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Coming to grips with the millennial mind

LUKE SLATTERY

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"I can no longer teach with these new brains," says an exasperated Clio Cresswell, mathematics lecturer at the University of Sydney and author of *Mathematics and Sex*. The core of the problem, she says, is the diminishing capacity of undergraduates for "linked thinking". And it's not just a problem in the classroom.

"I've always enjoyed teaching," she says. "But these days students are so busy posting on social media — 'love the burger', 'great fries' — that if something tragic happens to a loved one they struggle to understand why they're feeling the way they do. They've trained themselves in first-step thinking. Their worlds are constructed of disconnected moments."

It's an axiom of cognition that when the brain learns new ways of doing things, the command centre in the cranium evolves in response. Anthropologists and biologists track these changes across large spans of time, but the digital revolution has come on so fast that the brain is being remade in decades, not eons.

Between 2007 and 2012 the number of internet users doubled to two billion. Four years later the world's digital population had leapt to 3.5 billion, and this year it reached 4.2 billion — more than 55 per cent of the global population.

Cresswell has her own way of measuring the changes.

This year, after a break of five years during which she taught mainly gifted second-year mathematics students, she returned to a class for students who do not particularly like maths

but need it for subjects such as psychology and geology. Immediately, she noticed a difference.

"They don't turn up for lectures and they don't ask questions," she says.

"They have no idea about the interactive process."

She describes a sea of "glazed" eyes. "Mostly they're looking at their screens, and occasionally they'll take a photo of me and an equation."

Wiki, she adds, is their go-to tool. "But while Wiki is pretty good for maths it doesn't teach you how to think mathematically; the whole point is to connect ideas."

Cresswell's first-hand observations about what was once, rather quaintly, termed the chalkface are all the more penetrating because she is no badly dressed myopic maths nerd in the mould of *The Big Bang Theory*'s Amy Fowler. If anyone can cut through the fog of student lack of interest, it's Cresswell, whose TED talk Mathematics and Sexhas been viewed by more than eight million people.

So dispirited is Cresswell with the state of mathematics literacy, in an age when the algorithm rules just about everything, that she foresees a world divided into a numerate priesthood and an innumerate mass.

"I'm seeing a big problem in a society in which everything is maths-based," she says. "Fewer and fewer people know how maths works, and they're asking more and more stupid questions and getting more and more disenfranchised."

Steven Schwartz, emeritus professor and former vice-chancellor of Macquarie University, shares Cresswell's concerns about maths literacy.

A board member of Teach For Australia, a nonprofit body set up to tackle educational disadvantage, he nevertheless resists generalising about the digital brain when all brains are different.

Schwartz, whose academic field is psychology, stresses the prior role of genetics, which affects children's behaviour, particularly the amount of time they spend on devices and how their brains respond.

"Kids who are genetically inclined to obesity may spend more time in the bedrooms playing computer games than riding a bike to the beach," he says.

"This not only makes them fat but also affects their neurobiological functioning. These kids would probably wind up obese even if they never have access to a computer or phone.

"If a child inherits risk factors for cognitive deficits, as measured by NAPLAN (National Assessment Program — Literacy and Numeracy), he or she may spend more time playing computer games, which could make cognitive deficits even worse. Limiting device time for those kids may help, especially if they spend the liberated time reading.

"On the other hand, limiting device time for kids without the same genetic disposition to cognitive deficits will not have the same beneficial effect.

"The bottom line is that kids are all different and they need to be treated as individuals. When it comes to device time, one size does not fit all," Schwartz says.

New research does suggest, however, that some conclusions about the brain's response to digital stimuli can be made with confidence. A recent study out of Norway, published in the *International Journal of Educational Research*, found that students who read texts in print performed significantly better in comprehension tests than students who read the same texts digitally.

In the graduate employment market, however, there are signs the digital brain may not be all bad. Andrew Spicer, chief executive of Australia's biggest financial comparison website, Canstar, is "in awe" of new graduates.

"Millennials are highly educated, energetic, with a desire to learn, and many are entrepreneurial in their approach to business," he says.

Spicer doubts there is an enormous cognitive gulf separating the generations, although he says that his young graduates clearly have different ways of communicating.

This, in turn, puts the onus on managers to learn to communicate with them.

"Millennials' success in the workplace can be guided by teaching them patience and resilience, and managing their expectations. We have learned that it's valuable to communicate more, and explain the why as well as the what," he says.

Trent Innes, managing director of global software company Xero's Australian operations, is equally sanguine.

"What's different today is the pace of information," he says. "Devices have accelerated the frequency with which we communicate, and that can be overwhelming. The next generation needs more advice on how to use these tools. Our education system can help kids navigate what has become a river of information."

As principal of architecture practice BVN, it's Matthew Blair's job to think deeply about the ways technology is transforming architecture and building construction, and the changes, he says, are just beginning to gain momentum.

He foresees a time in the not too distant digital future when virtual reality and automation will turn architectural designs into finished built forms.

He works alongside the generation that will steer and shape this process and the most observable change he has noticed is its ability to inhabit the real and virtual worlds simultaneously.

"Their consciousness is in both places at the same time," he says. "The brain has enabled that to happen."

He's not the first to observe that digital natives feel they don't need so much to know stuff as to know where to find it.

"They think it's more important to think critically and have ideas," he says.

Blair concedes that the downside of the digital brain, with its capacity to traverse the temporal and virtual worlds, is a more diminished capacity to maintain concentration and focus, both of which are preconditions for the "linked thinking" that Cresswell says is essential to mathematics, and may also prove an essential ingredient of the self as conventionally understood.

"But I'm an optimist," Blair declares. "And it's good to be optimistic."