Case Study – Kevin O'Donnell

THIS CASE STUDY ON THE 'MATHS IN MOTION' SOFTWARE HAS BEEN WRITTEN INDEPENDENTLY BY KEVIN O'DONNELL. KEVIN IS AN ASSISTANT HEADTEACHER IN A UK BASED PRIMARY SCHOOL.

Maths in Motion – A Case Study from a Primary School Practitioner

Case Study aims

My name is Kevin O'Donnell, I have been a primary school teacher in the North East of England for 17 years and for the last 9 years I have been using the program 'Maths in Motion' within the 'classroom'. This case study/overview is not to tell you how to use the software – that is for you to decide; nor is it to explain anything technical – there are people behind it who know far more about that side of things than I! I simply wish to give you some details about why, as a practitioner, I think you should consider using 'Maths in Motion' within your educational establishment, wherever that may be, and how you could incorporate it into your curriculum. Hopefully, it will give you a glimpse of what your children too could achieve or gain from using the program…….

Put yourself in their place!

When the wonderful young people that I am entrusted to teach are making their own way in the world, they are unlikely to remember 'the' History lesson on primary and secondary information sources; they probably won't remember being taught the symbols for electrical components and they almost certainly won't recall when they were taught the calculation methods for the four rules of number! Yes, for sure, they'll have gained that knowledge but they won't spare a thought as to where they got it from. But what they will remember is: the History Trip to the local Museum and being scared on the Ghost Walk; they'll remember making rockets and seeing them fly off across the playground and they will definitely remember screaming and shouting at the top of their voices for the racing car that they'd built up in 'Maths in Motion' - and punching the air as it took the chequered flag.

So put simply, the very things that children will remember most about their years at primary school are the things that were fun… and unsurprisingly these things are also the things that I enjoy (teaching) the most too. And that's why 'Maths in Motion' has remained a part (actually a much bigger part now) of my teaching for almost a decade. In fact, this software is so powerful, it has developed from a one hour after school club to become an integral part of my school's maths curriculum…

How did I first get involved?

My involvement with 'Maths in Motion' started some 9 Years ago, and I have used the program extensively with children in each of the two schools that I have taught at ever since.

I've always been a huge advocate of using something practical and tangible to teach children, developing in them a sense of purposefulness so that they see the point to it and want to learn and improve; so when I received a call from a local authority representative at our local City Learning Centre to go along and 'sample' 'Maths in Motion' with some of my students, it wasn't a tough decision to accept the invitation. A computer program that incorporated a plethora of maths and science skills claiming to help 'build and race virtual formula one type racing cars' sounded pretty cool from the outset!

I was not disappointed - my class absolutely loved it from the off! They spent the morning, working in teams, with bits of string and protractors, pencils and paper – scribbling away sums, entering data into the computer and the like. The session culminated with 'The Race', a fantastic ending to a marvellous day.

From the very start of the session my children got 'it', all of them – any inaccuracies could mean their car crashing or running out of fuel. Get their sums right and they'd have a chance of winning… beating their classmates… being the best… top of the tree. What more motivation did they need?

Without exception, every child thoroughly enjoyed the session; they all left with a sense of achievement - even those that had managed to crash their cars: they were desperate for a chance to find out where they'd made a mistake and correct it so that if there was to be a next time they might win – a priceless outcome for any teacher!

And so, it was obvious to me from the very start that I'd have to get involved and if I was at all unsure over the following few days my mind was made up when (I kid you not) the children started to ask me on an almost daily basis, 'When can we do that maths racing thing again?' or 'So when are we getting Maths in Motion in school?', 'We think we've realised where we went wrong so can we try it again?' These requests were often from children that you wouldn't expect; the ones that didn't like Maths or the ones that found school boring. I knew that I was on to a winner!

