

Report by Kerry Ayre 2003 Churchill Fellow

**Establishment of a Global Classroom for
High School Science Students**

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Signed:

Dated:

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1. INTRODUCTION

One of my passions in teaching is to encourage students to undertake their own research investigations in the hope that they become independent thinkers and are able to use the skills they learn in everyday life. I would like to do this on two levels:

- **Firstly**, on an individual level, where I already encourage all of my students to conduct their own individual research investigations.
- **Secondly**, on a group level, where I would like to develop a visible and useable location for students globally to conduct research, post and discuss results, and access a database of common labs, activities and projects. This “global classroom” will be called the *GLASSROOM* and is the focus of this project

This report documents my recent Churchill Fellowship trip which I undertook in order to facilitate the establishment of a Global Classroom for High School Science students.

Everyone knows that scientists do experiments, carry out surveys, conduct trial tests and the like, but surprisingly, to most older Australians, school science did not resemble “authentic” science at all. Traditionally, Australian school Science has not represented authentic Science in that students have not learnt to design and conduct experiments or develop the skills of critical thought.

Until very recently, Australia has been very much behind education systems in both the United States and Europe. In 2002 however, the NSW Board of Studies stipulated that all Science students must undertake at least 2 “open-ended investigations”. The assessment or judging of these projects has largely been within schools, but there has been a slowly growing move towards holding an annual science fair or presentation day, with a format such that students can present their work both visually and verbally.

In Wollongong, we have held a Student Research EXPO at St Joseph's Catholic High School for the past 3 years, and have invited other schools to participate. It has proven to be an extremely popular day with the students, and also with the local community, teachers and parents. In 2006, with funding from the federal Department of Education, Science & Training (DEST) we are holding our inaugural Regional Science Fair at the University of Wollongong.

The aim of this Churchill project was to build on the research skills already developing in our students and to branch out from individual research projects to group projects. I am collaborating with Mr Russ Fisher-Ives from New Mexico on this project. Russ has been running science fairs at his Rio Rancho High Schools for 10 years, and is co-convenor of the International Science & Engineering Fair (ISEF) in Albuquerque, NM in 2007. We wanted to "connect the world" - to work at an international level so that whole classes of students in different locations could participate and collaborate, and use the internet to communicate.

I planned to (a) discuss the practicalities of the project with an initial small number of keen Australian and international science teachers, (b) review their syllabi to find common areas suitable for research, (c) seek sponsorship for the initial stages, (d) transform existing and traditional practical activities into an inquiry-based format (e) develop templates for the submission of practical and research activities, (f) develop a web site for communication, (g) find a suitable web company to manage the web site and handle the data stream (h) establish a mailing list, and (i) publicise the project in Science Teaching journals internationally.

The purpose of the *GLASSROOM* project is to enable students to be able to see themselves as young researchers, capable of collecting valuable information for other current and future students, and in doing so, to understand how higher level research operates.

Our Mission Statement is:

To make a visible and useable location for students globally to access a database of common labs, activities and projects. Student participants in the *GLASSROOM* will work cooperatively to conduct duplicate, parallel or complementary group research projects and use the internet to design experiments, share data, analyse results and discuss findings.

2. EXECUTIVE SUMMARY

2.1 Details:

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2.2 Project Objectives:

- To find ways to encourage students to undertake their own research projects so that they can become valuable researchers, now and in the future.
- To discuss with teachers, practical ways to instigate a project where students are linked via the internet, and also to discuss the possible pitfalls
- To establish an “international classroom” or GLASSROOM, which will link students globally via the internet so that they can produce a database of research projects and become active and rigorous researchers.

2.3 Highlights:

Indonesia

In Bogor, I spent a week at The International School of Bogor, a very small, but active school, with a group of very keen teachers. I spent time working with the high school students and talking to them about the idea of the GLASSROOM project. My main contact was Mr Steve Taylor who until recently was Head of Science at the Illawarra Senior College in Wollongong. Although we worked in different educational systems,

Steve and I were both extremely enthusiastic about teaching Science and over the years, we have shared many ideas for making Science fun. We were responsible for running the Illawarra Science Teachers' Association for the last 3 years. When I heard that Steve was moving to Indonesia, I realised that this would be an ideal opportunity to develop a liaison with another country, at the same time of being assured that I was working with a very keen teacher.

