Case Study

Australia

Intel® Teach Program

Maths on Track: What Makes for Success?

Formula One racing became the stimulus for Year 11 and 12 students at Melbourne's Kambrya College to discover what makes a successful racing team. After his involvement in the Intel® Teach Program their teacher collaborated with them to develop an exciting mathematics unit based on the Australian Grand Prix. In working out what makes this high octane racing sport tick the students used real life applications of mathematics to sharpen their 21st century skills of digital literacy, critical thinking, teamwork and problem solving.

Intel Teach Program:
"Learning opportunities that involve real settings, real data and interaction with real people are powerful. Under such circumstances students develop 21st century skills naturally. It is wonderful to see!"
Alan Thwaites, Senior Trainer, eLearning Coach and a Mathematics Teacher from Kambrya College, Melbourne

Challenges	▪ Today students need to be engaged in real life learning that involves using technology and developing skills for the 21st century. ▪ Teachers need to create learning situations where technology is embedded seamlessly into the unit of study.
Approach	▪ Provide professional development to enable teachers to integrate technology effectively in their classrooms and help students acquire key 21st century skills, including digital literacy, problem solving, critical thinking, and collaboration. ▪ Employ project-based learning to help engage students in meaningful learning experiences, including projects addressing real-world issues.
Benefits	▪ Through the Intel Teach Program, more than 15,000 Australian educators are now able to effectively integrate technology in instruction and help their students learn the skills they will need to succeed in the knowledge economy. ▪ As a result of improved instruction, many thousands of students across Australia are now learning the skills they will need to compete and thrive in the knowledge economy.

Intel® Teach Program: A Case Study

Kambrya College mathematics teacher, Alan Thwaites, developed a scenario or 'context' to make mathematics more meaningful and relevant for his students. Then he and his students harnessed their learning to examine Formula One racing and the importance of teamwork in achieving success.

Two things came together to make the unit viable. The Australian Grand Prix, held annually in March in Melbourne's Albert Park, generates great public interest. Everyone in the class was aware of the race and some students were very enthusiastic followers. Secondly, Intel is the Official Corporate Partner of BMW Sauber F1 Team and the BMW Sauber F1 Team Driver, Nick Heidfeld, was coming to Albert Park to race and could meet the students. The opportunity to relate their mathematics to the real world was too good to miss and "I grabbed it with both hands" says Alan Thwaites.

The students' goal was to analyse the task of a F1 team to get the car around the circuit safely in the fastest time possible and to explore the Essential Question, "What Makes for Success?" The focus was on teamwork: "What skills are important?" and "Why are teams important?" Nick Heidfeld, the BMW Sauber F1 Team and the race became the context to explore these questions.

The overall purpose of the unit was to demonstrate the importance of teamwork in developing the 21st century skills of critical thinking, problem solving, and collaboration. Using the Intel Teach framework of Curriculum Framing Questions, the unit provided students with clear, tangible, measurable objectives whilst actively engaging them in an authentic experience that used real data. In order to address the Essential Question, students investigated data, and developed and tested the answers, at the same time both personalising their learning and also gaining valuable knowledge on effective teams.

To emphasise the role that individuals and teams play, the class was divided into their own teams for the task. The Australian Grand Prix circuit was divided into sections and several teams examined what driving the track would look like mathematically. Each team evaluated their section of the circuit, eventually combining their results with those of the other teams to develop a picture of velocity and acceleration patterns around the entire track. Another team considered "g" forces upon the driver. Yet another team considered the roles of the driver and the pit stop crew, to investigate how they could work together to achieve their team goal.

Across the various areas of investigation groups specifically considered questions such as:

- What is the shortest distance around the Australian Grand Prix track? How important is this compared to other factors (eg speed loss through braking)?
- What contributions do 'downforce' and 'slipstream' make to speed and acceleration rates and how can drivers strategically use these forces to their advantage?
- What is 'g' force? What are the 'g' forces on the driver?
- Is there an ideal height and weight for a driver?
- What is the rate of fuel use during a F1 race?

Having spent time at school developing their own theoretical answers the class was ready to ask a real F1 driver if their calculations approximated to what actually happens in a race.

Nick Heidfeld, a world class driver, was perfect for the task. He is known as a cool headed, intelligent driver who is competitive but also keen to learn from other team-mates. Whilst drivers race for personal glory, Heidfeld said in a Eurosport article, "When I look at the data, I can see if he (another team driver) has been a touch quicker in a turn, and can then work on that turn. This good relationship also helps the team." Before the 2008 season

"I can relate the maths back to something that interests me".

Student

"Instead of doing questions out of a textbook we're adapting it to reality."

Student

began he said "My wish is for us to achieve our season's target this time round again and take home our first race win. Needless to say I want to be the driver standing up there on the top step of the podium. But the important thing first off is for us to get there as a team. Then I'll seize my chance sooner or later" (Yahoo, Eurosport 14/01/08).

Whilst Alan Thwaites set the broad areas of study and the outcomes to meet Victorian Curriculum Assessment Authority (V.C.C.A,) requirements, student teams met; brainstormed ideas; came up with their own topics; and, developed key questions for investigation and analysis. The "g" force group wondered if the down force on the driver felt similar to how they felt after carrying a heavy hiking pack for a long period. They came up with their own conclusions, then found they had to rewrite their understanding of forces acting on a body after hearing a real racing car driver describe his experiences during a race. Having talked to Nick they had a real understanding of "g" forces during a race and "they've come to realise the race car is an inverted or upside-down aeroplane wing. That's what holds it on the ground." (Thwaites)

The unit's rich and authentic learning came together in the interview with Nick Heidfeld who in GPUpdate.net had said: "I like the Melbourne circuit, as it has a character very much of its own – a cross between a street circuit and a permanent race track. As the circuit is not constantly used for racing, grip levels are extremely low particularly during the initial practice sessions. With no traction control or engine braking control it will certainly be a big challenge". Now, this group of local teenagers could test their theories against Nick's experience as part of a championship team racing the Albert Park circuit.

