

# Some pedagogical considerations

This document is a consideration of some of the ways in which a teacher's impact using 'Cars Maths in Motion' software differs (or should differ) from that teacher's impact during more ordinary classroom activities. It is not intended to be a definitive work, merely a guideline as to how a different approach in certain areas of teaching might pay the practitioner good dividends.

We hope that the document also points to areas where a teacher might need to 'up-skill' in order to get the best out of the software and their students.

The software designers, and authors of this document, Ian Whittington and Brian Richardson, have both used the program very regularly from its inception in the 1980's to the present day. Ian, a now retired Primary Headteacher, has worked with whole classes, groups and individuals – their ages ranging from Yr4 to Yr11 - and continues to work with students of all ability levels using this software. Brian, the Maths in Motion Challenge for Schools Organiser, holds a NCETM (National Centre for Excellence in the Teaching of Mathematics) accreditation for Continuing Professional Development and has trained well over 2,000 teachers in the use of the software. They are both responsible for the content and design of the software.

The Maths in Motion Challenge, which uses 'Cars Maths in Motion', has around 100,000 youngsters taking part in it, spread over many cultures and countries. It is a 'Linked Scheme' for the British Science Association CREST Bronze Award and, to the successful CREST Award winner, the Duke of Edinburgh's Award, Skills section.

The comments are divided into general overarching pedagogy and some ideas specific to certain mathematical concepts that will be touched upon throughout the software.

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## General Comments

### What is 'Cars Maths in Motion'?

It is a piece of 'Cloud' based software that ultimately simulates a car race. Students will need to use some basic maths skills, some strategy and some teamwork in order to set up a car that is competitive – the better you perform, the better your car will perform when it comes to the race! It is VERY competitive and VERY motivating!

### Who is the judge?

In 'normal' classroom situations, the teacher is the ultimate judge of a pupil's actions and achievements. These judgements are often conveyed by ticks, crosses and grades in books or by measured praise and admonition.



In 'Cars Maths in Motion' the ultimate verdict comes with the result of the race. The teacher does not need to point this out – it will be very obvious to almost all pupils where they finished.

This shift in emphasis is absolutely fundamental. The teacher is no longer the 'verdict giver'. The teacher is now 100% the impartial helper. The teacher is an explorer in the software WITH the children.

### **The right question at the right time**

Taking a first teaching step into 'Cars Maths in Motion' is an ideal opportunity to make a professional resolution..... 'I am going to ask the right questions at the right time.'

Which is better professionally? When categorising a circuit plan is it better to ask, 'Are you sure Feature 7 is a Tight Bend?' or to pronounce 'Feature 7 is a Long Bend'?

Which is better professionally? When measuring angles, is it better to ask, 'Are you sure that angle is greater than a right angle – 90 degrees?' or to say 'You are using the wrong set of numbers on your protractor'?

### **But I don't know all the answers!**

When the software is first introduced into the classroom the teacher MUST at least know how to set up a car and enter it into a race. Anything less would obviously be unprofessional and there is help available within the software to make this a relatively painless task! It is worth the time and effort and, apart from anything else, will enrich the understanding of what is being asked of their students.

The teacher DOES NOT NEED TO KNOW how to set up the fastest car or what the best settings are – it is sufficient to know what skills are required to achieve this.

### **The purpose of record keeping**

Despite living in a technology driven world, industry demands that many tasks are still recorded, sometimes manually, step-by-step. A number of record sheets can be printed out for use by the pupils.

One quality that is of fundamental importance in developing Mathematical knowledge from Yr4 to adult life is that quality is often, quite simply, - BEING ORGANISED.

The maths model that is 'Workshop Adjustments' is one such example.....

You enter four 'Workshop Settings' into the computer. The program shows you the 'Performance Settings'. You write them down. When you have done this a few times you can study the figures you have written down and decide on the best options.

Real engineers don't 'guess and hope' very often – they tend to base their decisions on knowledge and fact.

In addition, pupil record keeping can answer a teacher's own questions. For instance, 'Why was Ian's car so slow?', 'Ah..... He was carrying 100 litres of fuel too much and so his car was heavier than all the others. I clearly need to go over fuel calculations with his group again.'



It is sometimes a good idea to have a post-race debrief. Photocopy the winning team's worksheets and distribute a copy to all the other teams. Have a class discussion. Identify where and why the winning car 'had the edge'.

Finally, if you carefully file away pupil record sheets you will have an impressive store of 'evidence' to impress all but the most cynical visitors to your classroom.

### **Real Teamwork**

'Cars Maths in Motion' provides an excellent opportunity for REAL teamwork in Mathematics and the other STEM subjects. If you watch the best teams at any sporting event you will see that each team member has a different role to play. Often, they exchange roles to check on the work done by the others. Sometimes they stop work and all discuss the best option from a number of alternatives. The opportunities to develop personal learning and thinking skills are good and plenty!

A teacher who creates real meaningful teamwork situations within the classroom does their pupils a great service – industry and the workplace cannot exist without it!