Israel

In northern Israel, in the region known as The Galil, I spent time at the Branco-Wiess Anna Frank High School in the Kibbutz Sasa, as well as in the kibbutz itself. I was also fortunate enough to visit the Yi'ron Kibbutz. In addition I visited places such as Capernaum, Mt Masada, the Mount of the Beatitudes, Nazareth, Jerusalem and the Dead Sea. My initial contact was Mrs Rina Ne'eman whom I met in Australia in September, 2004, when she was accompanying her botanist husband on a sabbatical to the University of Wollongong. Rina is a teacher of Biology and she visited St Joseph's Catholic High School on a number of occasions, to find about schools in Australia and also to speak to some Religion classes about life in Israel. Rina later spent 6 months in Massachusetts on a second sabbatical and I was lucky enough to spend time with them on the way to a Microbiology workshop in Connecticut in July, 2005.

Massachusetts

I spent a week at Marlborough High School, which is in a quite small town, about one hour from Boston. The high school is large and flourishing and has a very active Science Department. The Head of Science, Mr William Rigney, is extremely keen and enthusiastic about encouraging students to undertake research projects. Bill is in charge of the Educator's Academy at the International Science and Engineering Fair (ISEF), held annually in the USA. I met Bill at the ISEF 2004 when I was there as the only Australian judge. Knowing how keen he is on student research, I have maintained the contact and was pleased to be able to visit his school, knowing that he would be very interested in developing the GLASSROOM project.

New Mexico

This was my second visit to Rio Rancho, which although only a small satellite town of Albuquerque in New Mexico, is a hub for student research. My first visit was as part of a Premier's Science Teachers' Award trip in 2003, the aim of which was to find out how to set up a Science Fair. Rio Rancho High and Mid Schools have been holding two science fairs per year since 1997, and they have been growing in size each time. The original instigator, Mr Russ Fisher-Ives, is now set to be the co-convenor of the 2007 ISEF to be held in Albuquerque. I have met Russ and his teachers on a number of occasions, on my last visit as part of the Premier's Award, and at ISEF in both 2003 and 2004. This was my first visit to his Mid High School, and I found the teachers there to be just as enthusiastic as at the High School.

California

I later visited California and met with contacts first made at ISEF in 2003 and 2004. These included Ms Heidi Black, Director of the Silicon Valley Science & Technology Championship (San Jose Region Science Fair) and Fred Stein (Education Officer at the Exploratorium in San Francisco). In addition, I visited the University of California at Davis and met with people who have previously been very enthusiastic about student research and have continued to furnish ideas for student research projects.

2.4 Major lessons learnt:

All teachers visited were extremely enthusiastic at the prospect of being involved in the GLASSROOM project. We were able to discuss their current research programs and ways in which their school could be involved. Of prime importance was finding out their prior experiences at student research, and discussing any perceived possible pitfalls.

The first problem will be that of language barriers. Fortunately, all schools have English, but in Israel it is the second language. However, this will not be insurmountable and it will also enable students in other countries to learn some Hebrew at the same time.

The second problem is that not all students in a class will be willing or capable of being involved. This may be because of an inability to access the internet, or an unwillingness to put extra effort into Science. So the communicating groups may not always be whole classes. In some cases they may be small groups, or pairs of students or even individuals.

Thirdly, Each school has different constraints placed on it by their Education authority. For example, in Israel, the students in Biology undertake a very large project and extensive project, often spread over 3 years. This is different to other schools where students mostly work in one year blocks. For this reason, groups collaborating with students in Israel may be in much smaller groups and may constitute pairs or individual students.

Fourthly, and very importantly, is that the Australian and Indonesian school years start in January / February, whereas the Israeli and USA school years start in September, so we will need to keep these time differences in mind when planning collaborative projects.

2.5 Dissemination:

In 2006, I will be producing and conducting teacher workshops on “How to Develop a Science Fair”, “How to Encourage Students to do Research Projects”, and “How to Conduct a Research Project”. As part of these workshops I will be telling teachers about the GLASSROOM project and hopefully linking some schools in NSW with each other, and also the overseas schools at the same time.

