Appendix 1: Interview analysis

A. Background information

Highlighted text: data extracted for analysis and outcomes
Ann Beth Claire

Qualifications and useful background information

Category

Respondent	1. Qualifications and basic knowledge	2. Confidence before MaST	3. Specialists or generalists?
A	Only Maths GCSE – then did science which maths came into – did all the statistical tests in my degree. (GCSE was enough) It's not something I find difficult. I enjoy maths. It's a strength after science and I used it within my degree and I could pull on all that knowledge. When I started teaching… You research and look at what you need to teach and the level you need to teach at – teaching Y2,3,4 when I started so felt I had enough knowledge to deliver what I needed to deliver but I've developed my teaching style as I've gone along. Did an access course – didn't do A levels Teacher training in 2008 – time of the numeracy hour – once I was in school it had all changed to the primary strategy. (Has it influenced teaching?) Primary	Yes - Confident maths teacher when I started. (Anything surprised you?) Techniques were different to what I had been taught – the methods you used to teach children – for example different methods for addition and subtraction than I had been taught. (Did you base your teaching on how you had been taught?) – yes initially – you go back to what you know – especially when its new and then it develops as you go on. When I was taught subtraction we'd have done long subtraction, we wouldn't have done counting on to do subtraction you'd have taken one number from another number. The skills I've got have developed as I've taught – equally my teaching styles have - you find what works and what doesn't work and obviously you have CPD which also informs what you're	(Is a maths qualification important?) No not really – you need a level of competence, but I don't think a qualification is necessary. I think you learn on the job and anything you don't know you find out. Or a good teacher would research or ask a teacher that does know. You do whatever learning you need to do to be up-to-date and upskilled to get you there – I think that's an important thing for someone's that going to lead maths in a school so that they are upskilled and know what's happening across the school. (What about specialist maths teachers?) More like secondary isn't it? There is probably a place for that – you'd hopefully have the best person for the job going round teaching it but they'd have to have a deep understanding of a

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	Strategy much better than numeracy hour – much more fluid and I think that helps. Numeracy hour had do an input, do a teaching bit, then let the children explore then do the plenaries – now its much more fluid and you don't need to do the teacher input – I try to get the children to do some of that now. So you just set them – this is what our learning objective is, right go and do this and then bring them back to do mini-plenaries as you go along so that they're doing the learning and I just consolidate what they're doing or correct any misconceptions as they're going along because I feel they're going to learn more by doing it for themselves rather than being talked to. When we did our training it was do this and do this very much on the clock which I didn't like very much.	doing and improves your styles.	wide range, wouldn't they? to transfer from class to class. Deep understanding of where they're going and that could be a positive – if they had G & T or children that needed moving on they would have that knowledge straight away. So that's where they would come into their own. (Can all teachers have this deep subject knowledge?) I think they get stuck (laughs) in their class, in their zone, if they're not moved around the school into different year groups they forget what's going on either side of their class so sometimes they haven't got that knowledge of where they're going next or where they've come from – if they've got gaps. A maths specialist would know what those gaps are and would probably be the best people to fill those gaps.
Respondent	1. Qualifications and basic knowledge	2. Confidence before MaST	3. Specialists or generalists?
B	I've got GCSE then A level Maths, the maths with primary education – so its not a full maths degree. Useful – yes, first of all I've got the confidence to know what I'm talking about, and secondly it gave me a deeper insight. When I got to college and looked at maths at a deeper level it made me question my own knowledge. Although I can't say I learnt a phenomenal amount of maths at	I would say I was over-confident with my own maths knowledge – before MaST, so the MaST has made me question my own knowledge again. College gave me some content, but my own level of interest and my own research actually gave me more knowledge and understanding rather than what we were taught – it made me	(Is a maths qualification important?) Yes I think so – at the moment its got to be GCSE – I think its got to be higher than that. Maybe not A level because that's too specialised – maybe a more in-depth knowledge of the curriculum you teach - something at college as part of your course. Specialist teacher – not sure – if I was to