Prior to the event students planned and rehearsed questions. With the assistance of their teacher they were filmed in 'mock' interviews to give them confidence and help to refine their questions. On the day of the interview the class travelled to the city. The students were both nervous and excited about meeting an expert and testing their ideas.

The interview with Nick Heidfeld was also a media event with reporters and cameramen present. This added to the group's excitement. When the interview started their teacher stepped back and proudly watched as their study, analysis and preparation enabled them to shift to a higher level of communication. They used technical terminology with confidence to demonstrate understanding of complex concepts, asked probing questions and conducted their interviews in a mature and professional manner.

The group who had studied 'slipstream' effects redefined their understanding when they discovered that their theoretical knowledge didn't allow for other factors they discovered through intelligent questioning at the interview. They asked whether the slipstream has a pulling effect and if that's why the cars sit so close behind one another, because they're utilizing that effect? They also asked Nick if he could drive into the slipstream of a car in front and use its pulling force as a kind of slingshot to get past the car in front.

After the interview one student said: "I thought they just had to drive fast but there is a lot more science behind Formula One than I thought". Their teacher found it very satisfying that they were able to interact and gain feedback from an expert who could take their learning beyond what was possible in the classroom.

The buzz after the interviews was obvious. The students excitedly told people on the train on the way back to school that they had met a Formula One driver and it was clear to Alan Thwaites that they liked sharing and discussing their work with others. One student said the best thing about the day was " Getting to ask Nick questions because he really knew his stuff", another, "We could ask questions relevant to what we wanted to know" and a third felt it was all worth while just to be able to " talk to a real Formula One driver". One old urban teenage myth was also exploded "Red cars don't go faster!".

Alan Thwaites has found a benefit from such a contextual learning unit which he no longer hears "Why do we have to do this? The question doesn't arise because (their study) is embedded in something that's real." His students have become more aware of the importance for them to work together to solve problems in teams and he has seen these young people grow in knowledge and maturity.

The students reacted positively to the unit. "I can relate the mathematics back to something that interests me"; "Instead of doing questions out of a text book we're adapting it to reality"; "It made me pay more attention in class because I knew we were going to have to explain what we were learning to Nick"; and "I enjoyed learning mathematics this way"; and "When I enjoy what I am learning it stays with me".

At the completion of the topic the class will analyse their collective findings; consider their response to the unit questions and to the Essential Question. They will create a Grand Prix wiki and other resources for students in the future to use as the starting point for studies of their own. They will consider the type of "teams" that impact on their lives, either teams from which they benefit or teams of which they are a part of, and evaluate whether these will support or hinder them in terms of achieving their personal goals.

Intel Teach Program

Intel is committed to improving education to prepare students around the world to thrive in the global knowledge economy. One of Intel's most successful worldwide programs is the Intel Teach Program, a professional development program that helps teachers improve the effective use of technology in the classroom to promote 21st century learning. The Intel Teach Program was introduced into Australia in 2003.

The Intel Teach Program is adapted in each country to address specific needs and has been localised by Australian teachers. The portfolio offers a range of face-to-face and online offerings designed to enable teachers to introduce, expand and support 21st century learning in the classroom.

The Intel Teach Program is a joint initiative between Intel and participating Departments of Education. The program is also offered to pre-service teachers in selected universities.

To date, more than 15,000 Australian in-service and pre-service teachers have completed the Intel Teach Program, together with over 6 million teachers in more than 50 countries.

Evaluation Data on Intel Teach

The program has gained wide acceptance amongst the teaching community. A longitudinal evaluation, conducted by Deakin University[1], shows that as a result of the Intel Teach Essentials Course teachers are increasingly using technology to plan and implement lessons that are inquiry driven and student centred. They are using technology and project based approaches more frequently to create a learning environment in which students develop 21st century skills such as collaboration, problem solving and critical thinking.

Evaluation results are indicating an increased impact on schools; following the course, 96% of teachers are seeing an increase in the integration of ICT across their school classrooms; 82% have developed new unit plans based on the Intel Teach framework, mostly in collegiate teams, and 83% are using technology in new ways.[1]

The strong alignment of the course to the states' curriculum and pedagogical initiatives has been very significant in influencing its impact at a classroom level and its capacity to support whole school change towards technology based learning.

Intel® Education Initiative

The Intel Education Initiative is Intel's sustained commitment to prepare all students, anywhere, with the skills required to thrive in the knowledge economy by improving teaching and learning through the effective use of technology and advancing maths, science, and engineering education and research. Through a sustained public private partnership with educators and governments in more than 50 countries, Intel works with international organisations and governments at an international, national, and local level. It invests approximately USD 100 million per year in education programs adapted to address the needs of each country to advocate for 21st century educational excellence through policy work and awareness efforts.

For more information on the Intel Education Initiative and the Intel Teach Program, visit: **www.intel.com/education/au**

[1] Intel Teach Essentials Course Impact Evaluation, Deakin University, 2006

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Front Cover: Racing Driver Nick Heidfeld with staff and students from Kambrya College.
Page 2: Nick Heidfeld and student from Kambrya College.

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