

***Schools Project***

**Final Year Undergraduate Students Research  
Day**

**Friday, 1 April 2011**

**SCHOOL OF CHEMISTRY  
UNIVERSITY OF BRISTOL**

**PROGRAMME**

Page	Time	Name	Title
	14.00	<b>Welcome</b>	
3	14.10	Swayne, Alexander	On chloroform: Its discovery and use in Anaesthesia.
4	14.30	Burkin, Kate	<u>Scientific Practical Assessment in Secondary School Education</u>
5	14.50	Bell, Camilla	
6	15.10	Crew, Tom	<b>Stimulating Scientific Curiosity in Young Pupils with Engaging Practical Investigations and Links to Universities</b>
	15.30	<b>Tea break</b>	
7	15.50	Wadsworth, Elenore	<b>An Investigation into the Use of Film to Stimulate Interest in Science at Key Stage Two.</b>
8	16.10	Gilroy, Andrew	
9	16.30	Marriage, Thomas	Teaching Sustainable Development in Primary Schools: Development of an “Energy and the Environment” workshop.
	16.50	<b>End</b>	

**Name:** Alexander Swayne

**Supervisor:** Professor Jeremy Harvey

**Title:** On chloroform: Its discovery and use in Anaesthesia.

**Abstract**

In this talk, I will describe the discovery of chloroform in the 1840s, and how this new compound was used as an anaesthetic. I will also describe the serious side-effects of this drug (including total respiratory and cardiac failure), and what was known about them in the 19<sup>th</sup> Century. I will argue that the fact that chloroform was used for over 100 years implies an ethical failure of leading medical practitioners at the time.

**Name:** Kate Burkin

**Abstract:**

Scientific Practical Assessment in Secondary School Education

My presentation covers a brief description of what I have done as part of the Undergraduate Ambassadors Scheme, UAS, concentrating on my ambassadorial duties within the three schools I visited. I will discuss my observations of normal lessons and Outreach events I participated in. The main focus of the presentation will be the Investigative Skills Assignments (ISAs), practical assessments used at GCSE and A-level. I distributed questionnaires which were completed by students at Badminton School, and conducted interviews with several teachers. These showed that practice exams are the favoured form of preparation and that the main limitation to the ISA is the limited mark scheme and negatively skewed grade distribution resulting in the loss of a couple of marks seriously altering the grade achieved by the students. I will also discuss the other forms of practical assessment that have been used and the advantages and disadvantages associated with each of them.

## **Camilla Bell, abstract:**

The purpose of this study was to investigate learning in an informal setting: to see whether learning still happens effectively if you remove the formality of a regular classroom setting.

The subjects of the study were a group of selected students from a local Bristol secondary school. The two case studies used for comparison were an after-school Science club for years 7 to 9 students and one-on-one tutoring sessions with 6<sup>th</sup> form students studying A2 Chemistry.

Both case studies were identified as “informal learning” as the learning structure, objectives, expectations of behaviour and accessibility differed from those present in formal classroom teaching. The objective of tutoring 6<sup>th</sup> form students was to help pupils who were struggling with their grades, and to increase their confidence in their own abilities. The objective of the after-school science club was to increase pupils’ interest in science by giving fun and informative demonstrations which would not normally be part of the science curriculum, and which might not always be available because of practical constraints.

The outcome of the study was assessed by measuring the satisfaction of the pupils, and by determining whether any effective learning had taken place, and for the younger pupils whether any showed an increased interest in science. The two studies provided an interesting comparison as they used very different formats of informal learning, and also showed the effects that age, differentiation and learner responsibility had on informal learning and its effectiveness.

The students’ learning was measured primarily by observation. For the Science club each session ended with a plenary, to determine what the students had learnt. The students also filled out questionnaires which asked whether the science club had improved their understanding in regular lessons, and also increased their interest in science as a whole. For the sixth formers the “measurable outcome” was determined by whether or not they achieved their predicted grades. However they also completed self-evaluations forms which asked whether tutoring had improved their understanding in class, made them more confident about exams or just more confident to asking for help.

The study also considered learning development, and whether informal learning has “multiplier effects” such as increased participation in more formal learning.

The conclusions of the study were that older students are more likely to benefit from informal learning than younger ones. Age and maturity play a major role as older students are more prepared to take control of their own learning, moving away from the passive acceptance of what they are taught in class towards taking more responsibility for what and how they learn. It also became clear that the familiarity that arises from one-to-one tutoring had a major effect upon increasing the confidence of pupils, which in turn helped them in the more formal setting of the classroom as they felt more in control. Lower down the school informal learning is difficult to initiate as the pupils find it hard to move away from familiar lesson settings, and the large groups and the age range can prove tricky to motivate and direct without behaviour expectations in place. However by giving open objectives for learning, and putting emphasis on enjoyment and the quality of experience, the pupils were motivated by self-interest and would usually arrive at learning outcomes of their own accord. It also gave rise to unintended learning outcomes, but it is often these self-inspired discoveries that prove how important and worthwhile informal learning is.

