students involved, opportunities for practical work are scarce and they enjoy sharing their recipes for products, such as bright pink nail polish made from gumamela flowers in the Philippines and laundry soap from vegetable oil and banana stalks in Singapore.

After the background research, activities always involve **discussion and debate**. For example, in the *Renewable Energy* topic students discuss and debate the questions:

- What are the arguments for giving people a choice about 'green electricity?
- Is this an issue in your country?
- Would you be prepared to pay more for it?

In the *Climate Change* topic their arguments are steered by the following questions:

- What actions have already been taken by the government in your country to tackle global warming?
- What actions would you be prepared to take as individuals?

Science Across the World teachers tell us that such contemporary issues are generally of interest to young people; some feel quite passionate about them and welcome the opportunity to develop and air their views in a well-managed atmosphere. These comments complement studies in England with teachers and students about their experiences of school science. Levinson and Turner (2001) concluded that '*young people [also] want to engage in discussion about science and society and are motivated by the relevance of contemporary issues*' and research by Cerini, Murray and Reiss (2003) recommended that '*the science curriculum should include more ethical and controversial issues'*, and that *'there should be more discussions in science classes. Discussions provide students with the opportunity to learn from someone*

Figure 2 Illustration from the *Biodiversity* topic: What else will we find in what William Shakespeare called '*nature's infinite book of secrecy*'?

other than their teacher and healthily, to disagree with teachers and develop their own ideas.'

Topic activities give plenty of opportunities for **creativity and positive action**. For example, in the *Biodiversity* topic, students design their own local Biodiversity Action Plan, which identifies a local problem and its consequences, their objectives in addressing the problem, their proposed actions and the likely impact or effect of their actions. In the *Domestic Waste* topic, students plan and carry out actions to combat waste in their homes and school. Such decisions and consequent actions give a clear indication of active citizenship and are to be encouraged.

Teachers Maria Rae and Todorka Stoeva Stankova in a Bulgarian primary school sum up their young pupils' experiences with the *Eating and Drinking* topic:

> *Participating in this project encouraged them to be more autonomous learners; they found the enquiry method of learning more stimulating than the 'spoon feeding' one they are used to most of the time. We focused on the 'here and now' of constructing knowledge rather than finding it in a book. The class dynamics improved through working together, interviewing each other about their favourite foods, etc. With the end result of a portfolio, pupils felt a sense of pride and achievement.*

Using science contexts to develop literacy and languages

The Science Across the World website and topics are in six languages: English, French, German, Italian, Portuguese and Spanish, and many of the topics are also in additional languages such as Bulgarian, Catalan, Japanese and Russian – with all translations provided by our team of enthusiastic teachers around the world who understand the language and literacy levels required for their students.

These resources make an ideal basis for Content and Language Integrated Learning (CLIL) (see Website) and are used increasingly as curricular content by science teachers working in a bilingual context, and foreign language teachers perhaps working with colleagues in their science department.

To support CLIL, Science Across the World has been collaborating with education consultants John Clegg and Keith Kelly in providing additional teachers' notes in the more recent *Biodiversity*, *Eating and Drinking*, *Genetics* and *Keeping Healthy* topics. The general notes on Language for Thinking on the website and the Language for Arguing notes in the *Genetics* topic, for example, may be useful for all teachers in developing their students' literacy. The British Council supported the booklets *Teaching ethical English* and *Share the world*, developed by teachers in the Balkans from Science Across the World topics and including many ideas for extending them,

Figure 3 Illustration from the *Biodiversity* topic: Insect-feeding birds play a key role in controlling insects, such as mosquitoes, which are important disease carriers. Reductions in migratory bird populations through hunting, habitat disturbance or pollution in one country can mean insect infestation in another. This shows that many organisms share hidden links with others; when one species dwindles, partners and parasites also suffer.

and these may also be of interest to UK science teachers.

Some comments from English-language teachers included:

> *This is a wonderful way of using their English as a new outlet – a window into the world.* (Teacher, Russia)

> *They gained confidence and experience in talking and writing.* (Teacher, Georgia)

> *It's one of the best ways to increase foreign language learning.* (Teacher, Lithuania)

> *They learnt new information and skills and improved their range of vocabulary in English. They were exposed to English in natural contexts and learned through interesting, relevant, meaningful activities.* (Teacher, Bulgaria)

CLIL usually works best when teachers do not work in isolation. Feedback from science teachers collaborating with humanities colleagues is always encouraging. As Maria and Todorka in Bulgaria commented:

> *We, the teachers, improved the relationship through collaborating and team teaching and we learned together. Other teachers noticed what we were doing and took an interest, thereby cascading some of the educational ideas on 'learning to learn' in a cooperative atmosphere and focusing on the process and not just the final results. The list of benefits is endless!*

These observations support those of Levinson and Turner (2001):

> *In general, science teachers feel that they lack the skills, confidence and the time to initiate and manage classroom discussion. Much could be learned from their humanities colleagues who demonstrably promote discussions of ethical and social issues.*

Box 3 Comments from students and teachers about Science Across the World

We didn't know what kind of energy is mostly used in other European countries, and we learned a lot and enjoyed communicating with other students. (Students from Slovenia)

We learned a lot about acid rain; the chemical background, effects and consequences. I think that the activity has also promoted a little bit of environmental conscience. (Students from Germany)

Science Across the World is a very good programme which gives us easiness and speediness of cooperation between people from different countries. I have used the topics for several years and they have always been rewarding and interesting. Students enjoy them a great deal. (Teacher from Poland)

SAW helps make students see for themselves that many school subjects which were previously 'unconnected' are really the elements which add up to the total sum of knowledge. (Teacher from Russia)

Completing the Exchange Form

Having completed the main activities, student groups then compare notes and agree on the entries they want to make on the Exchange Form. Small groups often make presentations to the whole class before the class comes to a consensus on the information and ideas that best represent the views of the class. This requires deliberation and constructive debate, which, when well managed, many students enjoy. The Exchange Form is a distinctive approach to encouraging international communications between students. Using a common Exchange Form for the whole class ensures that everyone focuses on the same issues for their activities and reporting. Communications between schools are constructive and related to the topic issues.

