Disciplinary Literacy in Math

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https://www.youtube.com/watch?v=_uwvz44Pz-k&t=53s

Nancy Frey: Disciplinary literacy is the field in which we apply what it is that we know about how it is that information is understood in a variety of subjects. Hi, my name is Nancy Frey, I'm one of the co-authors along with Doug Fisher of the ASCD Educational Leadership column Show and Tell.

Disciplinary literacies are essential for our middle school and high school students to be able to acquire. And they vary depending on the discipline itself. The disciplinary literacies that are used in science, as one example, are different from those that are used in mathematics.

In the video that accompanies this column, you'll see high school math teacher Jacob Hampton leading his students through a math problem as he shows them how he uses his disciplinary literacy in order to fully understand the problem. Enjoy.

Jacob Hampson: So one of the common challenges that I've noticed in our class is breaking down some word problems. So today, what I'm going to have us do is look at breaking down a word problem and so we know kind of our best tactic to answer the question. Okay so when I'm going through some word problems here, I'm just going to start by reading through the entire question. That way, I can get a broad sense of what the question is asking me to do. So here, I would say determine whether the given quadratic polynomial, Y is equal to negative 2x squared plus 4X plus 5 has a maximum or minimum value. Then I'm going to go look at the question again and see what is the question asked me by kind of breaking down some of the parts of the question. Okay, so we have determine whether the given quadratic polynomial and then I see a comma here. Okay that comma here is telling me that they're going to give me an example of what a quadratic polynomial is here. They give me the example Y is equal to negative 2x squared plus 4X plus 5. Now I still want to know what this is, what a quadratic polynomial is to help me make sense of what's going on here. Okay so I'm looking at the word polynomial and looking inside the word here at poly. I know that poly means multiple. Okay, so we're looking at something that has multiple and that second part of the word here, nomial, means terms. So here I'm looking at multiple terms, okay. So my example that I'm looking at has multiple terms so then I'm looking at the word quadratic and so breaking down that word again, being careful here I see that word quad. Now when I think of quad, I think of four like a quad on, you might take to the desert here. But we got to be careful here because the example that we're looking at is actually, it is a degree two polynomial, okay. And that degree two polynomial is looking at that exponent 2 here. Our highest exponent tells us what family of functions or polynomials we're looking at. So the quadratic function is a particularly important family because it has certain features that we're looking at and we'll be talking about in future classes that are important, okay. And one of those really important features is our maximum or minimum value. And so what's really nice about quadratic functions is we have a very targeted look at what a maximum looks like because our quadratic functions or degree two polynomials are looking at

having one maximum or one minimum. So it's a really good starting point for us. Okay so that's kind of a broad sense of what's going on with this question here.

Now when we're looking at this, we're looking at we either have a maximum or a minimum value. And when I'm thinking about this problem, I'm thinking what, there's got to be a feature here that is going to tell me whether I have a maximum or minimum value. And that feature, highlight in Orange here, is our A value. So we've talked about an A value and that A value is the coefficient to our leading term of our second degree polynomial. Okay so our polynomial in standard form here, quadratic polynomial in standard form, has that leading term of x squared and its coefficient is going to tell us whether we have a maximum or a minimum. Now if that coefficient is positive, we know that we have a minimum due to our apparent function. Okay but when we have a negative number, our polynomial is going to be reflected and that reflection is going to, and I should say reflected over the x-axis, that reflection is what's going to give us that maximum point. And what I can see is that if I know I've reflected over the x-axis, my maximum point is what I'm going to be looking at because we have that downward facing U of the parabola. Okay so looking at this, really our answer is right there for us but we have to be able to make sense of the problem and identify what it's asking for us in order to do that.

So what I want to have you do now, you'll look at a different problem, but we're going to look at quadratic functions still, and we're going to ask you for some other characteristics to identify some factors. But we're going to be looking at and spending some time on breaking down the actual problems themselves.