I aim to:

- Build a global database for students around the world to share common laboratory findings that are currently being done and discarded by classes
- Connect young researchers by posting the projects and findings of students and classes globally
- Create a global stage for posting young researchers’ work for use and recognition

- Create a global classroom that is visible and useable by educators.

Once the materials are produced and the project is underway, I will facilitate workshops for the state and national Science Teachers' Association annual conferences. I will also write an article for the Science Teachers' Association of NSW (STANSW) and for the Australian Science Teachers' Association (ASTA) journals, and report back on progress.

3. PROGRAMME

I spent one week in each of five places: Bogor (Indonesia), Amirim (Israel), Marlborough (Massachusetts), Rio Rancho (New Mexico) and Davis & San Francisco (California). In each of the first four places, I was based in a local school. I spent the week meeting teachers and students in a variety of subject areas. In California, I arranged meetings with my contacts.

Indonesia

Contacts included:

Mr Steve Taylor, Head Science and Maths Teacher, The International School of Bogor (ISB)

Mrs Sue Taylor, Head English and Social Science Teacher, ISB

Miss Selvi, ISB

Mrs Chris Rawlins, Principal ISB

Mrs Lizette Turnbull, Primary Teacher, ISB

Israel

Contacts included:

Mrs Rina Ne'eman, the Brano Weis' Anna Frank High School (AFHS)

Professor Gidid Ne'eman, University of Tel Aviv

Miss Adi Ne'eman, Jerusalem

Sasa Kibbutz

Mrs Ronit, AFHS

Mr Doverley, AFHS

Mrs Lynne Saferstein, AFHS

Mrs Judith, AFHS

Yi'ron Kibbutz

Massachusetts

Contacts included:

Mr William Rigney, Head Science Teacher, Marlborough High School (MHS)

Mr Dan Riley, MHS

Mr M. McCook, Marlborough Primary School

New Mexico

Contacts included:

Mr Dan Barbour, Head Scimatics Academy, Rio Rancho High School

Mr Carl Brady, Science teacher, RRHS

Mrs Jennifer Miyashiro, Science teacher, RRHS

Mrs Renee Saucedo, Science Teacher, Rio Rancho Mid High

Ms Debbie Loftin, Science Teacher, RRMH

Mrs Laura Vogel, Science Teacher, RRMH

Mr Ruben Lardizaba, Science Teacher, RRMH

and

Mr Mark Oleksak from Showboard Inc.

California

Contacts included:

Mrs Sue Hansen, University of California at Davis (UC Davis)

Professor Bob Hansen, Professor of Veterinary Studies, UC Davis

Professor Rick Grosberg, Professor of Zoology, UC Davis

Ms Heidi Black, Silicon Valley Science & Technology Championship

Mr Fred Stein, Exploratorium

4. MAIN BODY

4.1 Rationale

Everyone knows that scientists do experiments, carry out surveys, conduct trial tests and the like, but surprisingly, to most older Australians, school science did not resemble authentic science at all. For some, high school science might have been a fun time where we got to use equipment such as Bunsen burners and beakers, but it was very much teacher-directed and all practical activities were carefully prescribed and written up accordingly. However, for many others, there was little opportunity for practical activities. This was either due to a lack of background on the part of teachers, or perhaps a lack of equipment. Basically, there was no thought or input or ideas from the students. Sadly, this is still very much the case in primary schools in Australia today.

In this respect, Australia has been very much behind education systems in both the United States and Europe. In those places, particularly the USA, students have been conducting their own research for many years. We see evidence of this in American TV shows such as the Simpsons, the Bill Cosby Show, the Brady Bunch and others. We often see shows based around the “school science fair” where the kids do a project or make a model for Science.

In the mid-1990s, a movement started in the USA to make school science even more “authentic”. Whereas in the past, many students made a model to demonstrate for their science fair project, such as the ubiquitous volcano, they were now being encouraged to design and conduct an experiment, just as “real” scientists do. This movement is finally reaching Australia. In NSW in particular, the Board of Studies has now stipulated that all secondary students must now conduct an “open-ended investigation”. Some other States (WA, and Victoria) are also now holding an annual Science EXPO or Science Talent Search to encourage and recognise student researchers.

