

Making science crystal clear

Wed, Oct 15, 2008

Transition year students at Rosemont Secondary School for girls in Dublin are taking their chemistry class to a whole new level, writes John Holden

SCIENCE HAS a bad image. What many students learn in school about chemistry, physics and biology has already been forgotten by the time they get their Leaving Cert results. It hasn't been hip since Doc Brown invented time travel in *Back to the Future*.

The bad reputation stems from people's inability to link science with everyday life. Teachers and scientists alike are acutely aware of this in the classroom. However, accessible writers such as Richard Dawkins, Stephen Jay Gould and Bill Bryson have helped more people get to grips with the fundamentals of physics, chemistry and biology at a level that was previously exclusive to those studying or working in the area. Science is gaining street cred once again.

That's a positive, but the real challenge is to get more students interested. This can only be done if the practical uses of science are shown in the classroom. At Rosemont Secondary School for girls in Dublin, chemistry teacher Dr Eleanor Higgins has been doing just that. Using crystals as the medium, Higgins has been explaining their chemical make-up while also showing how they are used in our lives.

"I wanted something flashy for students to look at so I decided on crystals," she says. "They are very topical as they are so widely used, which most people don't know. I wanted to look at something superficial but examine it chemically and then show how it relates to everyday life."

FROM MAKE-UP to computers, jewellery to watches, crystals in their different forms are to be found in many everyday items. "I couldn't believe how many things I use regularly," says Rachel Jarrett (16) of Rosemont TY. "Not only have we been learning about their uses, though, we've also been making them in class. We have sugar crystals forming on the shelves which we made with sugar and water, and now we're using a combination of hot water, salt and cold ethanol (alcohol) to show how another type of crystal is formed."

There is another aspect to this TY science project. When you walk into the chemistry laboratory in Rosemont you find some students on laptops researching information on crystals. Others are busy with their microscopes assessing the results of previous crystal experiments while others still are in the process of creating more. The labour may have been divided but the end product will have been a team effort.

"We're growing our own crystals, discussing their structure, writing up our findings and making a poster, just like a research masters," says Higgins.

Higgins has a PHD in pure chemistry. From her experience at third and fourth level education, she is showing the students how science is taught at university. "I get them working on their own initiative," she says. "The objective is to get used to the idea of research-based learning. In school you are taught in a didactic way - you learn what you are told to learn. This is different. Students have to go off and find out as much information as they can about crystals - what they're make up is, what types there are, what their uses are etc. It's up to them to explore all the avenues they find, a learning approach they won't have experienced in a syllabus before."

Higgins could be working at university level, but she has chosen to work in the post-primary sector. "It was just a personal choice to teach at this level," she stresses. "But you can't popularise science at third level. It has to happen in school. Otherwise, how can they be

expected to know anything about it and be interested enough to take it up after the Leaving Cert?"

In her effort to give currency to science subjects in Rosemont school, Higgins has more than one hurdle to overcome. Not only is uptake in chemistry and physics at Leaving Cert level low in schools generally, girls are traditionally less inclined to study the subjects than boys. "There's a lot of talk about the different learning styles between girls and boys," says Higgins. "Certainly chemistry and physics have a masculine emphasis in schools. But they shouldn't have. Girls are extremely good at research and multi-tasking, which makes them suitable for all the sciences."

SIXTEEN-YEAR-OLD Clare Faughey has really enjoyed the research process so far. "I really like getting to try stuff out in class," she states. "The experiments we are doing with crystal formation makes learning about them more interesting and easier to understand. Plus when you learn how a scientific experiment is used, it makes the whole thing come to life. Crystals have played a big part in areas as different as communications, construction and alternative medicine. It's amazing. I'm now a lot more interested in chemistry than I was for the Junior Cert."

The Rosemont crystal project is but a brief module in the TY students' overall academic year. But Higgins hopes its impact will be long-term.

"What's really important is that we show how relevant science is," she concludes. "Students should understand that science is both useful and enjoyable, and helps us to interact with the world we are engaged in. It's a life tool."

Anybody out there? Kilkenny students put ET under the microscope

CBS Kilkenny is one school where science is on the up. Twenty per cent of students took chemistry for the Leaving Cert compared to the national average of 14 per cent. Likewise, 22 per cent did physics compared to 14 per cent nationwide. Around half took biology, which is the overall average.

"We have excellent support from our principal," says Derarca Maguire, who teaches physics at the school. "We have a generous budget and good facilities - all classes are in labs that are well kitted-out and with broadband. We're also encouraged to go to any relevant in-services. Plus it's a boy's school so they have a natural tendency towards the sciences."

The boys of CBS Kilkenny have also recently begun taking their TY science exploration more seriously. "In our school we divide the TY groups into four groups of about 24," says Maguire. "Each group follows rotating eight-week modules in physics, biology, chemistry and technology."

"The benefit of this for the 'recruitment' of students into the sciences at higher level is that each of the TY module teachers are specialists in that particular science - mine is physics, so I take all the groups for their physics module."

"It means they get a realistic taste of the subject from that specialist, and each module would be about 50 per cent course work and 50 per cent further afield. So really, by the end of TY, they can make a fairly educated choice as to their Leaving Cert subjects and it may have piqued a long-term interest in the subject that will extend to third level and beyond."

Maguire and many other teachers nationwide have tapped into a Second Level Support Service (SLSS) TY science resource designed by Anna M Walsh last year. The resource, which offered training and activities for teachers to use in class, has been of great use to Maguire and many others like her. "I think they're fantastic," she says. "You can pick and choose what works for you. I use about half of the activities. Some wouldn't work because of class size or the length of time you have with students, but they're generally very adaptable."

"A new activity which I have adapted and appeals to all the three sciences is called Is there anybody out there? The biochemistry of alien life. Basically it's about whether there is life on other planets. It goes through the physics of the size of the galaxy, and answers questions about how long light takes to get to us, how many planets are out there and also how many solar systems there are in the universe. After the extent of the universe is explained, the question is asked: out of billions of planets, why are we so lucky to be the only ones with life?"

"Then we move on to the chemistry of alien life. We look at what's required for human life but then assess what might be needed for another form of life to thrive. We don't know what types of environments are needed for other forms of life to exist.

"Then for the biology section we look at the characteristics of life, how proteins come together and how we reproduce. All the sections have activities to go with them. It always goes down really well."

In essence, the alien life exercise and any others from the SLSS series are about picking out the good stuff from science to make it interesting and having a healthy mix of theory and practical.

"The TY eight-week group module is terrific for me," says Maguire. "We stay with all the interesting stuff and keep in mind that it's TY and not a third year for the Leaving Cert."

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