Maths skills are essential for scientists. And teachers on vocational science courses embed maths in most classes. But it can be difficult to determine if a student is struggling with a calculation because of gaps in their scientific knowledge or because they lack underlying maths skills. This issue is further compounded by staff from different specialist areas not having enough time to discuss individual maths skills for each student.

My research aims to develop a tool which can use the digital marking of work to identify which maths skills students need most support with. The science department already uses Microsoft OneNote to support science teaching and assessment of class work. The specialisms explored in this project are biology, chemistry and physics.

The tool works by using macros to assess students’ skills, based on the comments teachers have made while marking. When they identify that a student has made a mathematical error, they add a tag to their comment by clicking a button that’s added to OneNote.

The comments should mention the maths skill where the student has made an error. A macro extracts all the teacher comments with a maths tag. These are put in a table, which also identifies the student and the subject. This table then transfers to an Excel spreadsheet, which analyses the comments. For each student and subject it counts the number of times an error for each skill has been made. For example, if a teacher says, “you have labelled the axes on this graph incorrectly”, it will pick out ‘axes’ and ‘graph’ and record this against both the student and the subject.

Three outputs are produced. First, a table is generated for each student, identifying which maths skills they need to work on based on the number of errors. These are rated red, amber or green. This can be loaded into the student’s own OneNote notebook, giving them personal feedback and links to online resources to practise these skills.

Second, skills can be analysed by cohort, to identify the support needed by several students. This is done by identifying the number who are rated red, amber or green for each skill. This, in turn, allows for maths sessions to be planned for an entire class.

Lastly, staff can assess whether students only make specific errors in one subject. For example, if they can calculate ratios in chemistry but not in biology, then staff can focus on supporting the subject knowledge rather than the core maths skill. Currently this tool is being used with two Level 3 BTEC Applied Science groups.

A number of findings have already been made about implementing and using online marking tools. Teachers said the single-press button to tag mathematical errors was helpful as it did not add to the marking time, which is where previous marking systems had failed. Using the tool has led to greater discussion across specialisms about maths skills and allowed specific teachers to lead on skills which fall more in their area, but are covered in all specialisms.

Using this tool to inform discussions with students has led to wider issues being identified in the application of maths. For instance, students who can calculate proportions in maths can struggle with dilution calculations in their science sessions. This highlighted the importance of teaching maths practically to generate the cognitive links between the calculations and the practical work.

There have also been some issues over implementation. For example, in chemistry students carry out a lot of titrations. Titrations contain the word ‘ratio’ and the tool would identify comments containing titration as a ‘ratio’ error, even though this was not the maths skill being commented on, but the topic.

There is now a need to assess the impact on students. This has started in a small way with students completing a science maths skills test. Some tests will be assessed with the tool, and others without it. There is also potential for the tool to be expanded to engineering, and to develop an equivalent for English skill.