

Coding, killjoys and the science of education

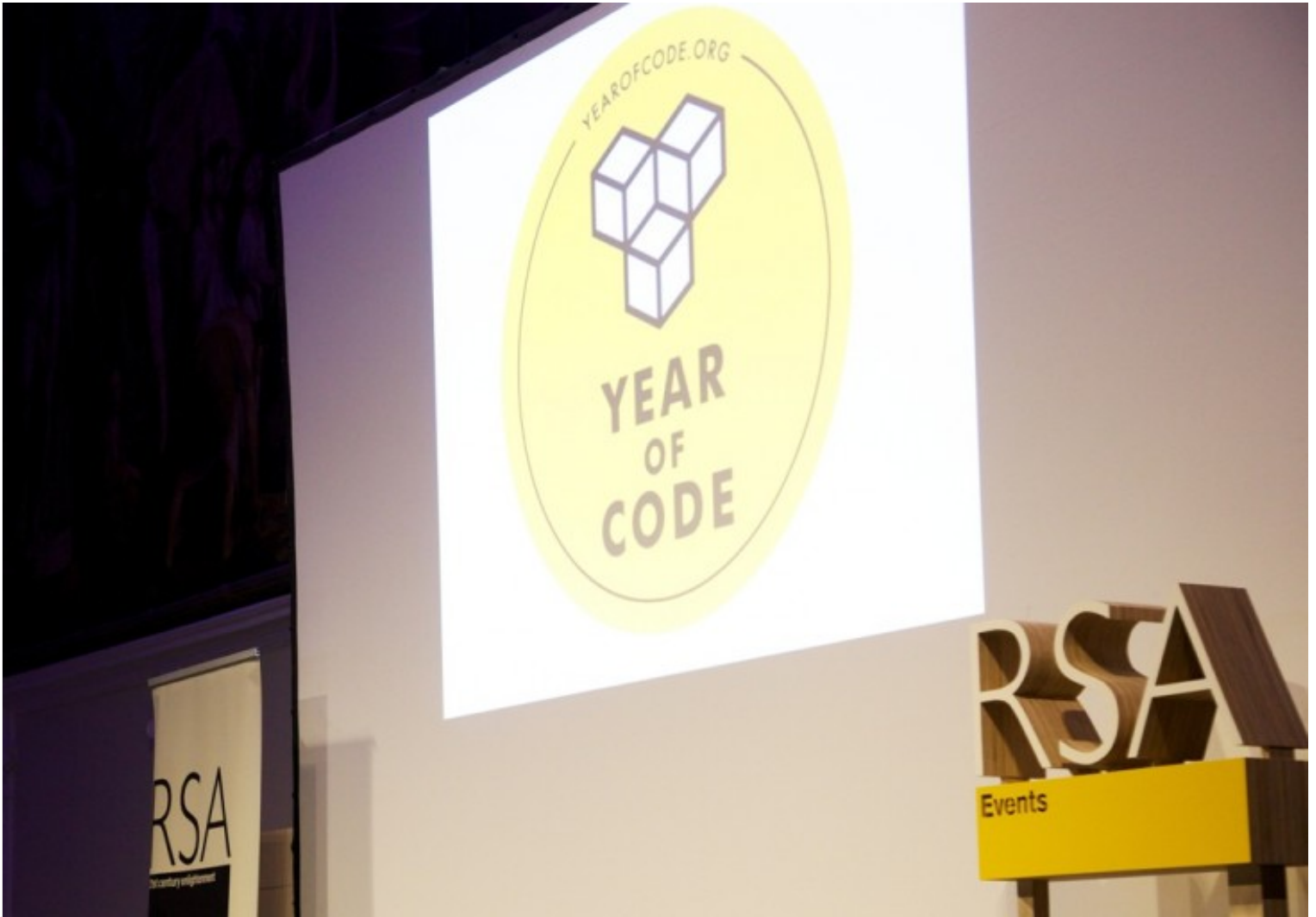
Nestling into a packed house at the [RSA](#) in central London earlier this week, it soon became clear that this wasn't going to be any old discussion around the education system. The [Skills 2014](#) event was timed to coincide with the [announcement](#) of the UK government-backed initiative called the [Year of Code](#), a campaign to raise awareness and interest in computer programming.

To recap, over the next 12 months a series of events will be held to promote coding in education, including a week-long stint in March which will encourage every school to teach pupils at least one hour of basic programming. And yes, it is very reminiscent of the [Hour of Code](#) campaign set up for [Computer Science Education Week](#) in the US last December. In addition, £500,000 (\$815,000) will be provided to fund teachers to train in programming.

