The International Year of Chemistry (IYC) Challenge

RSC Beijing Local Section Final Report

A Rare Chance to Study Science—Practical Chemistry for Migrant Children

Background

RSC members visiting Beijing are likely to have been impressed by the forest of new—sometimes spectacular—buildings springing up all over the city, but have probably given little thought to the people who built them. In fact, all the construction workers in Beijing, as well as those in the catering and other service industries, are migrant workers from the countryside who have left their subsistence farming existence in search of a better life. However, China has a rigid local residence permit (*hukou*) system under which migrant workers are only automatically entitled to social benefits—including free compulsory (Years 1–9) education for their children—in their home village. Around 40% of migrant workers therefore leave their children at home with their grandparents (giving rise to what social scientists call the "left-behind children" phenomenon) and probably only see them once a year at most, if they are able to return home for the Chinese New Year holiday. Although the Beijing Municipal government has recently started to make an effort to provide places in state schools for those migrant children who do join their parents, in practice this proves difficult for many families. Most migrant workers live in cheap rented accommodation in outlying areas far from state schools and work long hours, meaning they are unable to accompany their children to school. Although many secondary school pupils make the long journey alone, this is less feasible for primary school children. In addition, employers and landlords are notoriously unwilling to provide migrant workers with the documents which are necessary if their children are to enter a state school. Migrant students in state schools may also face prejudice from pupils (and even teachers) with a Beijing *hukou*. Therefore a number of migrant schools outside the state system have been set up on the outskirts of Beijing to provide an education for those migrant children who are unable to study in a state school. These schools generally suffer from a number of problems, including poor infrastructure and a rapid turnover of—sometimes poorly qualified—teachers.

Details of the programme

The RSC Beijing Local Section has used the IYC Challenge grant to set up a practical chemistry programme which can be taken into migrant schools and give students there a chance—their only chance—to study science. Suitable migrant schools were identified through a charity—the Migrant School's Foundation (MCF)—which supports migrant schools by encouraging companies and embassies to donate unwanted computers and other hardware

as well as providing volunteer English language teachers. The IYC Challenge programme is targeted at Year 6 students (the final year of primary school). Clearly safety is of paramount importance in designing such a programme so all the apparatus which has been purchased is made of plastic rather than glass and the experiments use household materials or non-toxic laboratory chemicals. Other safety measures include the use of digital rather than glass thermometers and the use of hot and cold packs to provide heating or cooling. Safety glasses, lab coats and disposable gloves are also provided for each student. The equipment and chemicals are stored in a set of plastic boxes allowing for easy transport to the migrant school.

The programme is currently running on one Saturday morning per month in Bowen Experimental School and is attended by 36 Year 6 students. Classes start with a few demonstrations (more spectacular than those experiments which can be done by the students themselves!) to introduce the topic of the day and then students work in pairs to complete the set of experiments. After each experiment, there is a class discussion of their results and some basic principles and ideas are highlighted. A second hand projector has been purchased so that students can be taken through simple Powerpoint presentations. Topics have included using red cabbage indicator to compare the acid–base properties of household materials, measuring temperature changes during exothermic and endothermic reactions, and the effect of parameters such as concentration and temperature on an iodine clock reaction. The excitement and thirst for knowledge of the children has been palpable and feedback from the school Principal and teachers, who observe the classes, has also been very positive. The programme will move to another migrant school next semester.

Key aims of the programme

(1) To give migrant school children an opportunity to learn basic scientific principles by carrying out simple chemistry experiments.
(2) To allow migrant school children to learn in a new and exciting way and thus inspire and encourage them to study harder in all their subjects.
(3) To engender a sense of self-worth by making migrant school children feel that, although they are at a disadvantage relative to their peers with a Beijing *hukou*, they have not been completely abandoned by society.

Additional benefits of the programme

(1) Encouraging a culture of volunteering amongst chemistry students at different levels: In addition to RSC members David Evans, Peter Payne and Zheng Chunxiao, research students from Beijing University of Chemical Technology currently act as demonstrators. They have found this an enjoyable and rewarding experience, being inspired themselves as well as inspiring their pupils. Aside from the personal benefits, the activity may

be a useful addition to the CV of students looking to study abroad or work with a multinational company after graduation. In addition, two international schools in Beijing have expressed interest in providing students as demonstrators for future classes, with a view to the students including their participation as part of the volunteering component of the International Baccalaureate “Community and Service” module in one case, and the Duke of Edinburgh’s Award scheme in the other.

(2) In order to launch the programme and generate publicity, a one day event for 250 children from migrant schools was held jointly with the UK Institute of Physics (IoP) and the MCF in Beijing University of Chemical Technology (BUCT) in April 2012. In the morning, the chair of the Local Section, Prof. David Evans, gave a lecture on “Chemical Magic”, using a variety of colorful—and sometimes explosive—chemical reactions to illustrate his talk. This cost of materials for this talk was covered by the normal outreach activity budget of the Local Section. He was followed by the IoP Representative for China, Prof. Richard de Grijs of the Kavli Institute for Astronomy and Astrophysics in Peking University, who introduced the pupils to some of the mysteries of the universe using some exciting visual materials. After lunch on campus, two groups of 50 older students carried out some chemistry or physics experiments for themselves while the younger students enjoyed a range of fun educational activities with volunteers from BUCT. This event was covered by both English (‘*China Radio International*’ and ‘*China Daily*’) and Chinese (‘*China Science Daily*’) language media.

(3) In addition to funding by the IYC Challenge grant, the programme has already attracted several donations. For example, BUCT paid for the transport of the children to the launch event, an international school has offered occasional free use of a school minibus, a local clothing manufacturer donated 60 child-sized lab coats, and a non-RSC member who regularly attends the Café Scientifique-style popular science lectures sponsored by the Local Section paid for 300 lunches for the migrant students, their teachers and volunteers participating in the launch event.

Future plans

According to the Chinese government ‘*2012 Report on the Development of China’s Floating Population*’, there are currently around 230 million migrant workers and their family members in Beijing and other cities all over China, accounting for some 17% of the total population of the country. Therefore there is a huge potential demand in migrant schools for activities such as that developed in this programme, and indeed this demand extends to rural schools. After learning from the experience of delivering the programme, the Beijing Local Section would like in the future to be able to provide additional kits, together with manuals and other teaching materials, and train RSC members or Chinese teachers to deliver the programme in other schools.

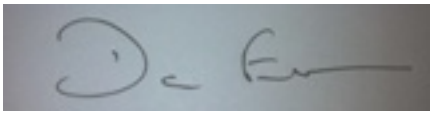
Publicity Material

Electronic copies of photographs and video recordings from the launch event in BUCT and practical sessions in Bowen Experimental School have been provided. A few examples are shown below.

Summary of Expenditure

Capital costs for apparatus and equipment as well as initial consumable costs were covered by the IYC Challenge grant (£1000) as summarised below (conversions from Chinese Yuan rounded to the nearest pound sterling). Now that the grant has been spent, current running costs of the programme are being covered by the normal outreach activity budget of the Local Section.

Item	**Cost (£)**
Plastic apparatus	290.00
Safety glasses	140.00
Digital thermometers	62.00
Stopwatches	66.00
Storage boxes	58.00
UV light	58.00
Projector (second hand)	80.00
Dewar flask	10.00
Cold packs	50.00
Hot packs	42.00
Dry ice	13.00
Sodium borate	18.00
Polyvinyl alcohol	20.00
Miscellaneous apparatus	52.00
Miscellaneous household materials	66.00
TOTAL	**£ 1025.00**



David Evans, Chair of RSC Beijing Local Section
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