Having completed their Exchange Form, students then have the enjoyable task of selecting up to 20 schools to exchange with, usually through the Science Across the World website. These will be schools where similar-aged students are working on the same topic at the same time, with the same language(s). Exchange Forms are sent to these selected schools and to those wanting an exchange with their own school. With sometimes hundreds of schools to select from and nearly 3000 teachers from almost 100 countries currently participating in the programme, the Science Across the World online database of schools is an invaluable resource for teachers and students looking to develop constructive links beyond their country and culture.

Using ICT constructively

Although many schools still transfer their Exchange Forms by post or fax, the vast majority now use our website. This creates a real purpose in using the Internet to communicate with schools in different countries. It also presents numerous opportunities for developing skills in ICT. These include research using topic data and hotlinks, creating and using spreadsheets and graphs, setting up exchanges with schools across the world, completing and sending Exchange Forms through the website in many different formats and creating school websites related to the Exchange Form. All of this is supported by new personalised functionality under My Zone, My School and My Exchanges for teachers, with restricted personalised functionality for students.

Amanda Ruiz Wilches, Chief of the Education Research Department, Education Secretariat in Colombia, Latin America, commented:

> *We consider that Science Across the World comes to fill up the gap of pedagogical needs we have in our educational system. The innovative methodology, and especially the possibility of sharing our culture with the rest of the world via the Internet, are aspects that make Science Across the World an excellent tool.*

Developing global perspectives on wider aspects of science

For many participants, the most exciting part, and the main point of the exercise, comes next – receipt of Exchange Forms from across the world. These are then analysed for similarities and differences, and patterns in response to the topic issues. Each topic suggests discussion points to help students develop global perspectives and better understand the issues in their own locality. For instance, younger pupils may compare their eating habits with others and discuss the science behind folklore and sayings from different parts of the world. Older students might explore the effect of the Convention on Biological Diversity at

Box 4 Extract from Exchange Form from Gymnasium Bilikova in Slovenia

We have chosen this plant as it is very common where we live.

Origin: *Adonis vernalis* comes from the Russian steppes. This species flowers in early spring and is one of the most beautiful European plants. It´s already famous since the ancient times.

Place of growth: It grows on steppes and pastures. That means it needs a lot of light but few nutriments. It can also be found on an alkaline substratum.

Form of the plant: It´s approximately 20–30 cm high. This herb has a scaly underground with a leavy stem. The leaves are feathery because they must resist the wind which blows on the slopes. The flowercup is fiveleaf-like with 10–12 petals.

Use: Pheasant´s eye is protected and can therefore be torn only at a certain time and in certain places. In ancient times Yellow Pheasants Eye was used to treat venereal diseases and later heart disorders. It´s torn in spring and prepared as tincture or tea.

You must be very cautious, because if you make a mistake when drying *Adonis vernalis* will be extremely poisonous. For self-medication this herb is not appropriate.

Written by Linda Masurová

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local and national levels in different countries. They may incorporate good ideas from different Biodiversity Action Plans into their own and perhaps explain whether or not the targets set by governments for using renewable energy are achievable and high enough. Such discussions may form a sound basis for interpreting these issues as they arise in the media. For example, as I was writing this article, the broadsheet newspaper headlines in England, *'Only nuclear power can now halt global warming'* and *'EU approves GM sweetcorn'*, provided good discussion material for topics.

Enriching exchanges and collaborations

Feedback from teachers and students indicates that Science Across the World can be a motivating and valuable experience. Many students personalise their topic work by sending colourful artefacts and students' work with their Exchange Forms. Others use the topics as the basis for extensive projects and developing longer-term relationships between small groups of schools around the world, some with support from European Union Comenius funding for teacher travel and training. Others may benefit from attending Science Across the World teacher workshops (such as those held recently in collaboration with the British Council to celebrate the fiftieth anniversary of the discovery of the structure of DNA) and based around our *Genetics* topic. Students might enter our regular online competitions, vote on different issues online or perhaps get involved in our new Young Ambassadors for Chemistry scheme in partnership with the International Union of Pure and Applied Chemistry (IUPAC), which is based around our *Chemistry* topic. With some planning and commitment to communications with other schools, Science Across the World can be a rewarding experience for all.

Science Across the World

Science Across the World is an international education programme developed and managed by ASE in partnership with GlaxoSmithKline (GSK). It is a winner in the 2004 Global Best Awards for Education and Business Partnerships and in the 2004 European Awards for Languages.

For further information visit the website:
www.scienceacross.org
Or contact Karen Shoebottom
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Website

Further information on Content and Language Integrated Learning (CLIL) can be obtained from the National Centre for Languages website:
http://www.cilt.org.uk/clip/faqs.htm

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