In NSW, the assessment or judging of student research projects has largely been within schools, but there has been a growing move towards holding an annual science fair, with a format such that students can present their work before judges.

In Wollongong, we have had a Student Research EXPO at St Joseph's Catholic High School for the past 3 years, and in 1984/85 invited all other local schools to participate. It has proven to be an extremely popular day with the students, and also with the local community and teachers and parents. In 2006, we are holding our inaugural Regional Science Fair at the University of Wollongong.

The *GLASSROOM* project will be an extension of individual Student Research Projects. Using research skills gained previously in conducting their own research projects, students will be encouraged to work cooperatively to study particular common aspects of the school curriculum, as well as current global issues. At the same time, groups of students in other countries will be synchronously conducting duplicate, parallel or complementary studies in the same area. They will then use the internet as a communication tool for sharing data, posting results and discussing their analyses.

Two types of projects can be researched in the *GLASSROOM*:

- Firstly, syllabus areas that are universally covered in schools, and
- Secondly, current global issues and areas of concern.

Essentially, students would continue to follow the syllabus as usual in class but would apply additional research techniques via projects in some areas. The sharing of information, consistency of procedure on similar projects / labs and the communicative skills between countries will be embedded throughout the project. Once the *GLASSROOM* is established, classes in other countries will be able to participate.

I have spoken to Professor Rob Whelan, Dean of Science at the University of Wollongong, about setting up a Global Classroom and these are his comments:

“I like the idea of the global classroom. The biggest challenge, and therefore the biggest achievement, will be the preparatory work required to find a number of common syllabus items or current issues that are at a similar level in all countries. In a way, it is similar to the challenge we have in setting approved exchange programs with other Universities. The idea of internationalising school activities is wonderful and parallels the objective that most Universities have of increasing international experiences of our students. Perhaps we can work out a way of getting some support material out of our academic staff in Science and posting it on our web sites”.

4.2 Purpose

The purpose of this project was to build on the research skills already developing in our students and to branch out from individual research projects to group projects. We decided to do this at an international level so that classes of students around the world could participate and collaborate, using the internet to communicate. Primarily it will help students develop both their research and communication skills.

Besides doing Science projects, we also want to encourage dialogue between students of differing backgrounds and cultures, in the hope that they will learn about life in very different places. We will start off with the students getting to know each other before becoming embroiled in a Science project.

In each place I visited, there was nothing but enthusiasm for the idea. Together we came up with a list of decisions to be made before starting a project and we discussed possible problems. Teachers in Israel in particular could see language problems, but we decided that with smaller groups, these would be easier to handle. I was able to meet with technology teachers responsible for communication and discuss practical issues.

4.3 Intended Outcomes for 2006

Within a year I would expect to have accomplished the following:

- (a) Secured funding for setting up the web site and having a web company in place to manage the data stream,

- (b) Finalised a template(s) for educators to post ideas for research topics,
- (b) Established a small group of educators world-wide, keen to be involved, and who are willing to participate in the initial phase – trialling templates, suggesting research topics, using the web site, transforming existing practical activities into an inquiry format,
- (c) Examined a large range of syllabi, looking for common areas where research activities could be developed,
- (d) Established the web site,
- (d) Publicised the *GLASSROOM* in Science Teachers’ journals in Australia and overseas, and visited Science Teachers’ Association meetings to talk about the project,
- (e) Secured sponsorship to enable me to meet with the initial teachers involved,
- (f) Presented the project internationally via professional conference shoptalks & presentations
- (g) Presented the idea to companies, universities and governmental agencies to begin interviewing students for the scope, time spent and level completed re: their research to establish validity by post secondary groups for students’ original work.

By participating in a *GLASSROOM* project, students will form an international community through which they will:

- Practice and develop all of their research skills,
- Develop oral and written communication skills,
- Make productive and effective use of the Internet and computer-related technologies,
- Learn to work individually and as part of a team,
- Appreciate the culture and way of life of students overseas

4.4 **Period and Timeline**

The initial job will be to design a template which teachers can use to send in their laboratory activities in an inquiry format. It will be of the form: Ask, Investigate, Create, Discuss & Reflect (AICDR).

