

CPD: Enriching and engaging classroom teachers via a ‘paired days’ approach

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An innovative course focusing on extension and enrichment for Key Stage 4 teachers in England was conceived and created by Mathematics in Education and Industry (MEI). This was made possible by a successful bid for funding from the Department for Education (DfE) following a tender for a more far-ranging Further Mathematics Support Programme (FMSP). The initial creation and implementation of the national programme utilised existing research findings to inform the structure and design of the course. This resulted in a two-day course, with the two days separated by a gap of 8-12 weeks, where opportunity was given to use skills and materials from the course. This paper outlines the processes involved in setting up the programme in 2012 and reports on the evaluation of it over 3 years.

Keywords: Professional Development; Key Stage 4; Extension and Enrichment

Introduction

Ofsted’s Made to Measure report (2012) capturing the state of mathematics education nationally identified that large numbers of ‘able’ students were not achieving their potential at GCSE and were not adequately prepared for A levels and beyond. However, the report also noted that in the most effective schools, “Pupils regularly tackled challenging work that went beyond the routine exercise, for example in the form of extension questions that involved twists on the standard approach”

The decision was taken to try to address some of these concerns by providing teachers with appropriate resources coupled with some form of professional development. There were several elements involved in setting up the course and these will each be considered in turn. It was necessary to decide upon the topics which might be of most benefit to teachers and their students, to explore effective models of CPD in order to have the best chance of impact upon teaching and learning and to design and to create resources for use in the classroom as well as during the CPD sessions. Additionally, consideration was given to the evaluation of the project in order that suitable data could be collected.

The aims for the course were to familiarise teachers with a range of free resources suitable for enriching and extending Key Stage 4 (KS4) students and enabling teachers to reflect upon different pedagogical approaches. It was also hoped that teachers would have an opportunity to disseminate materials to other members of their mathematics departments, so a short session was devoted to discussing appropriate strategies.

Ascertaining an effective structure for the courses

The structure of the course and the sessions within it were designed with the recommendations to CPD providers from the Researching Effective CPD in

Mathematics Education final report (Back, Hirst, De Geest, Joubert, & Sutherland, 2009) in mind. One of the key elements was that teachers were encouraged to try new activities in the classroom, and participation in the course would give them tacit permission to do so. Another element was that teachers would try out some challenging classroom resources during the sessions, reflect on the experience and consider how they would use them with students.

The role of the CPD leader was an important consideration. Linder, Eckhoff, Igo & Stegelin (2013) describe the difference between a trainer who uses a transmission model to impart knowledge or information to passive recipients versus facilitators of professional development who utilise active engagement so that teachers develop a working knowledge through a range of experiences. Through Factor Analysis, they identified five overarching factors each related to a number of scale items which characterise influential facilitators. Course leaders were drawn from a group of experienced CPD providers, and although there was no control over the 'Personality' and 'Connections' factors (2 and 5), the existing positions of the course leaders meant that they were in roles which fulfilled 'Support' scale items (Factor 1) such as 'wanting to help teachers improve' and the 'Knowledge' scale items (Factor 4) such as 'having a strong understanding of mathematical content' and 'a strong understanding of how children learn mathematics'. Built into the course were top of scale items from the 'Management' component (Factor 3) such as 'having teachers complete the actual activities' and 'having the teachers work in groups'.

Leinhardt (1988) recognises that teachers are resistant to change as beliefs about mathematics and teaching approaches are deep-seated. Goos, Dole & Makar (2007) cite Mewborn (2003) who identifies three key themes of effective professional development for teachers of mathematics: change is long term and evolutionary, teachers need to try out ideas and resources in their own classrooms and teachers need to discuss pedagogy and issues.

Thus it was decided that a two day structure would allow for exploration of a wider range of materials and pedagogical approaches and provide time for teachers to try out materials with students and then report back to peers on day 2, giving a better chance of impact on teachers. The course consisted of two single course days, separated by eight to twelve weeks. On Day 1, teachers would encounter a wide variety of challenging materials that they could then use with students in class. At appropriate times, course leaders would facilitate discussions about classroom use of the materials, drawing out both the expected positive outcomes as well as acknowledging any concerns, barriers or challenges that might arise. Teachers would then carry out a gap task between Day 1 and Day 2, trying out at least one new activity with at least one group of students and reflecting on the outcomes. On Day 2, teachers would report back to their peers about these activities and would then try out a second batch of materials with a different pedagogical focus.

The courses began in the academic year 2012/13 with cohort 1 and continued with cohorts 2 and 3 in the subsequent academic years. The two day courses have retained the same structure for all three cohorts, but some revisions to the content and evaluation tools have been made in response to feedback from course leaders and participants as well as to reflect the forthcoming changes to the National Curriculum for Key Stage 4.