	college it made me question what I need to know and research and to update my own maths knowledge. I went to Hull and did the first year of a Maths degree so we had maths at degree level for a year and I wouldn't say that was particularly useful although it did give me confidence to know I could attack degree level maths and I did know what I was talking about but it was more my own research.	question everything and want to find out about things.	teach maths across the key stage I know they would be getting quality teaching, but within a primary school I think its more important to have a relationship with the children, to build up not only their academic background, but their social background. I know that if I teach my own class the quality of my teaching goes up – the teaching you've just seen wasn't a fantastic quality because they're not my class and I haven't got a relationship with them yet and I think that's quite important. (Should every teacher have deep subject knowledge?) I don't know but think it's a good aim because we're trying to put the basics in, a good basis in English and maths - every teacher should have a deep subject knowledge of English and maths as that's the basis of what we teach. If I were to teach a history topic I could teach it through English - I could go off and research the bit about history.
Respondent	1. Qualifications and basic knowledge	2. Confidence before MaST	3. Specialists or generalists?
C	Maths degree 2003-6, PGCE – (has it helped in teaching?) No I don't think it has helped me with my teaching, it was too abstract to help me with my teaching of maths and I think, yes, you need to study to a higher level to have a good	I do feel like I could confidently approach anything better than most. I do feel that having that puts me in a better position than most but I couldn't tell you how it helps me because it doesn't help me on a day-to-day basis.	(Is a maths qualification important?) Yes definitely – I don't think enough of our staff have studied maths to a high enough level and I don't think they have a secure… they have a secure nuts and bolts of it but they don't make links like I

	understanding of maths but I think the age that I think I needn't to have such a high level to teach my children effectively – I also think that my maths degree wasn't taught for understanding I was taught to apply processes and I in hindsight don't feel that I had a good enough understanding of it - I applied processes to get through it. Part of my maths degree was maths in education at primary level so I used elements of that but I didn't use elements of partial differentiation and stuff like that		make links. What was glaringly obvious – I am the KS1 maths coordinator and we have a separate KS2 maths coordinator and he came to observe me and I went to observe him and we did some joint observations on everybody else. When he came to see me he said he can tell straight away that you have a sounder and more secure subject knowledge than everyone else – he said you are like me, because he also has a maths degree – the way that you are confident enough to question things out of the children that other people would skirt over. What we have to do is make sure the other members of staff are like us and are more willing to take risks and step outside the box of their own comfort zone and take a lesson in a completely different tangent if that crops up out of it. Specialist? Yes, definitely, definitely – if you only taught maths and you were effective at it then that would make the children more effective mathematicians. Where that doesn't sit true with me is that I kind of 'foster' these children and I don't just foster their mathematical development I foster their personal and social development and part of that comes from having one constant person who teaches them everything. If you went down that route what you would be

			losing would be worse than what you would be gaining maybe. But from my position, I wouldn't want anyone else teaching my children maths apart from me (and what about English?) Nor English – because they're mine, they're my class and I'm accountable for their development and their results. That bonus would go to someone else. The other day I wasn't here and someone had a bad accident and I still felt accountable and that is part ands parcel of being a teacher.

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B. Evaluation Level 1: Reaction

How the participants felt about the MaST programme and their personal reactions to the learning experience.

Category

Respondent	1. Why take part in MaST programme?	2. Useful aspects of programme	3. Less useful aspects
A	Initially it was Masters credits but also I do like maths and feel I have a strength in maths and could make that stronger. (Not because you had a weakness in maths?) No (indignant)	We did some work on the Crystal Maze and that was good because it gave you ideas and made you think outside the box for some ideas. (Have the tasks been useful?) Yes – You're doing the actual research and looking at the background that goes on behind that and you can say to people this works, and this is why. Important to research - yourself, you have your own ideas but they're not always right and you're trying to develop other teachers, so if you have some background from other research you can say that this works and you can prove that it works and I've tried it in my class and this works. You've got that knowledge behind you. People take it on board a bit more they believe in it.	Has it met expectations – some of it was aimed too high, in respect of it was very difficult to see how you could break it down and bring it into school – I know it was aimed to develop our own individual subject knowledge which I haven't got a problem with but its seeing the relevance sometimes. Some of it you could bring into a primary school. When we looked at base 10 which was all right because that's what we use, but then we looked at base 3 and base 6 and base 4 and I was thinking how would that be of any relevance to children in a primary school? Its mainly investigating number but there were elements of the course that were way above – there was a session on pattern near the beginning and I came out thinking I have no idea what I have just learnt. (As time has gone on have you seen any use of that?) No, not that bit. There was stuff aimed at us as learners that

