

Extended teacher professional development courses – feedback on the impact of undertaking MEI’s Teaching Advanced Mathematics (TAM) and Teaching Further Mathematics (TFM) courses

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Mathematics in Education and Industry (MEI) provide extensive opportunities for teachers to undertake professional development. Great value is placed on the feedback from those participating in the courses to establish their impact on the individual and their classroom practice and how they might be improved.

In summer 2013 feedback was sought from the participants in the 2012/13 cohorts of two extended professional development courses: Teaching Advanced Mathematics (TAM) and Teaching Further Mathematics (TFM). Two online surveys were designed using two different pieces of online software – a 15-question instrument that considered various elements of the TAM course and a more in-depth multi-sectioned 50-question instrument for TFM. The in-built analysis tools for each piece of software were utilised for initial analysis.

In this paper, an outline of the TAM and TFM courses will be given, along with discussion of the design of the two questionnaires, their administration and reflection on participants' feedback. Included will be consideration of how a 65% response rate was obtained for the extensive TFM survey, using a small incentive and how this contrasted to a high 85% response rate for the TAM survey, which wasn't incentivised. Finally, the impact of these extended courses on teachers' attitudes and developing practice through the feedback provided will be reflected upon.

Keywords: A-level, Mathematics, Further Mathematics, Professional Development.

Introduction

This paper seeks to review two extended professional development courses for mathematics teachers via administration of online surveys. An overview of the courses will be detailed before consideration of the construction and administration of the two surveys. A brief insight into the initial analysis undertaken, in the context of the construction of the surveys, will then follow. The paper ends with a discussion of the extended professional development courses, informed by the surveys. This should inform current work in the area of extended professional development courses in mathematics education and enable it to be contrasted to the somewhat more prevalent short courses in mathematics professional development.

Background of MEI’s extended professional development courses

MEI runs a number of professional development courses across England and internationally (Tripconey et al, 2013) of which there are two major ‘programmes’

that are classed as long-term professional development courses. These are Teaching Advanced Mathematics (TAM) and Teaching Further Mathematics (TFM).

TAM is offered to teachers wishing to develop their own subject knowledge and classroom practice in teaching A-level Mathematics. It aims to enable teachers to gain a deep understanding of the Core pure mathematics modules in A-level Mathematics and then also in the participants' choice of mechanics, statistics or decision mathematics. It seeks to give teachers experience of effective pedagogy at this level and to receive support in embedding this into the classroom. It also acts to get teachers to reflect on related research into the teaching and learning of mathematics at this level.

There is a full Master-level accredited TAM course, offered through several universities across the country and which is funded by the Department for Education for teachers in state funded schools and colleges (in the year of relevance here, 2012/13). A non-Master accredited TAM course is also available with no university component. This paper talks about the Master-level TAM course, where participants undertake eight study-days focussing on A-level Mathematics pedagogy over 12 months. Participants study the content of five A-level modules with online support and complete assignments along with having two school/college visits from tutor(s).

Many of the principles of TAM apply to TFM, with TFM being offered to teachers wishing to develop and extend their own subject knowledge and classroom practice in teaching A-level Further Mathematics. It aims to enable teachers to gain a deep understanding of the pure mathematics content in A-level Further Mathematics and then gives the option of considering applied mathematics materials. TFM seeks to give teachers an opportunity to reflect on their pedagogy at this level and explore teaching ideas and resources. It also acts to expand their mathematical horizons and explore links within mathematics. Teachers on the TFM course undertake up to four study-days, 20 online tutorials and two assessed assignments over the 14 month course.

TFM, like TAM, can be studied as an MEI certified professional development course only, or as part of a Postgraduate Certificate in Teaching Pre-University Mathematics (60 CAT points at Masters level).

Construction and administration of two online surveys

Feedback from delegates on both TAM and TFM courses is sought regularly, primarily via short simple forms at the end of study days and this feedback is independently reviewed by an external evaluator (see Searle, 2012; Lee and Searle, 2012). For the 2012/13 cohorts a more extensive review was instigated and took place in summer 2013. Two surveys, of different lengths and complexity were created using two different online software packages. One of the primary reasons for this choice was to investigate if free software would be satisfactory for more extensive evaluation purposes, or if subscription software would be advantageous.

For TAM, an online 15-question survey constructed in Google Forms considered different elements of the course. Around two-thirds of the questions contained 4-point Likert items (from 'Poor' to 'Excellent'), thus forcing the participants to choose a distinct positive or negative response (Allen and Seamen, 2007). The remaining questions were open comment boxes or a list of options to select from. For TFM, an online survey was constructed in the Survey Monkey software, with the 50+ questions considering different elements of the TFM course, including participant's backgrounds, their reasons for undertaking TFM, their

thoughts on different aspects of the TFM course and the impact they felt it was having. Question types varied across the range from open comment boxes to selecting options from a pre-defined list. Several questions were selected from Survey Monkey's question bank, mainly because those questions were pre-trialled and therefore already known to be 'good'. However, many of those in the question bank weren't able to be used as they were contextualised in American terminology and changing the questions would lose the implicit testing that had already been undertaken.