I would plan to make contact with keen science teachers who would like to be involved in the *GLASSROOM*. It will be important to find out about the facilities and experience available in these other places for students learning to post and review data so that our new “young scientists” will be able to replicate the system currently used by industry, universities and governments to maximise resources, time and personnel. This will make the learning “real”, rather than being “just for class”.

4.5 The Web-Site

Having settled on a name for our venture, we also have a web-site pending (www.glassroom.org) and a logo.



The web-site will contain links to:

- The inquiry lessons with tables of data that can be used and added to
- The biographies of those involved in the project
- Links that can help for ideas (by disciplines)
- Download sites for our template
- Communication with others, such as a chat room & question area
- Enquiry site – with questions such as: Would you like some info? Would you like to be added to our mailing list? Would you like to join up?

4.6 Decisions to be made include:

Recruitment of other teachers
Number of classes to include at the start
Age of initial students
Dealing with different academic years
Timing of topics
Finding topics of interest to all
Means of communication and recording of data

4.7 Possible topics for research

These included:

Changes in weather and climate	Pollution and pollution control
Variations in UV radiation	Ecological sustainability
Effectiveness of sunscreens	Stem cell research
Phases of the moon & tides	Space research
Housing construction materials & climate	Cancer incidences
Media coverage of important events	Germ warfare
Career opportunities	Antibacterial resistance
Remote operation of robotic devices	Sport
Influence of TV and video games	Astronomical correlations
Effect of TV and video games on myopia	Bird 'flu
Comparison of the cost of living	Global warming
Preservation of endangered organisms	Ownership of major companies
Water use – domestic, industrial and recreational	Population density
Cultural studies – changes in gender roles, communication devices	

5. CONCLUSIONS:

This project should work very successfully as long as there are enthusiastic teachers behind it. We already have several schools and countries lined up: Indonesia, Israel, Massachusetts, New Mexico, and I have others from Canada, Singapore and Costa Rica.

In addition, we have been contacted by Australia's office of the British Council, requesting that they be involved in the GLASSROOM project.

The project needs the support of each school to give permission for such collaboration between students and also to provide communication support via internet access.

The main part of communication will be via the website which is in the process of being developed.

2006 will be a very good year for establishing this project since, with funding from DEST, I will already be conducting teacher workshops and I can include dissemination about the GLASSROOM project in the process.

5.1 Dissemination of Information

Information will be disseminated in the first instance via our website, which is currently being produced. I will also be conducting teacher workshops in NSW. In addition I will write articles for both State and National Science Teacher Association journals and give conference talks at both State and National levels.

6. RECOMMENDATIONS

Student research is gradually happening in Australia, with NSW leading the way since the Board of studies made open-ended investigations compulsory. A few schools in NSW already hold an annual Science fair and competitions such as the BHP Billiton Science Student Awards and the Young Scientist Awards provide an arena for students to conduct research. Other States already hold an annual Science EXPO of various forms.

The move to student research is happening slowly. We must do whatever we can to encourage firstly teachers, followed by students, to engage in such critical thinking exercises that will eventually become research projects, so that critical thinking and research skills become entrenched and accepted in the school environment and our students develop into critically thinking and informed adults.

7. ACKNOWLEDGEMENTS

I would sincerely like to thank the Winston Churchill Memorial Trust for providing me with the financial and organisational support to allow me to pursue my passion in education. A special thanks goes to Meg Martin who willingly answered all of my questions and was particularly accommodating when I needed to postpone the trip for one year.

A big thankyou goes to Mr Greg Whitby, Director of Schools, Wollongong Diocese, for having faith in me and always supporting me in my pursuit of ways to bring students to research.

I am indebted to the four schools that I visited, for accepting me and making me feel extremely welcome in all cases.

Thanks very much to Steve and Sue Taylor, Rina and Gidi Ne'eman, Bill and Dianne Rigney and Russ Fisher-Ives and Renee Saucedo for their hospitality, friendliness and willingness to show me their special parts of the world.

Finally, thanks very much to Rob Kimbrey, for supporting me all the way, for wanting to come and share the journey and for keeping me together at the end under sudden unexpected extreme emotional duress.