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			we could bring back into school but there were elements that hadn't been brought down to our level – where were the connections to a primary learner?
Respondent	1. Why take part in MaST programme?	2. Useful aspects of programme	3. Less useful aspects
B	I wanted to be a champion of maths – that's why I wanted to go on the MaST and especially as there are so few women in maths as well and its always been a very male subject - I wanted to be a role model for the children I teach and if I was teaching girls for them to know that maths wasn't a scary subject, they too could be OK with maths. I believe the knowledge of teachers in this school isn't what it should be. We have a lot of teachers who are English based- I was aware of the skew towards that - maths is seen by a lot of the teachers as a scary subject and when we are in staff meetings and I turned the subject to maths the body language would change and turn to folded arms and a real fear of maths and 'here we go, she's talking about maths again'. I wanted to change that but didn't know how. I'm known as the maths specialist if they want to know anything about maths they come to me. So I'm a bit of a geeky maths specialist- I wanted to change that image so everyone had an enjoyment of the subject and not seen	Within the first week, breaking the whole thing down into those 5 big ideas and 4 pairs of pedagogies that was so important for me because it summed up everything I believed in but hadn't been able to actually put into words. So to go into a lesson and say that this is the conjecturing and convincing bit – it just enabled me to say this is why I do this sort of thing.	Some of the HEI days on a Saturday trying to put across subject knowledge knowing that the tutor at the front has not got the same subject knowledge as me – seriously lacking, I found it very frustrating to have people standing up there as experts and giving wrong information. When I questioned them by the way they answer I know they don't know what they're talking about. The essay writing, I've hated it, absolutely hated it, and I've seen no benefit of it personally but I know it has to be done as part of the Masters degree but I have not found it useful at all. (Not even the research side of it?) Very little of it – because I'm not doing research that really interests me I'm doing it to write an essay. I'll think of something I'm going to teach and see a reason for it (research) then although the latest assignment I'm basing on a whole school issue I'm still finding it very hard to get motivated to write the assignment

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	as something strange to enjoy. I'm known as a stroppy person, I've got a strong personality and I was aware of putting people's backs up and I didn't want that - it was the mentoring and coaching side of it - how to put it across was as important, and it is working it really is working, I'm pleased about it. It's very slow, drip, drip, but it's working.		
Respondent	1. Why take part in MaST programme?	2. Useful aspects of programme	3. Less useful aspects
C	2 years ago I had R and just moving into Y1 and Y2, I knew I wanted to take a maths coordinator role in school but the maths coordinator that we have in KS2 that was for the whole school was an AST in maths he's on the leading teacher team, he's very good and proactive and I couldn't see where my role fitted in school because there was no room for me and I've got the same maths degree as this other person and if I want to develop maths further in a school then I'm going to have to move schools – it was like an ethical thing, who am I who has only been in my career for 2 years to say actually I want to have a go at that. Another teacher said you should go on this – it would give you a qualification, it would raise your profile and you'd learn something from it as well.	The first residential was the best thing we ever did because that was about attitudes and changing your attitude and once you'd got into a different mind-set you approached it from a connectionist sort of approach and it just took off from there. Within the course the thing I'm mainly involved with is representation and mathematical thinking. Just about everything can come back to representation and mathematical thinking – I'm keen pattern as well, so it's the big ideas I like. The thing that helped me most was looking at jottings and representations - it helped me get an idea of what was going on in children's heads plus it informed my assessment better. I feel what has been more appropriate for me has been the using and applying	I'm not so keen on proportionality, but perhaps that's because it doesn't fit so well into Y2. The most contentious issue for me was some of this we did at A level like graph theory and algorithms and finding the shortest path, the postman algorithm and I thought yes this is useful, and I know the course is targeting everybody but that stuff I know what to do and I would spend my time better doing something else – I didn't need to do that.