## **Stimulating Scientific Curiosity in Young Pupils with Engaging Practical Investigations and Links to Universities**

Tom Crew

Supervisor: Tim Harrison

A decline in uptake of Science, Technology, Engineering and Maths (STEM) subjects at A-level, higher education, research and industry has been identified. This is a huge concern for the government who consider these industries essential to future development in a number of important areas. It is thought that perhaps the most efficient way of encouraging students to choose these subjects for further study is to capture and engage their interest as early as possible, by encouraging a positive attitude towards them at a very young age. With this in mind, there have been a number of reviews of the primary school National Curriculum which identified several flaws in our curriculum and suggested a variety of ways to improve and restructure it. Perhaps the most significant of these were the Independent Review of the Primary Curriculum by Sir Jim Rose and the Cambridge Primary Review. These two differed greatly in their approach and analysis but agreed on several points; they both highlighted the importance of a National Primary Curriculum as a means of assuring a standard level of Science education across the country. The Ofsted report, Successful Science, was a more detailed analysis of the National Curriculum for Science and claimed that “a secure and engaging experience of Science in the primary school is the foundation needed for successful science in the secondary school and beyond”.

All three of these reports noted that some of the best ways of delivering an engaging science experience included a strong focus on practical science as well as having good links to universities and other establishments, allowing a sharing of resources as well as visits from science experts who can provide exciting, stimulating science lessons. The importance and effectiveness of both of these have been discussed. A great example of the combination of these two is in the use of Investigate... exhibits from @Bristol; a dynamic, exciting set of exhibits designed to support active learning of science in Key Stage two and three. A Key Stage Two workshop was planned and run using four of the Investigate... exhibits and they were shown to be effective; open-ended and engaging. They are an excellent means of stimulating natural scientific curiosity in young minds and spurring pupils to pursue an interest in Science to a higher level.

## **Elle Wadsworth, Supervisor - Tim Harrison: An Investigation into the Use of Film to Stimulate Interest in Science at Key Stage Two.**

The drop in students taking Science subjects at University is a worrying statistic<sup>1</sup>. The glamorisation of other subjects has led to an increase in students studying these at a higher level, at the same time there has been a decline in interest in the STEM subjects (Science, Technology, Engineering and Mathematics)<sup>2</sup>. Career prospects in Science are not attractive. For example, the stereotypical Scientist is an old Caucasian male with wild hair and a long white lab coat – a role model which no child or teenager aspires to be when it is up against the popularity of footballers or actors.

The Undergraduate Ambassadors Scheme (UAS)<sup>1</sup> was set up with the aim to address this problem. The scheme places undergraduates into schools in order to inspire children with the hope that the next generation will be filled with budding Scientists who will continue to advance the world. The research in this project therefore was to find a modern teaching method to make Science fun and interesting yet educational.

In this project, films are used as a stimulus to remain up to date with a modernising world. Increasingly television and film are replacing reading for pleasure as popular activities for children in the home. Films are a potential educational tool for all ages to enjoy and learn from whilst being entertained<sup>4</sup>.

The film industry thrives off children's films, releasing an average of thirty films rated PG or U every year, bringing millions of children to the cinema<sup>5</sup>. With children watching films being a common activity outside school, incorporating popular films that have scientific references has potential to spark interest in the classroom. For a subject like Science, a whole film isn't necessary and may mask the links it has to the curriculum. Short clips, on the other hand, help pupils to focus on the lesson objective whilst being excited from the appeal of the film. The clips can be used as starters to excite the pupils for the lesson ahead, plenaries to round off a lesson or to break up long written assignments. In order to show all the film clips found throughout this project, along with their scientific relevance to the National Curriculum (NC)<sup>6</sup>, a webpage was set up. The webpage is aimed at teachers to use as a resource in class and is 'fit-for-purpose' in its complexity of use. Each clip shown gives a detailed synopsis to make it easier to find the clip most relevant to the lesson in question.

Questionnaires given to Year 5 pupils in SS Peter and Pauls Primary School showed that all their pupils enjoyed watching films, and thus watching them in class. Twenty-four out of twenty-five pupils thought that using them made Science more fun with twenty-three wanting more to be shown in their lessons. The teachers asked felt the pupils benefitted from the clips in class by engaging them instantly and by showing them that aspects of Science are all around us, even in film. Their responses showed that they found the website easy to use and an invaluable resource for modernising their lesson plans.

From the results of the questionnaires, the use of film has been found to stimulate pupils in lessons. It gave an alternative method of learning that linked an activity children enjoy at home, directly into the classroom. The pupils found Science more enjoyable which was the main objective. Film clips could hopefully be used by many teachers to help increase the number of pupils remaining in education to learn Science.

## **Andrew Gilroy**

As part of the Undergraduate Ambassadors Scheme run in conjunction with the School of Chemistry, two different lesson starters were planned and implemented on the subject of molar calculations across a range of ability sets with year 10 pupils in Bristol Grammar School. Student feedback illustrated that there was a strong preference to one starter over the other and that the starters successfully engaged the pupils at the start of the lesson. The research allowed the author to investigate common misconceptions and list potential ideas on how to tackle these misconceptions in the future within the classroom environment.

## **Teaching Sustainable Development in Primary Schools: Development of an “Energy and the Environment” workshop.**

**Name:** Thomas Marriage

**Supervisor:** Tim Harrison

**Abstract:** Global issues such as global warming and poverty have become increasingly politically important over the last century. This has led to a broadly global consensus for a need for more sustainable development, to protect the world for future generations. Education has been recognised as a vital aspect in achieving this sustainable development. Schools have a vital role to play in this process; they are responsible for equipping children with the right skills and knowledge to understand and deal with the global issues of poverty, inequality and climate change. I will briefly cover the background to education for sustainable development, before concentrating on the development and evaluation of a Key Stage 2 level science workshop. The workshop was designed to increase awareness of environmental issues, whilst investigating topics from the national curriculum for science.