F1 in Schools

Summary:

F1 in Schools is a global multi-disciplinary initiative that challenges secondary school students to design, build and race miniature compressed-air powered balsa wood Formula One cars. The competition inspires students to use IT to learn about physics, aerodynamics, design, manufacture, branding, graphics, sponsorship, marketing, leadership, teamwork, media skills and financial strategy, and apply them in a practical, imaginative, competitive and exciting way.

Aims:

The overall aim of F1 in Schools is to bring the excitement and motivation of Formula One racing to school whilst also delivering the curriculum in a real and meaningful way.

Main activities:

F1 in Schools is a unique technology challenge that enables second-level students to learn science by getting their hands on the latest technology from the worlds of engineering and manufacturing. The six main steps that are implemented in this hands-on approach are:
Plan: Form an F1 team and brainstorm. Put your best ideas together in a five-page plan. Design: Team members use CAD software to develop their ideas and model them in 3D. Analyse: Virtual Wind Tunnel software predicts the effects of drag and lift on the car design. Make: CAM software and a CNC system converts the car design into a physical car.
Test: Wind and/or smoke tunnels used to test and improve the car's performance.

Narrative:

F1 in Schools is a global multi-disciplinary challenge for students aged from 9-19 to use CAD/CAM software to design, analyse, manufacture, test and race their miniature F1 car made from balsa wood and powered by compressed air cylinders.
Working in teams of between three and six, the students prepare a business plan and develop a budget as well as raising sponsorship. Teams are encouraged to collaborate with Industry and forge business links. By using 3D CAD (Computer Aided Design) software, the team designs and evaluates the most efficient machining strategy to make their racing car (a Formula One car of the future). Furthermore, aerodynamics are analysed for drag coefficiency in a virtual reality wind tunnel using Computational Fluid Dynamics Software (CFD).
The challenge inspires students to learn about science, mathematics, aerodynamics, design, manufacture, branding, graphics, sponsorship, marketing, leadership, teamwork, media skills and financial strategy, and apply them in a practical, imaginative, competitive and exciting way. F1 in Schools Challenge is not all about speed, competing student teams are also judged on the quality of their engineering, graphic design, resource management, portfolio, media skills, handling of sponsorship and verbal presentation of their work. Besides using this initiative for teaching science the formed teams are given the opportunity to compete regionally, nationally and internationally for the Bernie Ecclestone F1 in Schools World Championship trophy.

Methods of learning supported:
Project-based learning, Inquiry-based teaching methods

End user:
Students grade 4-8 (ages 11-19)
Involved actors: Science Teachers, Secondary School students, University Educators and Students.

Location:
F1 in Schools takes place in Schools (preparation, design, initial testing etc) while visiting a certified center might be required for the final testing of the mini race car.

Connection with the curriculum:
Physics, Mechanics, Engineering, Mathematics, Geometry

Languages available:
F1 in Schools is an initiative that is implemented in 34 countries and its educational resources are available in more than 20 languages.

Where to find the application:
www.f1inschools.co.uk/

Evaluation parameters:
F1 in Schools has been evaluated by the National STEM (Science, Technology, Engineering and Mathematics) Centre based in York, UK and is promoted to many schools, colleges as a practice that advances science learning.

Time frame:
The F1 in Schools Challenge usually covers a period of several months of work for completing all tasks assigned to a group of students. Thus, it can be considered open ended.

Number of participants:
Students work in teams of between 3 and 6, each student is assigned roles.

Additional information or resources:
The F1 in Schools Curriculum Resource provides 70 lesson plans for staff to deliver a cross-curricular project through art and design, citizenship, design and technology, English, enterprise education, ICT, mathematics, PE and science. All resources can be found at: http://f1inschools.co.uk/page--curriculum-resources.html

Teachers' Competencies

1	subject matter/content knowledge	x
2	nature of science	x
3	Multidisciplinary	x
4	knowledge of contemporary science	x
5	variety of (especially student-centred) instructional strategies	
6	lifelong learning	x
7	self-reflection	
8	teaching/ learning processes within the domain	x
9	using laboratories, experiments, projects	x
10	common sense knowledge and learning difficulties	x
11	use of ICTs	x
12	knowledge, planning and use of curricular materials	x
13	Information and Communication Technologies with Technological Pedagogical Content Knowledge	x

Mapping best practices with main principles

PATHWAY

1. Building interest in natural science phenomena and explanations:

The engaging nature of the activities and the glamorous topic (F1 racing) make pupils want to learn. The offered resources enable teachers to make links between their classroom teaching and one of the most glamorous and exciting sports in the world. Some activities may even involve pupils contacting those involved in Formula One racing.

2. Building up informed citizens: Students understanding the nature of Science & Science in society:

The F1 in Schools process simulates many facets of real F1 racing. The worldwide popularity of F1 racing lends excitement while providing a relevant background for simulating critical elements of engineering in the real world.

3. Develop multiple goals:

- **understanding big ideas in science including ideas of science, and ideas about science**
- **scientific capabilities concerned with gathering and using evidence**
- **scientific attitudes**

The F1 in Schools approach allows students not only to have a sneak preview on the science behind Formula One racing but also to develop personal thinking, leadership and teamwork skills and encourage self-study. The development of these skills is essential in generating scientific attitudes among pupils.

4. Understanding students' concepts and learning style about of science phenomena:

Students have the opportunity through advanced software to initially test their design and theoretical approach and afterwards to learn by trial and error (hands-on) about science phenomena related to aerodynamics, engineering and physics.

5. Relevance of the content to daily life of students:

F1 in Schools along with the educational material that come with it enable students to make links between their classroom teaching and one of the most glamorous and exciting sports in the world. In addition, the science behind this approach is directly related to students' everyday experiences with friction, acceleration and laws of motion in general.

6. Understanding science as a process not as stable facts. Using up-to-date information of science and education:

Students form their own F1 teams to research, design, manufacture, and ultimately race their own scale model F1 cars. In their quest for the ideal design for their race car and collection of best experimental data they make use of all available scientific information up to date. Moreover, understanding the science behind racing is crucial for achieving, through hands-on experimentation, excellence in science.

7. Activities for gaining knowledge, not for entertainment, nor for simple imitating of results:

From a design and manufacturing perspective, students use CAD (computer-aided design) software to create virtual 3-D models of their cars and translate their designs into reality by means of CNC milling machines. They promote their cars through a variety of efforts: developing sponsorship decals and producing a design folder with initial design ideas, design development information, testing evidence, and graphical renderings.

8. Doing science: experimenting, analyzing, interpreting, redefining explanations:

The F1 in Schools initiative is based on hands-on experimentation (design, manufacture and test racing cars), data analysis and interpretation (monitoring the racing car's behavior) and redefining explanations (seeking ways to improve physical parameters for higher performance).

9. Assessment: formative ~ of students' learning and the summative ~ of their progress:

The assessment of students' learning and their progress in understanding science is an ongoing process. It continues through all phases of the challenge and besides evaluating each team separately, one can monitor each students learning based on his success in completing the scientific tasks that were assigned to him/her (each student has a specific role well defined role within the team).

10. Cooperation among teachers and with experts:

With Formula One reaching out to all corners of the globe, and its teams made up of a variety of nationalities working together to win the Formula One World Championship, F1 in Schools looks to replicate this scenario by bringing international science and business communication to the forefront and promoting global teamwork amongst young people and their teachers.