		in school stuff – have you tried this, have you tried that… you can teach this in this way. It's bouncing ideas off that are more effective than any of the theory	

C. Evaluation Level 2: Learning

Any increase in knowledge, understanding and skill following the MaST programme and their change in attitudes.

Category

Respondent	1. Attitudes and beliefs	2. Increase in knowledge
A	In order to get the children to know what they're doing they need to be doing it, talking about it, investigating it, they need… that's just my learning style actually – I try to do all learning styles so that all children have an opportunity to do things – so if they're doing it themselves, talking about it and note-taking to help them remember what they've done so its scaffolding them and everything… I'm very much into let the children learn so that they've got that understanding and then I'll go and talk to them and identify any gaps that are in their learning and fill those gaps and there's quite a lot of investigative maths that goes on in here. There's an element that you need to teach - got to do that input so you know where you're going. I need to know they're confident – tomorrow will review - will give them some structure. Let them explore and then focus on bits that need reinforcing - backwards way on really.	We did a 100-square in Urdu and I did a number line to 10 in Hindu when we were doing Divali – we were looking at pattern so it was developing the ideas. I don't teach 5/6 so if I was to work with a Y5/6 teacher I'd need to do my background before I went into that class to help that teacher – it would be nice to be armed with fresh ideas rather than reinventing the wheel. Do you think you have deep subject knowledge? I think, I have, yea, (hesitant) I think I have what I need – I have a deep understanding of maths but if I was to go in and support a teacher I still feel I need to go in and do my research to make sure I know about expectations (for different ages) – I'm not overly sure (of this), the strategy changed this and it will change again but all the goalposts were moved and people were expected to do a lot more earlier - I would research and read about it and have that knowledge – I don't know all the

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		ins and outs up to Y6 and this is part of having deep subject knowledge - I avoid Y5/6 like the plague!
Respondent	1. Attitudes and beliefs	2. Increase in knowledge
B	Making connections across the maths curriculum – this comes back to deep subject knowledge you can go off on tangents and make connections and then bring it back to the lesson rather than focussing on a single objective and not being afraid to go off. …	Yes – I now have deep subject knowledge…. The MaST has made me question my own knowledge again.
Respondent	1. Attitudes and beliefs	2. Increase in knowledge
C	I have a very positive attitude to maths and because I am confident in maths… this has passed on to the children. I think what you need to do is when you first approach a class of children you need to have a very sound secure knowledge of exactly where everybody is and every single individual step of maths and then you need to ensure that you are constantly upping skills - my view is that I am constantly putting in building blocks and constantly laying foundations and once I have laid foundations connecting them together and applying them to different things. If you don't lay the right foundations and make the right connections then when you come to applying then you're not going to be able to do it.	Not from my degree – that's come from the MaST course – when I started I thought I would be good at teaching maths because I could do maths and I had a degree in maths and actually the process has been quite gradual through the MaST course that the methods that I was teaching were effective, but not as effective as they could have been because I was teaching it how I was taught it and not making enough connections between things. I always felt I had deep subject knowledge, when I finished my degree but the more I learn the more it deepens and the more I attend MaST the more personal connections I make between things.

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D. Evaluation Level 3: Behaviour

The extent to which the participants have applied any increase in knowledge and changed their practice in school.

