

Focus: Problem Solving.

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Problem solving is at the heart of learning mathematics. For students to achieve 'maths with confidence', we want to encourage them to think, reason and reflect. We want them to engage in problem solving, so they can *'make sense of unfamiliar situations and tackle them intelligently'* (EEF).

"Problem solving is an important component of mathematics across all phases of education."

ACME, 2016

What is problem solving?

Let's start with what problem solving is not.

- Problem solving is not just about solving problems.
- Problem solving does not require difficult mathematics.
- Problem solving will not always look the same with every question.

Problem solving is wide ranging in both definition and application. In its simplest form it *'generally refers to situations in which pupils do not have a readily-available method that they can use'* (EEF).

In other words, problem solving is what you do when you don't automatically know the answer!

To be a competent problem solver, students need to use a variety of strategies. A problem solving strategy is different from an algorithm, where the student will know the steps needed to be executed. In contrast,

students would draw on a problem solving strategy when they do not have a readily available method.

There are many problem solving strategies but the ones listed below are indicative of those that students may use (often sub-consciously) when engaging with Blutick questions.

Problem solving strategies:

- Thinking logically/mathematically;
- Reasoning;
- Using what you know to work out something you don't know;
- Working systematically;
- Using visual clues, such as worked examples and videos;
- Making choices;
- Making modifications.

A problem solving approach is not really about remembering lots of information, but more about how to solve any type of problem in the future.

Another key feature of problem solving is looking back – or reflecting – on the steps you took, the decisions you made. Students need enough experience to build up these levels of reflection critically.

What are the challenges?

Being successful is not just confined to levels or grades or performance. Education has changed and the world today requires students to think flexibly, reason confidently, communicate their ideas and solve problems they have not yet encountered. The mathematics they learn today will enable them to meet the demands of the future.

But mathematics can sometimes be seen as getting lots of answers right or knowing which theorems or proofs to use. While this is one important aspect of mathematics, another part – problem solving, thinking and reasoning – is often difficult to see.

How can Blutick help?

Firstly, not all lessons/sessions/ mathematical moments need to be problem solving focused. To be a competent problem solver students need to be able to tackle problems fluently, flexibly with reasoning and confidence.

At Blutick we are not claiming that all questions are 'problem solving' questions. However, the pedagogical approach, which is what sets Blutick apart from other learning platforms, does offer more opportunities for problem solving, than might first appear.

The Blutick pedagogy – the videos, worked examples and intelligent

line-by-line feedback – helps to scaffold students, so they have the chance to solve problems on their own. If mistakes are made, the feedback supports and suggests, but it does not take over and tell. Over-teaching does not allow problem solving to take place; giving problems without any teaching removes the need to teach! So, we need to find a way of balancing both approaches.

Blutick does this. It scaffolds the problem by drawing attention to particular features of it that students are working on. In this way, it enables students to learn and build confidence in tackling similar problems in the future.

“A mathematically informed individual can think and act mathematically (e.g. applying knowledge and transforming methods to solve problems), use mathematical skills and forms of communication to analyse situations within mathematics and elsewhere.”

The Royal Society, 2014

- ✓ Blutick enables the pre-requisite skills of problem solving to be practised (e.g. fluency, flexibility, reasoning) through the variety of questions it asks;
- ✓ Blutick offers one layer of problem solving by scaffolding students to think about their next steps through the intelligent line-by-line feedback;
- ✓ Blutick enables students to build up experiences of tackling problems, thus helping them to reflect and look back, through its huge content bank of questions;
- ✓ Blutick offers levelled examples so that if a student tries a question (from level 2) but struggles to solve it, they can go back to a simpler, related problem to try;
- ✓ Blutick encourages students to use problem solving strategies by scaffolding feedback, not just concluding if answers are right or wrong;
- ✓ Blutick avoids predictability because it draws on such a quantity of questions;
- ✓ Blutick probes mathematical thinking by offering closely related variants of the original question, causing students to use and apply knowledge learnt.



References

- ACME (2016) Problem solving in mathematics: realising the vision through better assessment. London: The Royal Society.
- Education Endowment Fund (EEF) Improving Mathematics in Key Stages Two and Three. Guidance Report. Accessed 2 April 2020 <https://educationendowmentfoundation.org.uk/tools/guidance-reports/maths-ks-2-3/>
- The Royal Society (2014) Vision for Science and Mathematics Education. London: The Royal Society.