All this hullabaloo comes ahead of a [new computing syllabus](#) that's launching this September in the UK, making it mandatory for students between the ages of 5 and 16 to tackle programming in the school environment.

At the Skills 2014 event in London on Tuesday, a quick peruse through [the program](#) revealed some well-known names from the world of business, education and government were locking horns to reimagine education in an increasingly digitized world. While the occasion did have a strong UK focus, many of the ideas that emerged from the sessions can be applied to other countries around the world, with speakers hailing from Singapore, Israel, Estonia and other places.

Consider this: Around 1 in 4 young people in the EU today are unemployed. Conversely, around 1 in 4 employers have entry-level vacancies unfilled because they can't find the right candidates. Throw into the mix somewhere in the region of 900,000 job vacancies in the European IT industry, and it's clear that we need to start really thinking about ripping up the education rule-book.



Year of Code – Announcement

“More than one way to be an educated man”

[Suli Breaks](#) has become something of a phenomenon on the Web. While he’s currently [traversing the globe in 80 days](#), he’s perhaps more well-known for his spoken-word performances such as [why I hate school but love education](#), where he proclaims that there’s more than one way to be an educated man – it’s not just about school and university.

And it was this video that was used to set the tone for the day’s discussions, with host [Saul Klein](#) kicking things off with a fairly depressing statistic on how our enthusiasm for school steadily dwindles from a high of 95% of pupils in Kindergarten, to a low of 45% by the time they leave.”We start with this unbelievable enthusiasm and a love of learning, but then...”.

Klein deliberately trailed off, letting the downwards-moving curve on the big screen finish the sentence for him.

Yes, it seems the education system takes the enjoyment out of learning, by following a rigid curriculum that doesn't adapt to children's needs. But more on this later.

Instilling an entrepreneurial spirit

One of the key criticisms to emerge from discussions was that schools typically don't instill an entrepreneurial spirit in children. [Saul Singer](#), Israeli journalist and co-author of [Start-up Nation](#), pondered that whatever it is that makes a person innovative, may also make a country innovative.

“If you put the word ‘innovation’ into Google Images, you’ll see lots of pictures of lightbulbs because the symbol of ‘idea’ is the lightbulb,” says Singer. “So we think innovation is about ideas. But it’s not really about ideas – there are great ideas everywhere. It’s about what you add to the idea – and the main things you must have are drive and determination, as well as a lot of willingness to take risks.”

To look at what makes a country innovative, we need look no further than Singer's own country – Israel – which has been producing some amazing tech companies in recent times. Remember, it was only a few decades ago that Israel was largely an agricultural country.

So how does Israel teach innovation?

“We didn't teach it so much in our schools – we're talking about 21st century skills, the things that we don't learn in school,” says Singer. “Things like leadership, teamwork, strategic thinking, decision-making, emotional intelligence – Israelis learn these things, but they learn them through the culture, through the history and through the place that they live. The fact is, Israel itself is a startup...it started from an idea, and took a lot of drive and determination to turn that into a reality.”

But of course, not every country has this ingrained, thus we should focus on how we can

foster the entrepreneurial spirit within the education system. And the key is to start young.

“When you teach entrepreneurship, that’s when you *don’t* teach it, you do it,” continues Singer. “How do you teach a 4-year-old entrepreneurship? An entrepreneur is someone who sees a problem as an opportunity. That’s what 4-year-olds do naturally – they see problems and start solving them. What school has to become, is a place where that happens, where you let kids solve problems. A few years ago, it wasn’t as possible for kids or *anybody* to solve problems in real-time, for example over a weekend.”

Hacking weekends have surged in popularity, with participants working towards building a minimal viable product (MVP) in just a couple of days. But it can be done simply by giving a young person a problem and arming them with the tools and guidance to solve it. It’s about moving away from an exams-and-grading mindset to a practical life-skills ethos. What’s the best way to learn about cashflow? Create a small business with real money that requires cashflow knowledge.

This was a key topic of discussion throughout the day – a school curriculum that does away with facts and memory-building exercises to focus on *doing* instead. That doesn’t mean we simply ignore core numeric and literacy skills out the window though.

“It’s about applied learning,” says Singer. “We don’t want to get rid of curriculums, or get away from core skills – of course you need core skills – this isn’t about moving towards some woolly, airy-fairy curriculum. It has to be very rigorous, and it has to be applied.”