Category

Respondent	1. Application of increased knowledge	2. Changed practice of participant in school
A	I had knowledge about the different ways they could measure – we didn't particularly touch on units but I obviously knew what they were. One of the children used inches and I showed them cm and I've got the knowledge for supporting them and scaffolding them. One of the spring balances was in Newtons and one was in 1000s and if I'm asking them to compare probably only 2 children from the group of 6 would understand how to compare 1000s – using Newtons was much easier for them to compare - I obviously had the background but they didn't need to know that. You need to know what you're doing, what your expectations are and what the end product is. Preparation and planning is key to it – especially when it's an open ended task. It could go on for ever – you need to have a focus to pull them back in – I use success criteria in planning but if it goes off on a tangent then I'm happy to go with that, I wont always pull them back because that's not going to develop their learning - developing their learning is going with them and if they're going completely wrong that's when its time to intervene. I will then look at what bits missing and base next lesson around the gaps. You can gauge where your children are independently without having to support them without working	I do much more open teaching, I extend the children a lot more and expect more of them – I did algebra with my Year 1s last year and they rose to the challenge. We did the squares with different shapes and each shape has a different value – like a magic square and you have to work out the shapes from the totals at the bottom. I gave them number cards so they could try trial and error laying them on the shapes – they needed the concrete resources to lay them about and move them but they all got it and one child got onto a 4-square and did it in 10 minutes. The discussion around it and their understanding of number. I would never have done something in Y1 like that before. Sometimes I do input one day and do more of a focussed lesson – and then an investigation and sometimes backwards way on like last Friday – find the classes favourite jungle animal and represent it to the class - go find out and present your findings in some way. That was their starting point – no input, you may want to use these words - table, tallies, block graph, pictogram, these are the sort of things you may want to think about – some came up with graphs, some tallies, some just wrote a list of names and the animals next to them. When I looked at their books at the weekend I was able to look at what was missing and I'd noticed that nobody had used

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	alongside them in a tightknit group - I was looking, can they measure accurately, none of them used a tape measure from the middle, they all went from the end, so from that I know they can all measure accurately starting from zero and going up, so I probably won't go into conversions with them – I know as soon as they wrote 10 for the length of that bag that they had done them in inches and not in centimetres. I thought they would need help with reading the spring balance scales – they were upside down and up and down some went from zero at the top down and some were zero at the bottom up and nobody had a problem reading them. Could have had a whole day on that – lots of science in there (need to control connections). Making connections for them see where things are relevant to the maths but then you can't do too many connections because they will get lost – they'll be like, what am I doing, what am I learning? They were good at using numbers but only one group used units (of measure). Tomorrow we'll look at measuring but focussing on the units - I said to one of the groups – 10 what, 10 bananas? (representation)	pictograms so we did a lesson on Monday on pictograms. Basing it on assessment for learning. Friday we do sudukos which I'd never have done before – number ones and picture ones.
Respondent	1. Application of increased knowledge	2. Changed practice of participant in school
B	Questions – open questions, always looking at connections Don't want to make too many connections - I talked it through with my year colleague - I know what I'm going to do, I'm going to go into equivalent fractions and I had to talk the lesson through with him to make sure I wasn't going to go there – difficult, especially if you have a relationship with that	What I want to get to eventually, and I've got there with my own class – I want to be that person who isn't doing the teaching, I want them to be doing the finding out and I think that's quite difficult to get to.

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	class, if they show an interest in something, your automatic reaction is to build on that interest because they've asked the question about it or they've pulled out something else and it is stopping yourself.	
Respondent	1. Application of increased knowledge	2. Changed practice of participant in school
C	The only thing I've thought I'd like to find out more about that and that was Goodhart and her jottings and mathematical representation. All the other stuff all the other theory based stuff I could really do without. It really doesn't make me think I want to find out all about… timesing or find out how to teach this method better, I really take what they give me and apply it – realistically I would love to spend time thinking this week I'm going to go and research and find the best methods but practicalities and life get in the way of that. What happens is I take what the course gives me and welcome that with open arms. Sometimes you assume a level of understanding and when you come to apply it yourself you actually find that the level of understanding wasn't there as securely as you thought it was because if it was there they would be able to apply it to a different concept. I assumed it would only be my lower ability children that needed to see that (the balances) but it wasn't – everyone needed it.	I would hope that that would continue keep evolving even when MaST has finished, I would hope I would think that that links to that and we could do that together and we can apply that to that…

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E. Evaluation Level 4: Results

The effect on the school as a result of any increase in knowledge of the participant.

