Exploring quadratic curves with TI-Nspire™ Navigator™

Jay Timotheus – Blue Coat CE School, Walsall, England

Case Study

Exploring quadratic curves with TI-Nspire™ Navigator™

Teacher	Jay Timotheus
Location	Blue Coat Church of England School, Walsall, England
Class	14-15 year old students on the General Certificate in School Education Higher mathematics course.
Technology	TI-Nspire™ Navigator™

Setting

Blue Coat School is a state secondary school for students aged 11-18 years in Walsall, UK. This class have used the TI-Nspire™ handhelds previously and this was the first time I had also used TI-Nspire™ Navigator™ with them. In this lesson I used Screen Capture.

The lesson

In this lesson I wanted my students to learn how changing the value of a in $y = ax^2$ affects the shape of the resulting graph, and progress if possible to explore the effect of c in $y = ax^2 + c$. Starting with a blank Graphs and Geometry page, I asked the students to draw a graph of $f_1(x) = x^2$ and showed them that they would get a second graph if they type $f_2(x) = 2x^2$. I then drew a family of curves on the board that involved varying the coefficient of x^2 from negative to positive values, centred on (0,3) – and asked the students to try and reproduce this. I use the Screen Capture view to monitor the students' during the lesson and as a springboard for discussion.

There were some problems initially as I had introduced two variables rather than one - both a and c in $y = ax^2 + c$. (Some of the students in the class are particularly quick at learning new mathematics and I had wanted to give them a challenge.) However, the majority of students were struggling which was apparent quite quickly from the screen capture as many students had 'stopped' as they felt unsure what to do. I was able to address the problem and enable the students to get back on task quickly.

Students' mathematical learning

Students investigated the effects of varying values and looked at the impact that this had on the resulting graphs. The software gave them instant feedback as they varied the values. As the lesson progressed the screen capture images told me quite a lot. Some students were varying their quadratic curves by increasing the value of a, with all their curves having $a \geq 1$. Other students had started using values between 0 and 1. For quite some time no students chose values for a less than 0. During this stage of the lesson I used Screen Capture to identify students who were only using values for a that were ≥ 1 and asked them questions like, "Ok...that's really nice... but any ideas how you could get your graphs to fill this space here?" This prompted them to look at the coefficients that they had been using and many then said... "oh..." and went on to try (usually) $a = 0.5$ and then make further progress from there.

Conclusion

The TI-Nspire[TM] Navigator[TM] Screen Capture view enabled students to communicate their findings and consider alternative solutions - some students' curve families were larger/different to other students' curve families. TI-Nspire[TM] Navigator[TM] gave me continual updates on the progress the class was making so that I could target interventions better. Also students could 'see' that other students were progressing in ways that were different to them. Some students had clearly got screens that matched my hand-drawn diagram of a family of curves better than other students. This made them aware that the possibility existed of solving the task (as others in the room had clearly done so)