feature

Inquiry-based learning: it matters for life

By Sue Marks

Biography

Dr Sue Marks is Director of Teaching and Learning K–12 at Oxford Falls Grammar School on the Northern Beaches of Sydney. She is passionate about approaches to learning that inspire students to exercise agency, collaborate with others, engage in critical reflection and contemplate creative ways of communicating their ideas with others.

Future-ready students

What approaches to learning most effectively prepare students for life beyond school? How might teachers design learning experiences that engage, enrich and equip students, so that they *want* to learn, both at school and for the rest of their lives? These are fundamental questions for educators, and the answers to them ought to shape their purposes, programming and pedagogy.

The Australian Curriculum goes some way to answering these questions by identifying seven 'general capabilities' that are to be addressed within all Key Learning Areas. These are: Literacy; Numeracy; ICT Capability; Critical and Creative Thinking; Personal and Social Capability; Ethical Understanding; and Intercultural Understanding. Students develop these capabilities through explicit instruction, but also through experiences that require them to practise and demonstrate them. Together with focusing on the content of Key Learning Areas, it is also the role of teachers to design learning experiences so that students develop these general capabilities, in order that they might realise the goals set out in the Melbourne Declaration on Educational Goals for Young Australians (December 2008) — that all young people in Australia should be supported to become successful learners, confident and creative individuals, and active and informed citizens.

When students engage in inquiry-based learning (IBL), the general capabilities are inevitably developed as well, because students need to:

- think critically and creatively to solve complex real-world problems (some of which may have an ethical dimension);
- work collaboratively with others, including those from cultures other than their own;
- take responsibility for their own learning and adopt a resourceful approach to the use of technology, both for research purposes and in order to create solutions to problems; and
- present their solutions in modes that require them to articulately and authentically engage a real-world audience.

Figure 1: Breathalyser prototype by the winning PBL group

Authentic learning

In recent years, teachers have become increasingly aware of the value of IBL and its most common sub-category, project-based learning (PBL). They have witnessed the benefits of students engaging in active, self-directed and collaborative learning, and of this learning being authentic — meaning as close to what might happen in the real world — and relevant to them. IBL does not involve students learning content by rote and then regurgitating what they have learnt. Rather, it requires them to demonstrate a number of skills, including, but not limited to, their ability to: investigate, explore, question, debate, reason, imagine, tinker, experiment, hypothesise, brainstorm, prototype, create, present and evaluate.

The Buck Institute for Education (BIE), an organisation devoted to promoting PBL, highlights the importance of learning tasks being authentic. In a blog post on the BIE website (https://www.bie.org), John Larmer defines four aspects of a learning task that, when present, make it truly authentic:

1. It meets a real need in the world beyond the classroom or the products students create are used by real people.
2. It focuses on a problem or an issue or topic that is relevant to students' lives — the more directly, the better — or on a problem or issue that is actually being faced by adults in the world students will soon enter.
3. It sets up a scenario or simulation that is realistic, even if it is fictitious.
4. It involves tools, tasks, standards, or processes used by adults in real settings and by professionals in the workplace (24 May 2012).

It is no surprise that tasks that fulfil these criteria are often engaging to students. When IBL tasks are carefully designed, students may well feel they are not doing 'school work' at all, but instead that they are

Figure 2: The breathalyser instructing the user to blow through the tube

Figure 3: The breathalyser displaying the BAC and crash risk

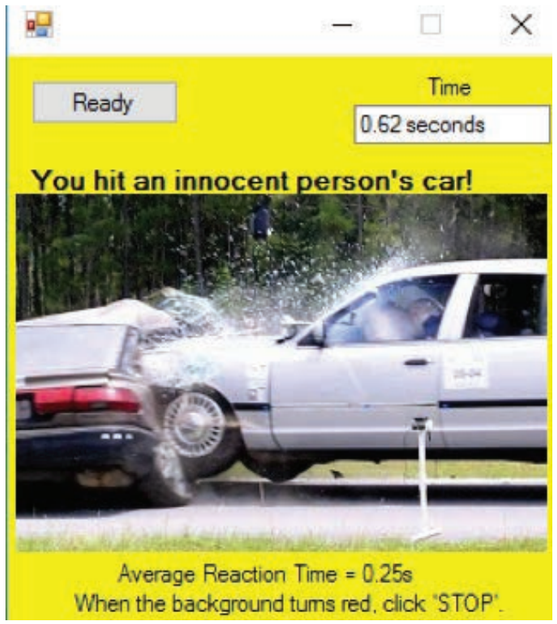

Figure 4: The software displaying an image of a car crash if the reaction time of the user is too slow