Category

Respondent	1. Effect on pupils	2. Effect on staff
A	Poor children! (laugh) I challenge them but they usually rise to it. Really surprised with some of the things they can actually do. All my year 1s in here can count backwards from 10 and keep going into negative numbers and understand that they can do 3 take away 7, whereas I know people have said that you can't do 3 take away 7. They've got that knowledge of numbers that go past, behind zero They've got a broader knowledge, a deeper understanding of number because discussions that go on and you listen in and they really understand it – its all that investigative work and talk and resources that are available to them. Children do the thinking, we do a lot of talking partners and a lot of group discussions – I've got all these things, what do you think I'm going to use these for - I'm putting the onus on the children and asking for feedback so I can correct any misconceptions before they go off. Getting them to question themselves – talk to your partner - do they agree with you?	We're trying to bring up everyone's skills and bring them up to the same level. We're using elements of the strategy and the MaST to get everybody teaching maths in a similar way. We all have different teaching styles and don't want to take that away from teachers. The elements from the MaST course we've picked are the ones that work for our school and we're developing them across the school – that's where a specialist can come in because they can make sure that's happening, they can go on with the training and bring it back into school and train everybody else. That's something that another class can't do they can't question their partner to do their thinking – so that's what I'm trying to develop.

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Respondent	1. Effect on pupils	2. Effect on staff
B	The MaST thing has taking me completely away from method teaching into an understanding one especially with the lower ability children. They can't retain methods – I never knew why they couldn't retain methods and they just can't because they don't have an understanding so now especially with the lowest ability children and those who display symptoms of dyscalculia everything is through understanding using the resources.	Being able to put this across to other people – those two simple questions – 'What's the same and what's different?' and 'What do you notice?' – that was so easy to put across to other teachers, just throw these into your lessons somehow and that was a really friendly way of changing peoples practice and I would say that has been the most powerful thing. I've chosen one other teacher and he is my Y6 colleague because we teach alongside each other anyway and because he's very open to new ideas. He was a really good candidate to choose because he will try out new ideas, he's not afraid if something goes wrong in a lesson - he doesn't see it as a failure. He sees it as something to learn from, so I knew I could change his practice. What I've done throughout the rest of the school, I've had INSET where I've tried to increase teachers knowledge and put across new ideas. What I'm trying to do is gradually work my way through people but its been really successful with one particular teacher and its starting to spread as well. Its funny because the INSET I've done it's the R teachers that have taken it on board more than any other year group because they see whatever they do as the starting point of misconceptions and they've really taken it on – in fact at the last INSET they invited the feeder nursery into school because they didn't want them to give their children misconceptions because it was all about shape – so that's been really useful. The language side especially.

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Respondent	1. Effect on pupils	2. Effect on staff
C	I have a maths friendly classroom and everybody in my classroom approaches maths in such a way that they can do it. This has passed on to the children and they are confident maybe not in what they do but they are confident enough to have a go. They never have any of this 'oooh maths is hard I can't do that,' because I would never say that. When I first started teaching I had Reception and I couldn't see the links between what I'd learnt and what I was doing, whereas now my children know the commutative law and they know the associative law and they know the difference between them. Perhaps if you went into another teacher's class they wouldn't be using that terminology in the same way that I can confidently do that.	People have noticed the impact, like last year with Rachel next door there has been a big rise in results and this year we have looked at gifted and talented and children achieving L3 at Y2 and we've got the best SATs results we've ever had in maths and because of that I've adopted a role in KS1 What concerns me a little about the MaST course with regards to the other KS coordinator and me putting in the foundations. I don't want them to be lost because somebody else teaches maths in a way that is by rote.