Modelling meta-cognition

Teacher: ... sure that you could get this question right. It's about the setting out of that work. So let's go through it step-by-step, so first bit let's read through it together. A cinema sells adult tickets and child tickets. The total cost for three adult tickets and one child tickets is £30. The total cost of one adult ticket and three child tickets is £22. Work out the cost of an adult ticket and the cost of a child ticket. So you've read through it once. Hopefully at that stage you're thinking what method am I going to use. Stephen has already mentioned simultaneous equations, yes.

Okay, it's recognising what the question is about, just that first read through. So then the next time you read through it, let's make sure we're circling, we're underlining those key issues. It's not just about quickly highlighting and moving on and trying to get the answer; it's about taking a step at a time. Four mark question, at least four minutes on it, okay.

So take the first bit. What's the most important bit? Well, it's the fact that it's about adult tickets and child tickets, two different types of tickets there. It then says the total cost of three adult tickets and one child ticket is £30. Have we all circled, we've all underlined? We've seen what the key bits of information are, yeah? Then we've got the next sentence. The total cost this time of one adult ticket and three children's tickets, child tickets, is £22. So you can see there, you've got two bits of information. Work out the cost of an adult ticket and work out the cost of a child ticket.

Now the important bit is, write down those key facts. What are those key bits of information? Well we've got three adult tickets, yeah, and we've got one child ticket, and together it costs £30. Notice I'm not introducing algebra yet, I'm just writing down the key bits of information. Move onto the next part of the question. We've got one adult ticket and we've got three child tickets and altogether that's £22.

So just starting to introduce, notice the addition sign, the equals sign, we're starting to now see that it's actually two equations. So let's now write in algebra; let's now write it more precisely. We're just going to use A and C. You could use X and Y if you wanted to, but let's stick with the A and the C so that once we've done the workings you can quickly see what the adult one is and what the child one is. So let's all of us please write it down now, using algebra.

Now, in this case, I've actually put 1C. You could just put add C, couldn't you? I'm going to stick with that 1C for the time being, because I think it's really clear to all of you then that it is just one child ticket, it's not just a C there. We've also got one adult ticket plus we've got three children's tickets, child tickets, and the total altogether is 22.

Right, we've now got our two equations, which a lot of the time that is what you'd be given on the test, but this time we've had that wordy question that we need to deal with. Right, let me just move this up a little bit. You know what we now need to do. We now need to label our two equations. We label the first equation 1 and the second equation 2. You are communicating to the examiner that you know what to do; you're communicating to that examiner that I know that's equation 1, I know that's equation 2, which will enable you to show the correct working.

Now we look at both equations and I look at both equations and I can in the first equation I've got three As, in the second one I've only got one A, and the same for the C. I've got one C and I've got three 'cause. So I need to take one of the equations and make the value in front of the letter the same, that coefficient in front of the letter.

I'm going to go with the Cs; I'm going to make both the Cs take 3C. So I take equation 1 and I write this down on my paper, and I say equation 1 multiply by three, so I've communicated what I'm doing, equation 1 times three. Let's times equation 1 by three then; remember you multiply each term by three, so we get 9A + 3C = 90.

So I've now got a new equation. I'm going to label that equation 3, yeah, because I've got three equations to work with. Now equation 2 and equation 3, I can see, have both got three Cs in it, so I'm now going to write down equation 2 again underneath equation 3. We can now deal with the problem. So what do we now do? Well, we need to eliminate the C. Because we've made those the same, we need to eliminate the C, so we're going to take equation 3, again writing it down, and we're going to subtract equation 2.

So let's do that. 9A subtract 1A is 8A. Notice I'm lining it up and keeping it in the same position, really clearly. I do 3C subtract 3C, to zero, and I do 90 subtract 22 and I get 68. Then the last step is, we need to make sure it's just 1A. We want to know the price of one adult ticket, so again we clearly show what we're doing. And we show what we're doing by dividing by 8. We know that eight adult tickets is 68, therefore one adult ticket is 68 divided by 8. So you should then end up with the adult ticket costing, oh, 8.5.

We need in pounds though, so when we now get to transfer that answer into pounds, we make sure we write it correctly, so I'm just going to write down A = £8.50. We haven't yet checked our answers so I'm not going to put it in the answer box just yet. We need to check it at the end. So we've got our adult ticket so now we need to find out what our child's ticket is. Now, let's look back at our first two equations. We've got 3A + 1C is 30, and we've got 1A + 3C is 22.

I'm going to use equation 2 for the next step and the reason why I'm going to do that is because it's got one adult ticket, yeah. Instead of having to do three lots of £8.50, I'm going to stick to the second equation. So let's now substitute, so let's write that down, so A = 8.5 into equation 2, so I've communicated that again. So look at equation 2; let's write it down. We've got 1A + 3C = 22. And let's now substitute our 8.5 in, so we get 8.5 + 3C = 22. So we subtract the £8.50, the 8.5, so we get left with 3C = 13.5. You're writing it down, Stephen, yeah?