Oh and one other thing – the person delivering that course did happen to mention a National Competition that the children could enter and that got me really thinking… how

wonderful it would be if a team of 4 children from my 'little old school' could be National Maths in Motion Champions (or World Champions as it is these days)… maybe they'd return to school as heroes? …maybe they'd become TV stars, maybe their picture would be in the local press, maybe they'd win a VIP trip to Silverstone – but that's another story entirely…'

Using the program in school - an introduction…

I suppose it's important to point out here that my computer skills are not great. I know how to use one and I know what I want to get out of it but that is all. Using 'Maths in Motion' is simply just a matter of getting used to using the software; and it comes with fool-proof guides and instructions that answer any question you may have. There is very little technical stuff to get your head around and if I managed then anyone can – as my children will give testimony to! If all else fails, there are some wonderful people at the end of an email who really do know everything about the software!

In the first few years of using the program it was used solely in the weekly after-school maths club, but over the years I have extended its use within the classroom and I now use it to teach the practical maths skills and calculation methods that the children require rather than just using it to practise them. The children understand that if they want to do well in the race they will have to learn how to use a protractor correctly, interpret scale and graphs, be accurate in the calculation of percentages and the many other areas of mathematics that are touched upon. They are motivated from the very outset to achieve – and they do.

More recently I have used the program as the basis for stand-alone problem solving lessons.

So how do I currently use Maths in Motion in the classroom?

… within a lesson or a series of lessons

Before starting the afterschool club; which runs for an hour each week from October to July; I use the program in a series of Maths and ICT lessons that span the first 2 weeks of term in September. I take both morning sessions and combine the Maths with ICT skills (data entry/ analysis, computer modelling/simulation).

These sessions are structured so as to be taught as a 'formal' lesson each day (see table below). I teach explicitly a different mathematical skill each day – the skills required by Year 5 and Year 6 mathematicians and also by users of 'Maths in Motion'!

	Lesson Focus
Monday	Using the paper track plan. Measuring straight lines, using scale, multiplying decimal numbers and interpreting data in a table.
Tuesday	Using the paper track plan. Measuring angles with protractors and interpreting data in a table.
Wednesday	Data entry of bends and straights into the program. 'Workshop adjustments' (maths modelling within the program). Calculating percentages of amounts to work out safe speeds. Interpreting data in a table.
Thursday	Using scale and track plan to calculate the fuel required for the race – multiplying and dividing by 1000, multiplying decimal numbers, rounding up/down.
Friday	How to work out pit stop strategy (fractions/ratio work and division) and final race adjustments. The Race.

I have the first race completed by the end of Friday's session, and without exception every child has *their* car ready and on the starting grid. (There is a really handy checklist in the Race Administrator's page to help you keep check of where every pupil is up to and what they still need to complete to have their car race-ready)

Typically, week 2, in which a different race is created, gives the children a chance to repeat the process but a lot more independently and at their own speed too (no pun intended). It also gives me the chance to work more closely with any students that may require further input with any of the skills taught, e.g. measuring using a protractor or working out 75% of 220. As the children were taught the relevant maths and computing skills in the previous week I find that shorter sessions are fine for week 2.

After these two weeks the children are then invited to join the after school club and the take-up is always excellent.

…as an after school activity

For the past nine years I have ran an after school club. All pupils in year 6 - without exception - are invited and some from Year 5, but there is no reason why a club can't encompass other year groups too! At the Maths in Motion club I have never had fewer than 20 regular attendees and in some years I've had as many as 35!

Feedback from parents is incredible, they are over-the-moon and some equally bewildered that their child is staying back for extra Maths! Many have offered to help out and get involved – another positive benefit for any school.

When I started Maths in Motion it was supplied on a CD-ROM and needed to be uploaded to a schools' individual network but now, as it is Cloud-based, many children continue to work on their cars at home; which is absolutely fantastic. At the end of one after school session I intimated that if any child managed to get a faster lap time than me, and thus get ahead of my car on the starting grid, then I would gladly give them 5 house points. Arriving at school the next day I had a queue of children at my desk all with broad smiles on their faces. They had news for me alright and were ready to see me keep to my promise – just brilliant!

Typically, I try to get through one race every 2 weeks in the after school sessions and certificates are given out for those lucky enough to be on the podium after the big fortnightly race. These certificates become treasured and are much sought after… motivation or what?

I do know that some schools run their club differently, the children work in set groups and run a season of races and have a league table that is updated after every race. This is fantastic and something that I have considered but with my children I like to get them to work with different people after every few races or so. The point is there is no right or wrong way to use the program – it is flexible enough to allow you to do what works for your school and your children – it is not prescriptive in any way!

