This video is to help teachers develop application tasks which sometimes is very hard for teachers to do. This particular one is about Mathematical Methods, but there are similar videos for Further Maths and for Specialist Maths. So what I'm talking about specifically today is the application task for Unit 3.

I'm Sue Garner an experienced teacher of Mathematical Methods and Specialist Maths. The copyright this is actually owned by VCAA. So there's a copyright statement. And this PowerPoint presentation is to help you to understand the purpose and the nature, and the structure of an application task. And it indicates how related assessment scheme could be devised.

One of the first things we find with application tasks is that people write them because they look like exams. And so what we're trying to do now is to show you that SACs are not exams. So one of the first things is, that they need a rubric, a related assessment task. So the purpose of the application task is for students to conduct a mathematical investigation with respect to questions of interest.

Now, I find that maths teachers often just if they're on holidays or look around, they take photos, they say, "That looks really interesting mathematically." They might look at bridge and say, "Oh wonder if that's a parabola or a catenary curve." They might look at what's happening at the moment with the pandemic or vaccination and then might think, "We ought to write a task about that." The best task is one that's written from a point of interest.

So students need to apply the mathematical construct to actually what you've written. And then investigate characteristics, features and behaviour of the systems, within the context. So the best way to write a task is you think of a context that interest you as a teacher and then your task has to have the one context all the way through it.

The nature of the application tasks for Maths Methods is that it must be functions and calculus-based. So in terms of where a lot of schools run them in about May, which means that you will have finished all of your functions work and you will be moving into calculus.

It can be practical or theoretical. So it doesn't have to be a story, although the stories are the most interesting ones but it can be a theoretical discussion about a part of mathematics. The application task has to be four to six hours, over a continuous period of one to two weeks. So what that means is you can't set it one week, and then do another part six weeks later.

So this little diagram says, let's identify the context. So as a teacher, you've thought about, that looks interesting. Look at your garden and say the growth of the plant, look at your animals, see the growth of a pet. Something that's interesting. You then think about how you could represent that mathematically, you systematically explore and analyse it. And then you interpret and communicate the results.

And then at the end, the student then can do the, I'll call it the 'what if case'. We've communicated the results that we found. What if something's a bit different? What if we changed something? And that's going to be your component three.

So, the application task needs to have, three components of increasing complexity. So the first part is the introduction of a context, specific cases for examples. So you would actually put numbers in there. You introduce the context or the story and you put numbers in there.

The second component is consideration of general features. So that's where you need to put parameters. A, B, K, whatever you like. And you actually consider, if you change A what happens, if you change B, what happens? And then you look at what happens to the graph, what happens to the stationary points, what happens to the story of the context.

And then part three is what I said before I called it the 'what if'. What if we change something? What if we vary what we're thinking about? What if we think about a different assumption? What do we think about different conditions? And then get the students to investigate that. And so that will be quite open-ended, which means that students sitting next to each other, could be looking at the same SAC, but they will have quite different answers, that could be equally good.

So the four key aspects are, choosing the context, so that's up to you as the teacher. Identify the questions of interest. Relate to these questions and relevant concepts with three components, that I've just talked about in the previous slide. And then you devise the assessment scheme, what sort of rubric do you want to use. Remember your marks aren't going to be on the paper.

So this first video, we're going to look at choosing the context and identifying questions. The basically sum what we're going to look at. We're going to look at describing the context. Explain how the context was chosen. Identify questions of interest. Identify the relevant assumptions, variables, etcetera. Give your task a title, try to make the title a little bit interesting. And show the title as I'm going to go through now and show you the context that I've chosen.

So, I've been interested obviously through the current pandemic, and a, a lot of teachers are writing SACs about the current coronavirus. One thing that I am quite interested in is what happens when these experimental drugs have been put into patient systems. And in the UK, particularly last year I was interested, that when patients were hospitalised, so I've got the last sentence there as an example. The common steroid drug dexamethasone, was found to be useful in the treatment of patients in ICU, in the UK throughout 2020. So I found that particularly interesting last year, because dexamethasone is a drug that is commonly used in cases where steroids are used. But it was found specifically to help patients with the coronavirus. And those of you who've been teaching for a long time, will recognise a drug concentration cat task, which I looked at as reference for this task.

So the questions of interest could be, if I choose this dexamethasone or any experimental drug, what dose of drugs should be given to the patient? How unwell does the patient have to be before you decide to give this drug? How long does the dose take to work? By the way in the UK, they decided that the patient had to be in ICU before they were administered the drug. So that was the condition that they put on it. How many doses does the patient need over what period of time. And what is the maximum concentration of drug in the patient's system, and how safe is it.

I identified relevant data, I read some articles about doses of certain drugs in different scenarios, and I looked at the spreads of diseases in various contexts. I gave the task a title and called it ‘drug concentrations’. You could have made something a bit more interesting but I've called it ‘drug concentrations’.

Now, this connects to something this is very interesting, called damping functions. The damping functions that are very interesting area of mathematical investigation. So these are the, these are the points about a damping function. An exponential function provides mathematical interests, where an exponential function either rises to a horizontal asymptote, or reduces to a horizontal asymptote. So that's the exponential feature of a function.

A circular function is also interesting 'cause it provides a cyclic nature, which is valid to look at, in terms of taking drugs and what it does to your system. And one of the things that we are allowed to do in this study design, is that we, we are allowed to investigate the sum difference or product of any functions.

Well I would like to use a product of an exponential and a circular function which creates a non-constant amplitude. So basically, I've got a trig function which cycles and the exponential function dampens it down.

I looked up some resources, there's, there's three there, there's one that's actually quite funny, that talks about opera singers when they first sing, and what happens to the tone of their voice, when they lose their breath on the voice, dampens down. So there's a YouTube clip about that and then there's a clip of that damped trig functions. And then there's from the cool maths kids. These are really good. Quite funny, way to look at what a damping function actually is and how the exponential function does it.

So that's the end of video one, video two. I'm going to move on to component one of the task.

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