The process for administering the surveys entailed an email from course tutors, containing a link to the relevant online survey. This was emailed to the 116 TAM and 82 TFM delegates in the 2012/13 cohorts. TAM emails were sent during summer 2013, but with several follow-up reminders in September, and 101 replies were logged (87% response rate). TFM emails were sent in September with two reminder emails and 55 replies were logged (67% response rate). As the TFM survey was extensive an incentive of a prize-draw for a £25 Amazon voucher was offered, whereas no incentive was provided for completion of the TAM survey, primarily due to it being much shorter in length.

The use of online surveys is known to induce a smaller response rate than that of a comparative paper-based survey (Nulty, 2008, p. 303). As such the response rates for these online surveys can be considered as being high, with the TAM response being particularly high. This is likely to reflect the engagement that participants have with both courses, i.e. that they are extended 12-14 month courses, with extensive interaction with the tutor(s). It is also likely that high engagement with the online surveys was seen because aspects of both the courses involved online working, be it through accessing the bank of online resources or attending online tutoring sessions.

Feedback from the surveys

Initial analysis has been conducted using the in-built functionality of the survey software. Google Forms, as a basic 'free' tool, is reasonable in producing summary analysis automatically, though customisation is not very extensive. However you can export the underlying data to then work on in other software of your choice. The subscription service of Survey Monkey has much more powerful analysis options built into the software and it too allows you to extract the raw data.

TAM survey

Considering the TAM survey first, a number of questions gathered background information on the participants, for example, their name, the university they were studying TAM through, the number of years they'd been teaching and the number of years they'd been teaching A-level Mathematics. In the replies a roughly equal number of responses were received from participants associated with each of the six universities that 'hosted' TAM. Responses indicated that those on the course had been teaching for a number of years (2% - 1 year, 24% - 2 years, 18% - 3 years, 57% - 4 or more years), but have not necessarily been teaching A-level Mathematics very long (42% - 1 year, 26% - 2 years, 16% - 3 years, 17% - 4 or more years). This matched the outline aim of the course to enable inexperienced participants to develop their own subject knowledge and classroom practice in teaching A-level Mathematics.

A section of questions asked participants to 'Please rate' various aspects of the course via a 4-point scale of 'Poor' to 'Excellent'. A selection asking about the

delivery and content of the course are given below, with the percentage that chose either Excellent, or the second highest value, given in the parentheses.

- The teaching ideas gained on the study days (100%)
- The insights into mathematical concepts gained on the study days (100%)
- The Core Mathematics online sessions that you have seen (97%)
- The feedback from your two lesson observations (99%)
- The Integral online mathematics resources (99%)

A final question was – ‘My thoughts on the impact that the TAM course had on me...’ This was an open question, but one which all 101 respondents completed. Replies varied from a few words, to, in the majority of cases, several sentences and paragraphs of text. Detailed analysis is yet to be done on this aspect, but several reoccurring themes were evident, including: increased confidence, an increase in awareness of methods and materials and that it made them think about the subject in greater detail.

TFM survey

Similarly to the TAM survey, the TFM survey also began by gathering information on teacher’s background experience, including previous CPD they have undertaken. However, it moved quickly to more detailed questions on their thoughts and feelings of the course, its content and its impact. Numerous Likert items were used, varying from 3-point to 7-point scales. The latter were predominantly the pre-trialled questions from the Survey Monkey question bank; the former acted as a way to judge specific content, i.e. on a scale of ‘Not enough/About right/Too much’.

In some, but not all questions, both positive and negative orientations for questions were used. For example, in the selection of questions on: ‘What were your feelings and impressions whilst doing the course?’, on a scale of ‘Strongly Disagree/Disagree/Agree/Strongly Agree’, the majority responded at the ‘Agree’ end of the scale in response to ‘I enjoy the work’. Conversely, many responded at the ‘Disagree’ end of the scale in response to ‘I find the work onerous’.

Some of the pre-trialled questions used had non-symmetrical response options, i.e. there weren’t an equal number of positive and negative possible answers. For example, in ‘How much did the success in the course depend upon understanding ideas, rather than memorising facts?’, the response options (with the percentage who selected them) being: ‘A great deal’ (26%), ‘A lot’ (53%), ‘A moderate amount’ (15%), ‘A little’ (6%), ‘None at all’ (0%).