Ascertaining relevant content for the courses

Decisions about the mathematical content for the course, mathematical skills to be developed and the design of the resources to be created were made following the analysis of data collected from a range of sources:

1. A comparison of GCSE and A level syllabuses produced a list of common content
2. Scrutiny of GCSE Examiners' reports from the preceding 2 years gave an indication of the content that Higher Tier students tended to achieve less well on under examination conditions
3. Semi-structured interviews with 11 teachers from a range of schools and colleges generally concurred with the findings of 1 and 2 above
4. Semi-structured interviews with 6 of the teachers gave insight into the skills that students embarking on Advanced level courses often lacked
5. Semi-structured interviews with 5 GCSE teachers produced a set of ideal criteria for the resources to be developed

The content and skills were assembled into a graphic (figure 1) in which the relative size of the word is proportional to the number of interviewees who mentioned it.

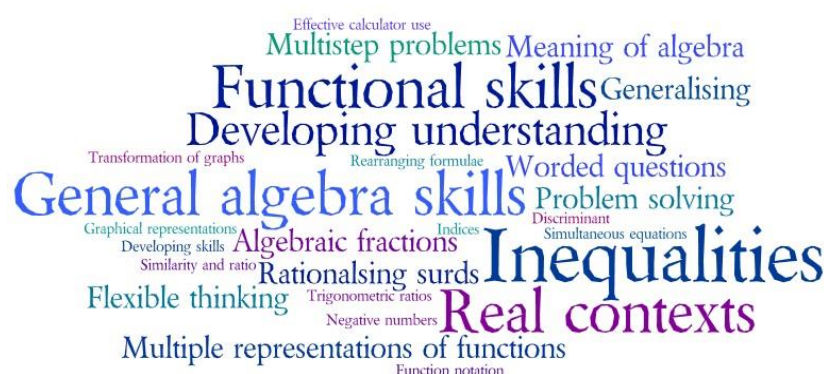


Figure 1: Graphic representing the number of interviewees who mentioned specific mathematical content and skills.

When asked about the structure of resources, GCSE teachers had a range of criteria to adhere to so that the chance of them being used would be maximised. These criteria included that materials should be flexible in format so that they can be used by a whole class, for example by projection onto a screen, or by individuals or small groups within a class, for example as a worksheet with clear instructions. The teacher notes should be as brief as possible, but also give hints or suggestions for use as well as answers. There should be few barriers to using a resource; additional equipment such as IT access should be kept to a minimum. Resources which might fill a short time slot at the beginning or end of a lesson would be welcomed as would having access to a range of resources fulfilling different pedagogical purposes such as exploration, making connections and consolidating. However, longer, more in-depth resources were also requested.

During the course, attention was drawn to the structure of the resources in order that teachers would recognise some of the key features and perhaps be in a better position to transfer these structures to other resources and content. Examples of this were that a maze activity was created which had the design feature that at each

‘turn’ in the maze several common errors and misconceptions were targeted so that teachers could use it to assess understanding and inform their teaching. This was particularly popular and was replicated for other content by a number of teachers. Card sort activities which did not have a one-to-one match for each item were also used as this was deemed to increase the challenge to learners. All resources were trialled in schools and feedback was acted upon.

The courses have been provided nationally for three years; to date there have been 61 courses with a little over 1,000 teachers attending, drawn from over 670 different schools. Additionally there have been two national conferences, each attracting 80 to 100 delegates, allowing teachers to showcase and disseminate their work as well as attend a series of workshops.

Evaluation tools

Since this was a new programme, it was important to seek to evaluate both the course and the materials. A series of questionnaires were developed for Cohort 1:

1. Teachers’ self-reported frequency of use of extension and enrichment materials prior to course (T1) were sent to teachers and brought to Day 1.
2. Teachers’ self-reported frequency of use of extension and enrichment materials at the end of the course (T2) were completed at the end of Day 2.
3. Teachers’ detailed reflection on the activity they used for the gap task (TR) were handed out on Day 1, completed by teachers following the use of a resource of their choosing and handed in on Day 2.
4. Student feedback on lessons using the materials (SR) were completed by students at the end of the same lesson that the teacher completed TR for.

In the light of responses from Cohort 1, T2 was amended to additionally include a question asking for clarification about any change in reported frequency of use. All questionnaires utilised a combination of 4- or 5- point Likert scales together with open response questions. All questionnaires were also used with cohorts 2 and 3.

The purpose of the student questionnaires was two-fold: to give the resource creators feedback on the materials but also to give teachers some insight into how their students had received the materials. This might serve to convince individual teachers that students find these resources engaging and worthwhile or could provide evidence to support departmental decisions to utilise this type of material.