The coding conundrum

Entrepreneurialism is one thing, but specific, tangible skills such as coding are vital too. And there’s a real demand for such skills just now – in Britain and beyond.

“There’s a huge shortage of skills in the UK at the moment,” says Mike Warriner, Engineering Director, Google. “And it’s gotten worse. The number of children doing A-Level Computer science has dropped over the past ten years, from around 10,000 to 3,500 – which is pretty shocking really, considering there’s something like 900,000 job vacancies

in the IT industry across Europe.”

Teaching kids how to problem-solve is a pivotal part of their development in the early years. And programming goes a long way towards teaching many such skills beyond that of pure code.

“You need to understand not only how to build computers, but also about all the interactions between how it all works,” says Warriner. “And I think this is a key thing people learn from coding – it’s not just about the dry algorithms and equations, it’s actually about getting things to do things. This could be tactics, interactions, collaboration...skills that can be used in other facets of school and life in general.”

Of course, there’s no shortage of services geared towards helping people of all ages learn valuable coding skills *outside* the school environment. There’s [General Assembly](#), [Thinkful](#), [Khan Academy](#), and [Codecademy](#) to name but a few.

Indeed, Zach Sims, CEO of Codecademy, was in the house to impart some thoughts on how coding can become better integrated into education and society. And part of it will involve convincing parents that it can bring many valuable skills to a child’s arsenal.

“There’s two immediate value propositions for parents,” says Sims. “It teaches you a better way to think. There are different ways that learning algorithms change the way you think, and change your problem-solving abilities. It makes you a better thinker. But I think another argument that’s valuable to parents is the employability aspect too.”

Parents are already on board with the importance of mathematics and English in school. Any parent still wondering whether programming deserves an equally lofty status should take a look at the growing ubiquity of computers, tablets, smartphones, smart TVs and all the rest.

Getting creative



David Puttnam

How do we ensure that children can create art that stands the test of time, and how do we teach creativity in a digital world?

[David Puttnam](#), the producer behind movies such as *Chariots of Fire*, *Midnight Express*, *The Killing Fields* and more, has turned his attentions to education in recent years, serving on boards and lecturing at various universities. He says schools should do more to encourage children to pull their various strands of creativity and know-how together to create something significant.

“There’s a moment in all our lives, where three or four things align and come together, and if you’re smart enough, and have a good enough memory you can collect those thoughts and pull them together,” he says. “I’ve done it before on *Local Hero* and *Killing Fields*. [But] I don’t believe there’s anything in present day education, that allows you or encourages you to do this.”

Interestingly, Puttnam actually uses a fictional 80s’ movie character to illustrate what he

means about encouraging bright students, who may not fit into a conventional schooling system, to flourish.

“Steve Jobs is a Ferris Bueller, Bill Gates is a Ferris Bueller,” he says. “But ‘Ferris Bueller’ isn’t seen as a role model, it’s seen as an aberration.”

Indeed, the general idea behind Puttnam’s thinking is that creativity is a muscle, albeit with certain preconditions attached – focus, tenacity, collaboration, imagination, and resilience. “Resilience is a vital one, he says. “Most good ideas get rejected at some point – I cannot tell you how many scripts of Chariots of Fire were turned down.”

It’s all about *not* accepting someone else’s judgement of your ideas. And this single-mindedness has to be encouraged from a young age.

[Ian Livingstone](#), author and co-founder of the popular Fighting Fantasy roleplaying gamebook series, and UK-based games company [Games Workshop](#), offered his thoughts on the role creativity plays in building out broader skills.

“There’s a few reasons why I think game skills are life skills,” says Livingstone. “They’re problem-solving, they’re intuitive learning, they’re trial-and-error, it’s not being afraid of failure and being risk-takers. Also because of online gaming, many people are playing together. These are all life skills – entrepreneurial life skills.”

More specific to education though, Livingstone touched on some of the same ideas touted by the other talkers, *vis-à-vis* ditching fact-learning for problem-solving.

“We don’t have to clog up our brains with stuff that’s seen as important in schools,” he says. “It’s how we process the information [that matters].”

But how radical should we be about *not* learning facts, and concentrate on how we process information and problem-solve instead? Data and information exists on hard-drives and servers, so do we need to know ‘stuff’ like we used to? It’s a massive departure from what we’ve all become accustomed to, and it won’t sit comfortably with everyone.