… in a problem solving lesson

This academic year, I have tried to integrate the program even further into my teaching practise and have been able to use the program to develop problem solving skills. In short, I set up identical racing cars with a variety of errors borne out of my 'poor' calculations. The children had to identify the problems and solve them in order for the cars to navigate safely around a track. In this particular lesson the children worked in pairs and were encouraged to talk through their findings with each other every step of the way. The premise for the

lesson was to 'Solve real-life problems using maths skills' and in the process to build my pupils' perseverance and resilience with respect to problem solving.

The Maths lesson was observed formally by our SIP (School Improvement Adviser) who just happens to be an OFSTED inspector too. The feedback from the lesson was great – 'The premise thoroughly engaged pupils', 'All groups made at least good progress' and 'a strong sense of challenge – pitched to all but then bespoke to meet a variety of needs' were just some of his comments.

… individual or part of a team?

The education skills of the software writers are evident throughout and the program lends itself to a wide range of classroom organisation – individual, paired, teams of 4…

My preference, and it is only my preference, is for the children to get used to the program individually first. This means that each child will be able to tackle all aspects of the maths and computing so that when they do work with a partner or in a team they do not take a passive role and have the confidence to play their part in the decisions and take their share of the workload. That said, once they are teamed up, the high level conversations really do start. To hear ten year olds knowingly discuss the setting in the maths model for Aerodynamic Downforce or Gear Ratios is a joy to behold - and nowhere near out of the ordinary once have you got into the project.

The impact of Maths in Motion on Teaching and Learning

I suppose we cannot ignore the pre-requisite for most of the things that we do in school needing to have an impact on the academic achievements of the children in our care; we are after all teachers and must impart knowledge. Maths in Motion certainly ticks all the boxes in terms of a teaching resource; it most certainly enables a child to develop and practise essential mathematical skills and concepts which results in progress.

Children learn using the program and in my vast experience as a teacher of 17 years standing I can say that Maths in Motion has had a hugely positive impact on children of *all* abilities. Over the years I have seen many shy, apprehensive children become confident mathematicians. I have witnessed a number of apathetic, bored Maths students' thrive in a new-found love of the subject and proudly list Maths as their favourite lesson. I attribute all of this in no small part to their involvement in Maths in Motion and, as an added bonus, a new found confidence or appreciation of Maths ensures progress is accelerated in other curriculum areas too. In fact the attainment of these children (in Reading, Writing and

Maths) has been far greater than would have been anticipated at the end of Key Stage 2 when they move on from me to start their secondary education!

Much more than just an academic tool…

It has been wonderful for me over the years to see the friendships that have developed due to a child's involvement in Maths in Motion. I've witnessed many children arranging to meet up after school to work on their cars. Or when I give the track plans out a day or so before the club, the children will have an impromptu 'team meeting' before leaving school to divide up the workload, 'I'll work on the straights and can you do the bends?' Unforeseen friendships have developed as a result of being involved in Maths in Motion – it gives the children a common interest and so children that have simply been classmates become friends. Absolutely priceless – school is 'cool'.

The Future of Maths in Motion…

I will certainly continue to use the program for as long as I am able because I know the hugely positive impact that it can have on an individual child both academically and emotionally. It also comes with the added bonus of 'Competitive Racing' via the Maths in Motion Challenge for Schools - which is now a worldwide affair. This Challenge is sponsored by several companies and costs nothing over and above your annual licence fee. My children think it's brilliant that they can pit their racing wits against teams from all around the world and realise that they (a child from a small town on Teesside) are as good at maths as someone in Australia, Spain, Qatar, China or Singapore! This competitive edge to the program is genuinely fantastic and brings yet another dimension to the table. There are at least three International races each year – the Christmas Fun Race, the Summer Fun Race and the big one - The World Maths in Motion Challenge knockout competition.

There is no doubt that win, lose or draw, the children in 'my' school will carry on racing for a long time to come – I feel I owe it to them and that their overall education will be all the better for it!

Kevin O'Donnell

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