Findings

In the SR questionnaires, students were required to rate on a scale of 1 to 4 (1 being ‘not at all’ and 4 being ‘a lot’), how much they enjoyed certain activities, how much they made them think and how much mathematical progress they felt they had made. One of the surprising, but encouraging, findings was the activities students reported as making them think more, and which they felt they made more mathematical progress with, were also amongst the top-rated activities for enjoyment.

Within the TR questionnaire, teachers were asked to reflect on what was successful about the lesson in question and how they knew. Responses to these open questions are of particular interest as they give some insight into what criteria teachers personally use to judge the success of a lesson or activity. Responses to these questions fell into three broad categories: engagement, dialogue and teaching and learning. Within ‘engagement’ were responses such as “little or no off-task behaviour” and “a range of pupils contributing - not just the usual suspects”.

Responses in the ‘dialogue’ category included “discussion generated between pupils” and “peer to peer questioning, not just pupil to teacher”. In the ‘teaching and learning’ category responses such as “minimally invasive teaching approach able to be used”, “pupils being made aware through the task of their own lack of understanding or misconceptions” and “aha moments” were cited.

T1 and T2 were parallel questionnaires, asking a selection of identical questions at the start and end of the course. Figures 2 and 3 show the shifts in reported frequency of use of extension and enrichment materials for cohorts 2 and 3 respectively; an additional question seeking to clarify any differences was asked, and it is the responses to this that have proved most illuminating, particularly where the frequency of usage has stayed the same or decreased.

Cohort 2		T2				
		1	2	3	4	5
T1	1			6		
	2		1	10	4	
	3		1	52	42	3
	4			11	25	2
	5			3	2	4

Cohort 3		T2				
		1	2	3	4	5
T1	1			9	1	
	2		2	21	5	
	3			34	47	1
	4		2	3	38	6
	5			17	7	3

Figures 2 and 3: Summary of responses to the T1 and T2 question ‘How often do you use materials to extend and enrich the learning experiences of your Higher tier GCSE students?’

Key: 1 never, 2 almost never, 3 occasionally, 4 frequently, 5 almost always

Reasons given for decreased frequency of usage (12.7% of respondents) were often related to misreading or misinterpreting the question on T1 and occasionally were similar to the response: “My idea of what an extension task is has changed”. In the written responses, no-one indicated that usage of extension materials had actually decreased.

The responses from teachers whose frequency of usage had stayed the same (43.9% of respondents) were very interesting. Many teachers responses indicated that they now had a slightly different view of what constituted an extension and enrichment activity, whilst others gave responses stating that the way in which they used materials and/or the type of resources they used had changed e.g. “Same, although I don't feel the same about how I use them! I am more confident that I pick the task more effectively and deliver the lesson more productively” and “I use the extension resources about the same frequency but I think I use a more varied selection and I am using them to better effect”.

Teachers who reported increased usage (43.4% of respondents) often reflected some of the underpinning principles set out earlier. “Improved! Because I've been a bit braver as I've had the opportunity to work through some of the problems before using them in the classroom” was a common thread amongst responses and indicates the success of the strategy of doing the activities with teachers during Day 1. The teacher responding “I now have a greater awareness of different styles of activities; there are lots of activity templates that you can use for a range of topics” perhaps shows that drawing attention to the design features of the resources during the course has enabled this teacher to transfer these to other content areas. A response of “More often than previously; making more effort as a result of courses and student feedback to resources” might indicate that the student questionnaires played a part in changing this teacher’s perceptions.

Summary

When setting up the programme, the recommendations of the RECME report (Back et al. 2009) were fundamental in guiding the design of the two days and this has proved to be a successful model for this type of CPD.

The aspects of the provision which teachers have cited as having been effective in increasing usage have been:

- Development of dedicated resources, particularly short adaptable activities.
- Having time during the sessions to try out resources and discuss their usage
- Developing an awareness of what makes for a good extension and enrichment resource and how teachers can adapt existing activities
- Having confidence or 'permission' to try out resources with classes
- Reflecting on usage and how students benefit from teaching approaches which make connections

Many teachers have reported feeling empowered to use a wider range of materials and approaches in the classroom as a direct result of having experienced them as a learner during the course days, having thought about how they might use them in the classroom and anticipating how their students might respond. A requirement from the course to try a new activity encouraged teachers who were reluctant to do something different to do so, perhaps giving them permission to make a change. Reflecting on that lesson or activity, alongside written evidence from students has also proved a powerful tool in changing teachers' perceptions and practices.

The reformed GCSE curriculum and assessment requirements for first teaching from September 2015 will mean that many teachers will need to adapt their teaching to promote problem solving approaches alongside a deeper understanding of content and connections within mathematics. This type of CPD will be essential in supporting teachers to develop their skills and adapt their pedagogy.

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