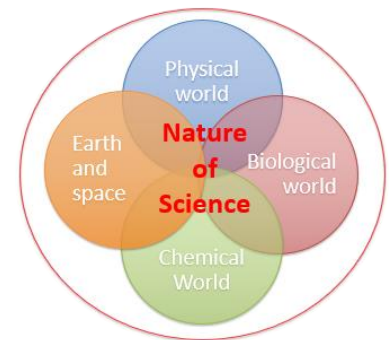


Student voice and choice – exploring new worlds in our Science classrooms

Dr. David King, Science Team Leader, JCT

Science is a collaborative and creative human endeavour; a process of discovery towards a deeper understanding of the natural world. The study of Science is a social activity; an exploration into a living field that is historically located and as relevant locally as it is globally. As part of the reform of Junior Cycle, students who have been studying Junior Cycle Science in our classrooms (currently 1st and 2nd years) are engaging with a new approach to learning about, with and through Science. Their curriculum invites teachers and students to experience a new structure and approach to teaching, learning and assessment that looks to enable students to take control of their own Science learning.

The learning in Junior Cycle Science is organised into 5 key areas, or strands. These include four contextual strands related to Earth and Space, Chemical World, Physical World and Biological World. There is also a unifying strand that connects all Junior Cycle Science learning, which students experience in every class – the Nature of Science Strand. Through engaging with the Nature of Science Strand, students work as scientists rather than just ‘study science’. They progressively develop Science understanding, skills and values as they investigate in Science, communicate in Science, and develop an appreciation of how scientists work and the interplay between Science and society.



The Junior Cycle Science learning journey places the student at the centre of their own educational experience, with flexible learning approaches towards achievement of an array of learning outcomes at the end of third year. For example, an Earth and Space learning outcome states that

“Students should be able to examine some of the current hazards and benefits of space exploration and discuss the future role and implications of space exploration in society.”

As the field of space exploration moves, grows and develops along with our society, so too will our students’ examination of this field. Through exciting learning outcomes like this, teachers and students can work together to develop a curriculum that speaks to the living discipline of Science but is also responsive to the needs, passions and curiosities of our students at their age and stage of learning.

One key aspect of the work of a scientist is investigation. Junior Cycle students will ask questions and make predictions about phenomena in the natural world and follow their curiosities through scientific investigation. It is envisaged that students will gain *“frequent opportunities to develop their understanding of scientific processes... and to develop their inquiry skills to a point where they can conduct their own investigations from start to finish”* (Science Specification p 14). Students will get the opportunity to showcase their investigative skills at different points throughout the three years of Junior Cycle.

Junior Cycle reform celebrates the fact that no single assessment can capture the full picture of student learning. It also celebrates the centrality of the student and the professional judgements of teachers as part of the teaching, learning and assessment journey. With this in mind, the Junior Cycle Science

assessment landscape has changed. Now, students will experience a range of assessment opportunities throughout Junior Cycle that allow them to show their learning in many ways. As well as ongoing assessment and reporting that happens throughout the 3 years and continually moves learning forward, there are new national assessments, the outcome of which will be recorded on the students' Junior Cycle Profile of Achievement:

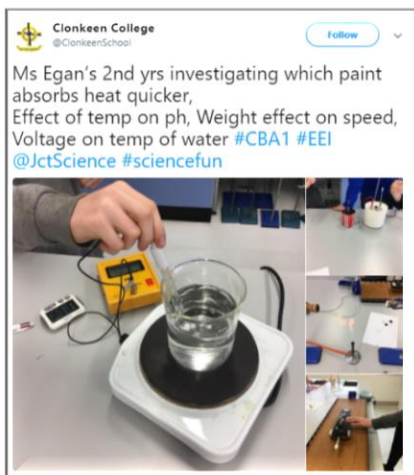
- 2 Classroom-Based Assessments (CBAs), one in second year and one in third year – judged against national criteria by the teacher
- A written assessment task and a final exam in third year assessed by the State Exam Commission.