What's being suggested *isn't* about not-knowing things. The general consensus is knowledge that we may use on a day-to-day basis, such as arithmetic (times-table) and spelling should remain, but we need to rethink how we assess 'success'.

"I think it's interesting that Michael Gove (UK Education Secretary) [wants to test 4-year-olds](#)," continues Livingstone. "I just can't get my head around that – it's great that he's introducing other things, but why test 4-year-olds? If one child says 'brought', and another 'brang', are they going to be castigated?"

The basic idea is this. Find what a kid does at an A* level, and focus on that. In theory, the kid will leave school knowing and appreciating what they're good at. They might be amazing at 5 or 6 subjects out of 9, so why not focus on these, rather than forcing them to do the stuff they're not so good at? Tip that even further towards specialization – what if a pupil only has a desire or natural aptitude for 2 or 3 subjects? It doesn't take a maths whizz to figure out how much of their time at school they end up hating.

Indeed, all the potential joy that's stymied in formal education should be brought back into play, so to speak. Let's stop being such killjoys.

"Let's take all the fun stuff that we talk about outside of school *into* school, and maybe try and be a little more playful," says Livingstone. "With teachers acting as facilitators rather than just talking *at* them [the children]. People who get the A-Star aren't necessarily going to be the best or most imaginative employees."

Education shouldn't be a chore. And it shouldn't be fearful – it should be enjoyable and fun. There's a reason why many kids love school at the start, and gradually grow to hate it as they progress through the years.

The numbers game



Conrad Wolfram

Maths may not be many people's favorite subject, but it is an important one for many reasons – so we need to make it as popular for schoolchildren as it is among policy-makers.

Meet [Shimon Schocken](#), founder of [Slate Science](#), an initiative designed to generate hundreds of 'a-ha' and 'woo' moments in schools. What moments could we be talking about here? "When the child realizes that what they've learned is directly relevant to something, maybe from a different class or everyday life," says Schocken.

Slate Science specializes in building mathematical skills and intuition through playful interaction. Though many of these games seem little more than that on the surface, they set out to teach things like algebraic expressions, and 'mapping' without being overt about it.



“It’s very important to ‘seed’, in a child’s mind, ideas that will germinate and blossom along the way – it’s called spiral learning,” continues Schocken. “Math education should be constructive, engaging if not addictive, it has to be relevant to one’s world, and it has to be taught. Taught by teachers.”

Then there’s [Conrad Wolfram](#), a major proponent of [computer-based math](#), and Managing Director at Wolfram Research, the maker of Mathematica software and the Wolfram Alpha search engine. He’s [previously said](#):

“There are a few cases where it is important to do calculations by hand, but these are small fractions of cases. The rest of the time you should assume that students should use a computer just like everyone does in the real world.”

Indeed, these sentiments permeated Wolfram’s talk.

“Stop teaching calculating and start learning maths,” he said. “In the real world, we use computers for calculating, almost universally. In education, we use people for calculating almost universally. And those two have diverged more than ever and will continue to do so, unless we fix the fundamental problem. This is the key reason that maths is so despised in education, yet so powerful in the real life.”

Wolfram's primarily arguing for a subject called computer-based mathematics, one that takes the real world and replicates it in education. This is complemented by computer-assisted maths, which will involve "modernizing the pedagogy" – how we get people to learn subjects, including maths. Combining 'assisted' with 'based', Wolfram argues, will be a huge benefit to the subject within schools.

"Doing what I'm suggesting makes maths a more conceptual subject, not less conceptual," he says. "This idea that using computers somehow makes it dumbed-down is nonsense – if it's done appropriately. Because you're doing what you're doing in the real world."

In years gone by, there was a huge gulf between the machines and tools you use in real life, and what was actually available in the classroom. This gap has narrowed though – PCs, tablets and software are broadly the same across the board, so there should be a much greater correlation drawn between what's taught in schools and what will ultimately be used later in life.

While computers can be used in many subjects to 'assist' learning, what Wolfram talks about is ensuring teachers are there to guide the pupils through the problems, with the machine doing the calculating.

"I'm not against people learning things that they actually need to know by hand, but what they shouldn't be doing is wasting their time learning stuff they don't need to know by hand," he says. "Instead, they should be doing higher-level problem solving."

With programming likely to receive more attention in school syllabuses around the world in the coming years, computers will likely become more and more ingrained in classrooms around the world. And with a PC or tablet on every desk, machines may well end up replacing many time-consuming manual activities in maths and other school subjects. But it may require a seismic shift in attitude for this to ultimately happen.