And then the last step, we divide by three and we get 4.5, but remember it's in pounds so it's £4.50. Now running out space now, but I want to do my check; I must check my answers. Don't just look at your answer and go, oh, that sounds fine, £8.50 for adult, £4.50 for child, fabulous, I'm going to write it in my boxes. You must always check when you do a simultaneous equation, and the check is – you write it down here – whoops, the check is to use one of the equations – I'm just going to take equation 1 and I'm going to substitute my values in. So I need to 3A + 1C = 30.

Make sure you're writing all this down, please, and see it there. So our adult ticket is £8.50, so I want to do three times £8.50 plus one child ticket of £4.50, and it should equal 30. So let's check that, three lots of eight is 24, 25.50, 25.50, add £4.50 is 30. I've checked my answer. Now and only now is when you should be putting your answer into the box and making sure you include that zero, yeah. Do not leave it as 8.5, it's in context, we're talking about money, you must be putting £8.50 and £4.50. Yes, George?

George: When I did it in the mock, when I did it in the mock, I did like [unintelligible 00:12:06].

Teacher: Yes.

Female: That's what I did.

Teacher: When you see that question and that is what it's on about, it won't, it won't give you the marks, it will not give you the marks. When you see a question set out like that, um, where you've literally got the question at the top, and this is an indication as to why it's a simultaneous equation, you've got the question at the top. You've got a humungous space to show all your workings and then you clearly get four marks. And it's always the same. With simultaneous equations you get those two bits of information or the two equations, four marks, a big page to write your workings. Is that alright, George, it's...?

S to S modelling of meta-cognition

Female Teacher: Um, Callum, if I could ask you to just come out and explain that first one, um, so we can have a little look that and you can all check your answers. So absolute silence please. Um, I also really like the way Callum set out question 2, but we've kindly got a volunteer for question 2, so George, once Callum's explained question 1, um... Is that alright, just put that over there.

Male Teacher: Uh, the best thing to do, Callum, is just to write it out again for people on the blank.

Female Teacher: I'm not sure whether we've got another... I'm not sure whether we've got another, another blank. [Singing] No [paper] on that.

Callum: Do you want me to use this one or not?

Female Teacher: You could easily do it on just a piece of paper though, can't we, yeah? Okay, so if you use yours as a guide at the top, is that alright?

Callum: Yeah.

Female Teacher: There we go.

Callum: Alright, so I just first I circled the main information, so two tables and three chairs, uh, cost $2,000. Um, and then three tables and two chairs cost 2,500. And then, um, I wrote this out to make it clear to me, so two tables add three chairs are 2,000, and three tables plus two chairs are 2,500. So there you can see that I've started to put it into a simultaneous equation form and then I can simplify that to 2T + 3C is 2,000, and 3T + 2C is 2,500. Um, then what I did was, up here, I timesed them to get them to have an equal number of Cs, so 4T + 6C is 4,000.

Male Teacher: Is that [unintelligible 00:02:37].

Callum: Sorry.

Female Teacher: That's it.

Callum: And 9T + 6C = 7,500. And from there I can just minus, uh, these two to get, um, rid of the Cs, but that would be a negative. So what I did was, I labelled this three and that four, and then I did up here 3 - , no wait, 4 – 3, which would be 9T + 6C = 7,500 again, minus 4T add 6C = 4,000.

Female Teacher: Callum, can you just [leave] that up a bit now? So can I just, just interrupt there. That is perfect what he's just explained. [Maddy], it's the same conversation we had, wasn't it? Maddy went, at that stage, it looks awkward though, can we introduce negative. So

it's realising that that stage, it's perfectly done by Callum, but instead of writing it 3 and 4, he's written it 4 and 3, he's actually rewritten it, yeah, just to make it easier to see. Really, really good; well done, Callum.

Callum: Then from there you can see that this is 3,500 and here, that would just be 5T. So 5T is 3,500, so you just divide that. T would be 700. Uh, and then you can take your first equation, which was...

Male Teacher: Um, Callum, what's the [unintelligible 00:04:20] you've gotten just there? You're being really pedantic and perfect.

Callum: What, here?

Female Teacher: Yeah.

Male Teacher: Yeah.

Callum: I can do that.

Male Teacher: Yeah.

Callum: [Fast]

Male Teacher: Just to be really sure.

Callum: Then, from there, uh, you take your first equation, so 2T, so here you can see that's 700 times 2, uh, add 3C equals, and then just the same on the 2,000. And 700 times 2, oh, is 1,400, add 3C is 2,000. So 2,000 minus 1,400 is 600, uh, so 3C is 600. Uh, but you need to find Callum: so it's 200 'cause you just divide that by three. Uh, then you can check it. So take your first equation again, 2T is 700 times two. Add, and then it's 200 times three equals 2,000, so that's 1,400 add 600 and that does equal 2,000.

Male Teacher: And what else you can do?

Callum: Uh, you write that in.

Male Teacher: Write it in.

Callum: So T = 700, and Callum: = 200.

[Applause]

Female Teacher: I think, I think I will get, get you in to teach my year nines simultaneous equations, Callum. Honestly, honestly, absolutely fabulous, well done.