Final Report

Abstract

We are a group of enthusiastic mathematics and science teachers with an interest in raising student achievement and making the link between the STEM subjects. After spending several months working as a STEM Knowledge Network we were able to commit time to evaluating the benefits of cross curricular teaching and the effect of the National STEM Centre resource collection on both our teaching and the students' learning.

Aims of the STEM Knowledge Network

Our main aim is to improve teaching and learning in STEM subjects through use of the National STEM Centre resource collection. We also want to help students make the link between the STEM subjects.

Background

We are a group of five mathematics and science teachers who have an interest in enhancing and enriching the school curriculum, making links with the world of work, and using varied contexts to help young people relate school science and mathematics with their real-world experience of STEM.

A description of the STEM Knowledge Network

As a STEM KN we hold fortnightly meetings to discuss STEM resources, plan cross curricular lessons, reflect on lessons taught using the National STEM Centre resources, discuss STEM club activities and incorporate STEM resources into the mathematics and science KS3 Scheme of Work.

What has been learned:

One of the main things we have learnt is the different ways to approach topics such as collecting and interpreting data and using formulae. For example, by using the data collected in a science investigation in a maths lesson, students were able to make links between the subjects.

As a maths teacher, when team teaching I was able to see how topics such as averages, graphs and rearranging formulae were approached in science lessons. Whilst supporting in a year 8 science lesson I was able to show pupils other methods to work out the mean, median, mode and range. Pupils recognised I was a maths teacher and were interested to know why I was in their science lesson. Amy Jeetley (Science NQT) and I then explained to the class about the use of mathematical applications in science. The students are now beginning to see the link between maths and science.

Amy Jeetley feels her confidence in teaching has grown due to the support of the STEM KN. She has been able to discuss her lesson ideas and teaching methods with a group of science and

mathematics teachers resulting in her trying new approaches to topics in her lessons.

To raise the profile of STEM in the school we organised for all of year 10 and half of the year 9 students to take part in a STEM day as part of a Business and Enterprise day. We used ideas taken from the resources at the National STEM Centre to motivate and stimulate interest in STEM. The day gave us the opportunity to put into practice the cross curricular activities we discussed in our meetings.

During our meetings we also evaluated lessons we had taught using the STEM resources and discussed changes we would make to the resources if we were to use them again. Some of the resources, in particular the GAIM resources were slightly dated. Although the students didn't comment on this, as teachers we felt the resources would have been more effective if they were modified to make them up to date. For example, one of the resources discussed was a GAIM 'practical activity' called 'Old Bangers' which explains how to work out where a car is from based on the vehicles number plate. There was another resource in the same collection 'Outward Bound' that used feet instead of metres.

It was interesting to share ideas and hear colleagues suggestions of ways to improve teaching and learning through the use of the resources. Tim Willetts (Mathematics NQT) described how he has changed the way he teaches as a result of our discussions and the range of resources he has been using. When planning his lessons the first place he looks for resources now is the National STEM Centre eLibrary.

We all agreed that the many practical activities we have been using recently have motivated and encouraged the students to want to succeed and have resulted in students being more enthusiastic in lessons. This has led to improved behaviour and better progression.

Many of the resources involved thinking skills and challenge, these related well to the process skills in the new programme of study for mathematics. We found that there's no point in 'reinventing the wheel' as many of the resources in particular the SMILE and Cre8ate resources were good quality effective resources. I uploaded many of these resources to our department Scheme of Work to share with other colleagues.

The network and use of the resource collection has made me realise the potential of 'out of the classroom learning' and 'bringing the outdoors in'. In particular I enjoyed using the Cre8ate resource 'Helicopter Seeds' and the Nuffield Foundation 'Cemetery Mathematics'. The 'Helicopter Seeds' resource involved pupils collecting Sycamore seeds and then testing them in class in order to collect data and investigate how they are dispersed. The 'Cemetery Mathematics' resource involved students visiting the local cemetery and collecting data from the gravestones. The data from both resources was then used in class and students calculated averages and displayed the data in different ways.

The impact on teachers' practice:

We have found having fortnightly meetings a great way of sharing good practice and this has had a positive impact on our teaching allowing us to be open to new ideas. There are many resources used in science lessons that could be used in maths lessons. The network has given us the opportunity to share these resources which we would not have been able to find the time to do otherwise.

The National STEM Centre has a wide range of good quality cross curricular resources that we will continue to use in our lessons. These practical investigative resources have made a difference to how we teach our lessons and we now realise the impact such resources have on students' attainment levels. This has resulted in changing the way we approach certain topics by including more kinaesthetic activities.

Next Steps:

Primarily we would like to promote the STEM KN within Baxter College and recruit more members of staff. We hope to achieve this through advertising the STEM KN on the Learning Gateway (VLE) and in staff briefings as well as during whole school events such as the Baxter College Autumn Fayre. Students in the STEM club have made bath bombs and packaging for the bath bombs which will be sold at the Autumn Fayre.

We will continue our fortnightly meetings to discuss good practice as these have proved to be successful and have led to us reflecting on our lessons, sharing resources and planning lessons together.

As a school we are hoping to organise more STEM days where all students take part in STEM activities. We have begun this process by introducing STEM activities to students in years 9 and 10 during our Business and Enterprise day. Students were asked to design and make balloon powered cars in small groups.

Initially pupils from local Primary schools will be invited to STEM events including the KS3 STEM club and then in the future we would like to open the club to other local Secondary schools.

Advice to teachers who may want to try something similar:

It's important to have support from your senior leadership team as you will require cover to team teach and to visit the National STEM Centre. You must be willing to teach outside your comfort zone and try cross curricular resources including kinaesthetic investigations and teaching outside the classroom. Be willing to work together and take advice from each other regarding approaches to a particular topic. We found having fortnightly meetings a valuable way of communicating ideas. We also used this time to plan and reflect on STEM lessons, organise educational visits, discuss future projects and competitions, and plan activities for our KS3 STEM club.

References and resources:

GAIM http://www.nationalstemcentre.org.uk/elibrary/file/1953/practical_1-10.pdf

SMILE http://www.nationalstemcentre.org.uk/elibrary/resource/621/activity-list-cards-0001-2403

Cre8ate http://www.nationalstemcentre.org.uk/elibrary/resource/93/helicopter-seeds

Nuffield Foundation http://www.nationalstemcentre.org.uk/elibrary/resource/1684/cemetery-mathematics

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