2nd year students are engaging with the first of the classroom- based assessments this month and are carrying out an *Extended Experimental Investigation*. For this assessment, students will formulate a scientific hypothesis, plan and conduct an experimental investigation to test their hypothesis, generate and analyse primary data, and reflect on the process, with support/guidance from their teachers. Students can develop their own question, based on their areas of interest in Science stemming from their personal lives, or as experienced during their Science classes. They are invited to investigate individually or in groups on one or more of the following topics:

Water	Plastics	Food	Forces
Chemical reactions	The Earth / Moon / Sun system	Plant growth and behaviour	Energy conservation

From the moment students get an opportunity to seek answers to their own questions and connect the pursuit of their own curiosities with the work of scientists – they are hooked. Student choice is central to engaging students in their Science learning, and the Extended Experimental Investigation has student choice at its core. Rory O’Kane, 2nd year Science student from Clonkeen College, Dublin likes the freedom of choice in his CBA. He says, *“I love having the freedom to choose my own investigation from an area I have an interest in”*. His teacher, Máire Duffy, is amazed by the work of Rory and indeed all her students:

“It’s amazing to see the variety of experiments that students have come up with by themselves. There is a real sense of satisfaction as a teacher to see students being inquisitive and putting their science skills into action. There is a great atmosphere in the class!”



Over the Assessment period students engage as scientists trying out their ideas and refining their investigative work, reporting their findings in a manner of their choosing. As well as written reports, students might present posters, pictures, and so on. How we communicate Science moves in line with our advancements as a digitally literate age, as students use digital media such as PowerPoints, digital scrapbooks, virtual learning environments, even Podcasts and videos to form their ongoing research records and maybe even their final CBA report. Seeing students’ creative approaches to scientific investigation is a great source of pride for Science teacher Jennifer Egan of Clonkeen College:

“I’m thrilled to see their enthusiasm, creativity and ideas come alive in my lab. Feeling very proud of my students. Already looking forward to next year”.

It is fair to say that students have been on an exciting learning journey, but so too have their teachers. Junior Cycle for Teachers (JCT), a support service for The Department of Education and Skills, provide continuous professional development (CPD) to teachers and school leaders to support their enactment of Junior Cycle reform. In their CPD, Science teachers have looked at the purpose and possibilities of the changes in Junior Cycle Science. They have collaborated with colleagues in their own schools, and with schools in surrounding areas, to plan for Science teaching, learning and assessment as part of the changes in their subject. Building on the excellent practices that already exist in our Science classrooms, Science teachers have worked at developing their pedagogical and assessment practices, as they seek to bring the world of Science alive in their classrooms in new and exciting ways. Teachers' commitments to the reforms in Science are bearing fruit across the country. Mike Kavanagh, Science teacher from St. Augustine's College in West Waterford, can see the benefits of this approach to developing scientists before his very eyes:



"I was delighted by the way the students' ideas developed into fully fledged scientific inquiry over the course of the planning stage. Weaker ideas were abandoned as the penny dropped on what was realistically testable. There's a great infectious buzz around the science labs at the moment".



Once students complete their CBAs, their teachers will come together to share their experiences of their students' Science learning in Subject Learning and Assessment Review meetings. Through conversations about student work, teachers will develop a shared understanding of the standards of Science learning expected nationally, as they make professional judgements on the quality of student learning in their CBAs. Following this, teachers will award a descriptor to each students' CBA, and provide detailed feedback on their work to support future learning. Each CBA descriptor will be documented on a students' Junior Cycle Profile of Achievement (JCPA). Replacing the old "Junior Certificate", the JCPA provides a broader picture of student achievement across their Junior Cycle learning journey.

The American astronomer Carl Sagan famously said that:

"Imagination will often carry us to worlds that never were. But without it we go nowhere".

Through a responsive curriculum, our Science students have the opportunity to use their imagination to engage with the living field of Science. The Junior Cycle process of ongoing teaching, learning, assessment and reporting rightly positions teachers' professional judgements as central to our students' journey within this field and provides opportunities for standards in Science education to surge from the ground up, like a rising tide from our classrooms. One can only imagine what worlds our Science students and teachers will carry us to in the future.