

QUANTUM: TESTS WORTH TEACHING TO

How do you know if your students have understood a concept? Ask them questions.

STORY BY Simon Peyton Jones

A well-posed question makes you think. It leads to dialogue, exposes misconceptions, and helps distinguish when you think you know something from when you actually understand it.

Suppose you had a ready source of good questions about computing. You could use them to check your own understanding. You could set a quick overnight quiz, which your students could do on their phones, so that the next day you'd have an idea of whether they'd "got it". If not, their answers might tell you their misconceptions.

Writing good questions is hard

The trouble is, it's hard to come up with good questions. It's easy to think of ones that test whether you can remember Python syntax, but harder to find ones that exercise computational thinking. But there's good news: we only need do it once. A corpus of

COMPUTING AT SCHOOL
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Kate collects toys using this algorithm. She has a toy in her hand.

Identify the selection statement that matches this flowchart.

A if

B if elseif

C if else

D if elseif else

```

graph TD
    START([START]) --> Q1{Is toy a car?}
    Q1 -- YES --> A[Put toy into box]
    Q1 -- NO --> Q2{Is toy a train?}
    Q2 -- YES --> B[Put toy into bucket]
    Q2 -- NO --> STOP([STOP])
    A --> STOP
    B --> STOP
            
```

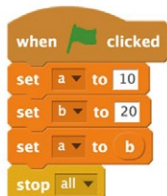
■ Testing if students really understand the difference between selection statements. What misconceptions would the wrong answers here suggest?

HOW YOU CAN HELP

We need your help, because the network effect is key. The more people using Quantum, the more people will think it's worth writing questions for it: the more questions there are, the more attractive it will be to use. So whether as an author or consumer of high-quality computing questions, we need you. Start here: helloworld.cc/2jAJXL3

Consider this Scratch program. What will be the values of a and b after it has finished?

- A a = 30
b = 0
- B a = 20
b = 10
- C a = 20
b = 20
- D a = 30
b = 20



well-crafted, free, online questions would be a useful tool for the computing curriculum, year after year.

The Quantum project has precisely this goal. We aim to develop, with your help, thousands of questions on the computing curriculum, from primary to A level. We have 2,500 already, and more come every day.

What makes Quantum different?

Quantum is different from other online platforms. It's focused on frequent, low-stakes, formative, diagnostic assessment to support learning (in contrast to high-stakes summative assessment).

It's also school-led and crowdsourced. Teachers use the questions on the system and upload their own.

Quantum uses a free online platform, Diagnostic Questions. Moreover, the questions will be available online, free,

forever; anonymised data will be available to researchers.

It's evidence-driven and research-led. Our partners include two leading assessment experts: Tim Oates (Cambridge Assessment) and Robert Coe (Durham Centre for Evaluation and Monitoring). CEM aids to provide quality control for the crowdsourced questions, by analysing the data from thousands of students doing thousands of questions. No one has ever done this before.

The project has two goals; the first is being immediately useful to computing teachers. We have a need for high-quality assessment material; Quantum will produce this quickly.

Secondly, no one has tried to crowdsource assessment items, and then use data to evaluate and improve their quality. If we can make this work, the results will be useful for all subjects in any country. We aim to change the world! (HW)

PROJECT QUANTUM - A TEACHER'S PERSPECTIVE

Iain Davis, Assistant Head and Year 6 teacher, has taken a look at diagnosticquestions.com and Project Quantum, and predicts a bright new future for assessment.

STORY BY Iain Davis

INTRODUCING THE CONCEPT

When I introduce something new to staff, I always approach one of our teachers who is less confident with technology. If they can manage it, the rest should too, right? After a quick 10-minute demo with a less confident KS2 teacher, she took to it like a duck to water.

You get an e-mail message saying you have won a prize in an internet raffle. You should:

- A. Be very pleased and tell your friends.
- B. Just delete it because it is not true.
- C. Contact the sender to check if it is true.
- D. Send your home address so that your prize can be delivered to you.

Something I hear again and again from my fellow teachers is 'there's a big problem with assessment in schools'. From changes in the national curriculum to high-stakes end-of-year tests, the whole system is under pressure. Computing isn't like reading and maths and so quite often I feel it can't be measured by children sitting a paper. They do enough of that in the run-up to SATs, and don't our teachers already have enough to do?

I was introduced to Project Quantum in October 2016, so our school is still at the start of our journey with it. We had been looking for an effective way to assess computing for a while, with mixed success. We wanted something to help us measure progress and provide easy assessment of learning. The online platform diagnosticquestions.com does this perfectly. It has many questions across a number of subjects; the current count is 29,284, with 2,340 being computing.

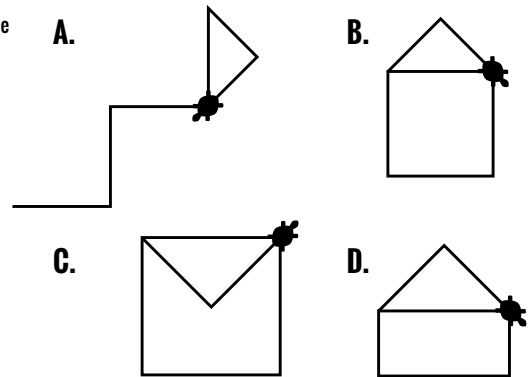
■ A great way to test (and teach) programming is by getting pupils to work through code in their heads or on paper. helloworld.cc/2jADjo7

A turtle is facing right.



What shape will the following sequence of Python instructions draw?

```
forward (100)
right (90)
forward (100)
right (90)
forward (100)
right (90)
forward (100)
right (45)
forward (70)
right (90)
forward (70)
```



Improving teaching and learning

The biggest benefit I've found from using the site is that not only does it give me a way to measure progress, but it also shows me quickly where my students are on their learning journey. I'm then able to push those that need to be moved onto working at a greater depth, and also know who I need to support more. Normally with computing, it will take a few sessions to get a good grasp on what it is that pupils can and can't do.

Free and easy-to-use

The platform is free to sign up to and on their site they state that it will be free forever! No need to set aside precious budget areas. As is always the way with new initiatives, there are early adopters and those that are less keen to embrace change.

The children have taken great enjoyment from it, as they get instant feedback and they see it as a low stakes/low threat piece of assessment, unlike certain booklets that we give many children in the month of May. At present, I'm trying to come up with an end-of-year question bank for each year group so that we can measure their progress across the school.

In control

This platform also puts the power into the teacher's hands. I choose what I will assess, and, in turn, that reflects what I will teach and what my children need to learn. What I love about it is that it is easy-to-use, quick to set up, and the insights I get into what my children know is invaluable. Will this new platform change attitudes to assessment? I hope so. (IWD)