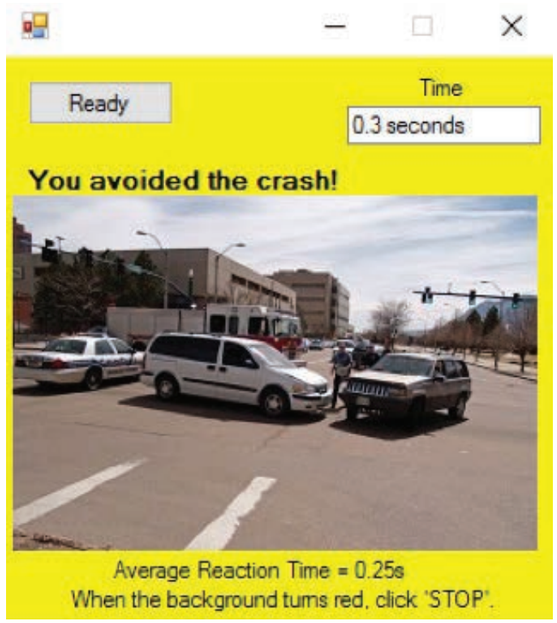

Figure 5: The software displaying an image of a near miss if the reaction time of the user is acceptable

tackling challenges that have the potential to make a real difference to the world in which they live.

An example of PBL from Oxford Falls Grammar School

At Oxford Falls Grammar School (OFGS), we piloted a PBL task with Year 10 students at the end of Term 4, 2016, after their yearly examinations were over. This time is often less productive than it should be, as students have a tendency to view post-examination school work at the end of the year as merely a way of marking time before the holidays begin. We were determined to re-invent these 'wasted weeks', and to imbue them with fresh motivation and meaning! Thus, the PBL journey began.

Establishing teams and developing collaborative skills

Collaborating effectively has long been considered a broad skill that is of enormous benefit to students (Johnson, Johnson & Stanne, 2000; Terenzini *et al.*, 2001). As Oakley *et al.* (2004) state:

> *Compared to students taught traditionally, students taught in a manner that incorporates small-group learning achieve higher grades, learn at a deeper level, retain information longer, are less likely to drop out of school, acquire greater communication and teamwork skills, and gain a better understanding of the environment in which they will be working as professionals* (p. 9).

To foster the learning behaviours associated with collaboration, such as listening, teamwork and empathy, we began the Year 10 PBL experience by dividing the students into teams that were determined by teachers, not the students themselves. It was felt that these teacher-determined groups more closely approximated real-world environments within the workforce, where people often do not get to choose those with whom they work. Once the students were placed in teams, teachers worked with students to foster collaborative skills that they would need once they launched into the project that lay before them. This involved each team setting group norms that mattered to them and that they wanted each member of the team to abide by once they began to collaborate on the project. Students discussed and wrote down what they liked and did not like when working in groups. Some examples of group norms were:

- We will all contribute and try to the best of our abilities.
- We will all respect the opinions of others in the group and not shoot them down.
- We will communicate clearly with one another.
- We will meet deadlines.

Students then formed their own group contracts that reflected the group norms they decided upon, and these contracts included how they would respond if any of the team members contravened the norms they had established. These group contracts were part of the shift towards students taking greater ownership of their learning. The norm-setting and contract-forming process prompted students to reflect on what it means to collaborate effectively and, as the project began, provided a framework for holding themselves and their peers accountable, without the need to rely on the intervention of teachers.

In addition, students reflected upon and discussed their individual strengths as learners (such as being good at public speaking, or savvy with information technology) and areas that each of them felt they needed to improve upon as learners.

The driving question

Engaging IBL begins with a driving question that addresses a real-world problem. With this Year 10 cohort at OFGS, the driving question for their PBL experience was:

When IBL tasks are carefully designed, students may well feel they are not doing 'school work' at all, but instead that they are tackling challenges that have the potential to make a real difference to the world in which they live.

How can we address crime in our society?

Students knew they would need to begin by thinking broadly about this question, and would then need to narrow their focus by homing in on ways to combat a *particular* crime. To this end, the broad, driving question was also posed in a way that helped students to focus their investigation:

How can we find a solution to *a specific crime* that will persuade an *authentic audience* to use our idea/s?