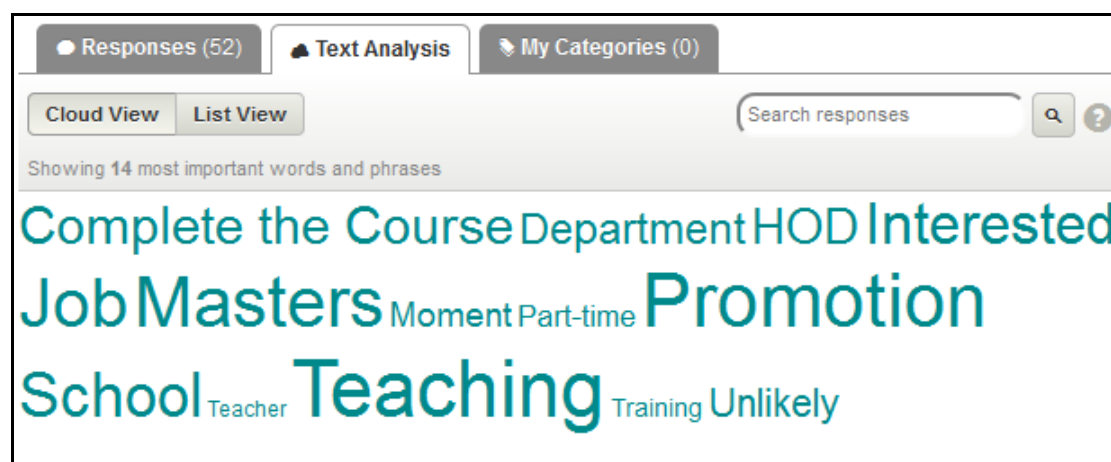


Figure 1 – Survey Monkey text analysis output.

Another feature of the Survey Monkey software was its ability to produce text analysis for open response questions. See Figure 1 for the output to the question – ‘Do you have any intentions following completion of the TFM course? I.e. to seek promotion?’ With the word ‘promotion’ featuring as one of the most prominent in the output, it is worthwhile thinking whether having this as the prompt in the question itself could have affected the participants’ choice of answer, i.e. they didn’t take the time to think up their own response, instead just repeating the one suggested.

A section of questions asked about impact of the course. These too were all open ended, to allow the teachers to freely and fully explain their thoughts on the particular aspect that the question was asking about. Questions included for example:

- Did the material have an immediate (during the course) impact on classroom practice?
- Did the ideas on teaching style impact on groups other than Further Mathematics groups (A-level or GCSE)?
- Do you feel that doing the TFM course has affected your self-esteem? Please comment.

These are all more challenging to analyse, but again, clear trends in the answers emerged – for the three questions mentioned above, the predominant answer was ‘yes’ followed by some quantifying comment. The survey thus allowed good insight into the impact the course is having on its participants, and suggests areas for further investigation.

A final question on the survey was ‘Overall how would you rate TFM as a piece of Professional Development?’. The results were overwhelmingly positive: ‘The best!’ (35%), ‘Excellent’ (42%), ‘Good’ (19%), ‘Average’ (2%), ‘Below average’ (2%), ‘The worst!’ (0%).

In summary

Reflecting upon the two different surveys and their associated administration, then the response rate seen to the TAM online survey, when compared to that of the TFM survey (very high versus high), appeared to at least be in part due to length and complexity since the TAM survey was much shorter and generally simpler to complete, with fewer open questions that required ‘time and effort’ to be put in to finish the survey. However, even with long and complex surveys, like the TFM one, it is evident that extensive feedback and a high survey completion rate can be obtained, though it shouldn’t be underestimated how valuable the close connection that tutors had with participants was in facilitating this, over and above completion being incentivised with a monetary prize-draw.

The software used for the surveys was seen to be of differing standards. As expected the paid-for software was far superior in almost all aspects of customisability in creation and analysing, though the option to export the raw data collected was seen in both. For constructing a survey such as that used for TFM, it was felt that the free software would have fallen considerably short of our expectations regarding the value of the responses.

Initial analysis that has been conducted has given good insight into teachers’ thoughts and feelings of the course they undertook and the impact that it is having on their teaching. Many positives about the courses have emerged from the surveys along

with insight into a few areas where a small number of teachers think enhancements may be able to be made, e.g. on the level of difficulty of the assignments.

The outcome of these more extensive surveys support the recent development that MEI has created another extended professional development course to complement the TAM and TFM courses – this is ‘Teaching GCSE Mathematics’ (TGM). It builds upon the principles of TAM and TFM but is aimed at those who are working at GCSE level, as opposed to A-level Mathematics/Further Mathematics level.

MEI will continue to monitor its professional development courses and intends to reflect further upon the different provision that it has. Extended courses, shorter courses, i.e. single day events, and live online professional development all have specific facets that allow teachers to development their mathematics knowledge, skills and teaching practice in a manner suitable to their current level.

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