An entry event and an immersion experience

An entry event, designed to generate enthusiasm for a project is often organised by PBL facilitators at the start of a project. The teachers designing this task at OFGS were very aware that students would need to be exposed to a broad range of ideas in order to stimulate their thinking about crime in our society and how best to

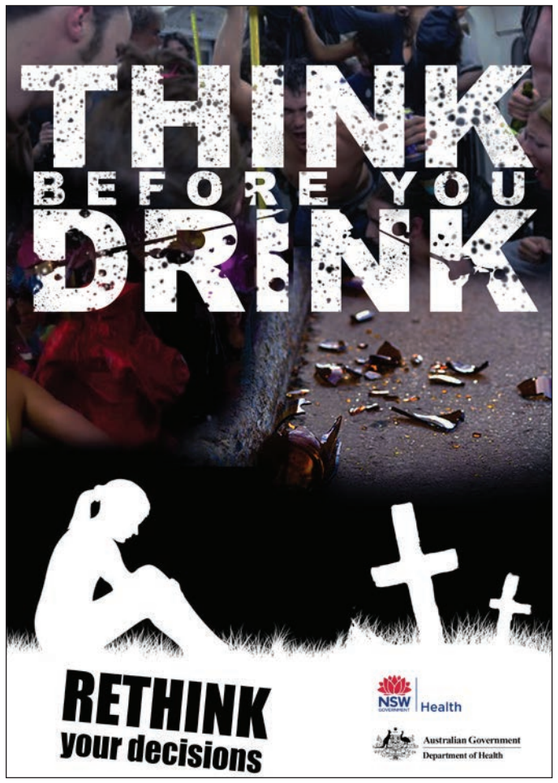

Figure 6: Think Before You Drink: The winning team's poster

combat it. To this end, an external company visited the school and simulated a crime scene, setting up a number of stations that required students to engage with real-world evidence related to arson, an autopsy, DNA and ballistics in order to solve the crime. Worksheets provided by the company enabled students to play detectives, and then a debrief of each form of evidence by the facilitator enabled students to see how close they were to actually solving the crime.

After this entry event, an interdisciplinary approach to the topic of crime was adopted as students embarked on an immersion experience. Year 10 teachers took the topic of crime and planned lessons around it. For example, English teachers explored some crime fiction and a podcast that explored a real crime with their students. History teachers looked at some contemporary examples of war crimes. Maths teachers asked students to engage with statistics on a range of crimes and PDHPE teachers looked at the physiological impact of excessive alcohol consumption and use of some illicit drugs and how these have been shown to lead to certain crimes, such as domestic violence.

The task

Students were then given a step-by-step guide to the task, which is outlined below:

This task requires you to work in groups of 5–6 to pitch to an authentic audience a proposed solution to a specific crime. You will follow these steps:

- Choose a particular crime that is prevalent in our society.
- Research and inquire into the nature of the crime.
- Identify a problem related to that crime.
- Propose a solution to that problem.
- Produce a product that forms a part of your solution. (Although teachers did not tell students this at the start, for fear of pre-empting or inadvertently limiting students' own creative ideas, in the teachers' minds a 'product' could be an invention or prototype of a physical product designed to prevent a crime or help combat the effects of a crime, or it might be a TV advertisement/short documentary/artwork/speech to a real audience designed to raise awareness about the dangers of a crime.)
- Pitch your idea for a solution to the problem, explaining how your product will form a part of this solution.

Figure 7: Students engaging in the entry event: Solving a simulated crime

At this point, the assistance of our teacher librarian was invaluable, as students sought advice on the types of sources that might yield interesting information on the crimes they were considering for their investigation.

Broad group research

Once students had been immersed in the topic and the requirements of the task had been explained to them, they began to work in their teams to research a range of crimes. At this point, the assistance of our teacher librarian was invaluable, as students sought advice on the types of sources that might yield interesting information on the crimes they were considering for their investigation. Students needed over a week to research ideas before they felt confident that they had found a specific crime that was relevant to their society. They were then ready to investigate further in order to arrive at some way of combating, or minimising the impact of, their chosen crime.

Specific, in-depth group research

When the groups had decided which crime they would explore in detail, the research needed to become much more focused and intensive. Each group began to work collaboratively to plan a strategic approach to the research. To keep the research contemporary and relevant, they needed to consider exploring the websites of various government agencies, statistics on the crime, previous attempts at solving the crime and possible approaches to finding a solution.

At this point, teachers needed to be flexible in their approach, recognising that in any one lesson they might need to offer explicit instruction in a key area, be a sounding board for students' ideas, or challenge students' assumptions by asking probing questions. Larmer (2015) makes the point that:

> *... one of the biggest hurdles for many teachers is the need to give up some degree of control over the classroom, and trust in their students. But even though they are more often 'guide on the side' than the 'sage on the stage', this most certainly does not mean that teachers don't 'teach' in a PBL classroom* (bie.org).

In the context of our Year 10 PBL experience, students sought the support of teachers, including the teacher librarian, at various stages. Teachers responded flexibly, but, wherever possible, they responded to students' questions with questions, rather than answers, encouraging them to think critically about ways to solve their own dilemmas.

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Figure 8: One of the judges of the presentations testing the breathalyser

Presentations

At the end of this three-week intensive block (that replaced most normal classes), each group presented to three or four other groups and a panel of teachers selected the best presentation from each pool to present to the whole year group at the 'Combating Crime Symposium'. These group finalists presented to a panel, pitching their solutions to their chosen crimes. Most of the presentations surpassed teachers' expectations, demonstrating a mature level of thinking that was not always evident when these students were completing more traditional 'school work'. Most group presentations were accompanied by an awareness-raising video on the group's crime, made by the students, and/or by a prototype of a physical product designed to combat the crime.

Some of the projects included:

- A moving, skilfully crafted video, to be viewed on television, the purpose of which was to combat domestic violence.
- A lacquer product that students made and tested that was to be sprayed on buildings to make them 'graffiti-proof'.
- A clever device designed to enable people to breathalyse themselves to test their blood alcohol content (BAC). This device approximates the likelihood of crashing a car based on the user's BAC. It was accompanied by an app for a mobile phone designed by the group to test drivers' reaction times. The app displays a graphic image showing a car crash, if the reaction time is too slow to prevent a crash, or a car stopping in time, if the reaction time is acceptable. This winning group's device was accompanied by a poster and movie designed to raise awareness about the dangers of drink-driving and under-age drinking.

Reflections

One of the disappointments of the pilot PBL experience was that we did not manage to secure a panel of judges from the real world, as we had hoped. We would have liked a member of the police and possibly representatives from government agencies related to the relevant crimes, but this did not work out, despite our best attempts. Instead, we set clear, real-world criteria for the evaluation of the pitches and asked teachers who had had backgrounds in relevant areas, including an ex-lawyer, to join the panel. In recognition of their efforts, the winning group members were awarded movie vouchers.

We asked students to evaluate the PBL experience and it was encouraging to receive feedback from the majority of students indicating that they had enjoyed and benefited from the experience. There was also feedback that the research period was a little too long. (Students were working on the project for most of each day over the three-week period.)

At OFGS, other cross-curricular, PBL experiences have emerged, on a smaller scale, since this pilot, as teachers have grown in confidence and have seen for themselves the benefits of this type of learning. An example of this was an elective History class studying Ancient Sparta. For their assessment, the students became curators of a museum featuring exhibits, explanations, and interactive features. These History students also collaborated with a Drama class that was studying lighting design and was tasked with lighting the History students' exhibits in a way that they, in consultation with the History students, deemed to be effective.

Planning is currently under way at OFGS for a new Senior School extension class that will be introduced in Year 7 in 2018. In this arena, and in other contexts, we intend to explore ways for rich IBL to flourish, so that students enjoy authentic learning experiences at school and are well equipped to embrace life beyond the school gates.

References

Australian Curriculum, Assessment and Reporting Authority (ACARA) 2010, Australian Curriculum.

Johnson, DW, Johnson, RT & Stanne, ME 2000, *Cooperative learning methods: A meta-analysis*, Minneapolis, MN: University of Minnesota Press.

Larmer, J 2012, 'What does it take for a project to be "authentic"?' *Buck Institute for Education PBL Blog*, 24 May.

Larmer, J 2015, 'Gold Standard PBL: Project Based Teaching Practices', *Buck Institute for Education PBL Blog*, 21 April.

Ministerial Council on Education, Employment, Training and Youth Affairs 2008, *Melbourne Declaration on Educational Goals for Young Australians,* December.

Oakley, B, Brent, R, Felder, RM & Elhajj, I 2004, 'Turning student groups into effective teams', *Journal of Student Centered Learning,* vol. 2, no. 1, pp. 9–23.

Terenzini, PT, Cabrera, AF, Colbeck, CL, Parente, JM & Bjorkland, SA 2001, 'Collaborative learning vs. lecture/discussion: Students' reported learning gains', *Journal of Engineering Education,* vol. 90, no. 1, pp. 123–130.