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Captain Science Says

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As Chief Scientist, I am often asked about the future.

How do you predict it? How do you plan for it? How do you *teach* for it?

Google's chief economist Hal Varian had a simple rule. If you want to see the future for all of us, look at what the richest people have today. Technology will find a way to make it available at scale.

One hundred years ago, the rich had servants. Now we have dishwashers and microwaves.

One hundred years ago, the rich could afford delicacies like ice-cream. Now we can all have ice-cream, all the time, and it comes in 250 flavours from Coles.

One hundred years ago, the rich could travel around the world. Now more than five million Australians get on a plane and fly overseas on a holiday, every year. And another four million travel on business.

I don't know about trickle-down economics… but trickle-down *technologies* makes sense.

So that's one approach to seeing the future. But today I'd like to propose a variation.

To see the future for your children, look at the superheroes of your parents.

Take me, for example. I grew up in the Silver Age of Comics: the 1960s. My parents were Golden Age: from the Great Depression to about 1950.

Let me introduce you to some of the heroes of their era.

First, meet CAPTAIN SCIENCE.

An eminent physicist with enormous wealth, and a young assistant, named Rip.

He is visited by an alien, who passes to him the Vessel of Star-Born Knowledge, A Mechanical Brain that Can Impart To Its Wearer (All) Unlimited Information!

My children have Mechanical Brains, too. But they call them smartphones.

Second, let's meet CAPTAIN VIDEO.

Captain Video is the Greatest Electronic Wizard the world has ever known! The Master of Time and Space! The Guardian of the Safety of the World! He fights for Law and Order, from a Mountain Retreat, with technological tools!

And here is one of his marvellous inventions: a "motor-propelled wheelchair"!

Well done, Captain Video, Greatest Electronic Wizard the World has ever known. He conjured up a motorized wheel chair, decades before they became the present-day standard mobility device for the disabled.

Now, meet our third hero: V-MAN.

A hero. A patriot. Armed with superhuman strength.

And supported by a team of V-Boys, with whom he communicates via… a ring.

Yes. He Skypes. With bling.

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Now, we could say that science cuts superheroes down to size. But I prefer to say that science and technology makes superheroes of us all.

Science and technology are our superpowers.

And stories… imagination… are our guide.

What might that mean for the decades ahead?

Well, what does a superhero look like to you?

Can they move things with their mind?

Imagine a device that can translate your brain signals into computer code.

Imagine if your brain was linked to the internet.

Imagine a Bluetooth connection, in your head.

Is your superhero ultra-strong, ultra-fast, and bullet-proof?

Imagine if that device in your brain linked to an exo-skeleton, made of carbon fibre. And you could move the limbs in the way you wave your hand, by thought.

Does your superhero have fantastic vision?

Imagine if we all saw the world through augmented reality – with a contact lens.

So that we could see through walls…

… or know instantly what to do in a medical emergency, because the instructions would just scroll in front of our eyes. Hand here. Press this hard. This many compressions.

It's astonishing… but it's achievable, perhaps within the next decade.

And perhaps, if we're honest… it's just a little unnerving.

After all, if a *superhero* can be pushed aside by technology… then what are the chances for everyone else?

Will we also be pushed out of our jobs by machines?

Or if we can't beat them, will some of us join them? Will the rich race ahead with the benefit of technology? And will the rest of us be left to fall behind?

Will we fail as parents?

Or worse… will we succeed… and see our children vanish into a whole new world, with marvellous technologies, that we don't understand, and can never enjoy?

By now, I'm sure you've seen the headlines. The panic seem to come in waves.

We're in the midst of another round right now, sparked by the release of a new report from McKinsey, the global consultants.

McKinsey estimates that about fifty per cent of all the jobs done today could conceivably be done by machines. That's the jobs of today, with the technologies of today.

By 2030, McKinsey predicts that up to 800 million jobs could be displaced by automation across the globe.

Put yourself in the position of a new parent. Here you are, baby at home, dreaming of her future, projecting ahead.

2030: it's barely more than a decade away.

Your child will still be in primary school. You might still have a HECS debt!

And now you're told that close to a billion jobs will be gone – as many as one in three jobs in developed economies?

That's not unnerving – that's appalling!

Of course, if you read the report, you'll discover that 800 million jobs is simply what McKinsey considers the "fast" scenario. The "slow" scenario is 10 million jobs lost: virtually zero percent.

The range is important, because it captures the reality that any report worth reading will acknowledge.

Change is complicated. It comes down to choices. And it cuts both ways.

We can confidently predict that some jobs will be displaced, just as jobs have always been displaced.

But jobs will also be created. Jobs will be transformed. Jobs will be opened to new kinds of people. Jobs will require different skills.

Some companies will undoubtedly take advantage of new technologies.

But I can imagine that others will cater to consumers who prefer their services delivered robot-free.

Robot-free restaurants. Robot-free music. Robot-free handicrafts. It won't be long, in a neighbourhood near you.

Even with the resources of McKinsey, it is all very difficult to model, and extremely dangerous to think you can predict.

But taking all that into account, it is not impossible to prepare.

And when parents ask me where on Earth to begin, in a world of such stupendous potential, and such staggering risks…

…I tell them to learn from the secrets of parents before.

After all, look at the things that seemed amazing to my parents' generation.

The helmet of knowledge. A motorised wheelchair. Video calls.

In their day, those things were science fiction.

And that generation of parents raised the people who made them real.

Bill Gates. Steve Jobs. Jeff Bezos, the founder of Amazon. Thousands more, men and women, from many backgrounds, in many countries.

How did they do it?

Certainly not the Captain Science way, by the convenient arrival of an alien with all the answers from outer space.

It would be nice… but I wouldn't count on it.

No, these parents raised their children the old fashioned way, with two very ancient technologies.

And both of these technologies are widely available, and publicly funded.

Can you guess? I'll tell you.

The first is the book. Yes, the humble book.

Steve Jobs said that school was tough because all he wanted to do was read and chase butterflies.

Jeff Bezos read the science-fiction masters: Jules Verne, Isaac Asimov and Robert Heinlein.

Bill Gates read so constantly that his parents had to bring in a rule: no reading at the table.

That might sound familiar.

Anyone who grew up with books will understand their power to stir the heart, to stock the brain, to spark the imagination.

Perhaps that's why a particular statistic from the TIMSS Study caught my eye.

TIMSS is the Trends in International Mathematics and Science Study, one of the two major global rankings, alongside PISA.

Consider this: students who have more than 200 books in the home are eight times more likely to perform at the advanced level in science, than students with fewer than 25 books at home.

That's in Year 4.

By Year 8, the gap is larger again: students from a home filled with books are nine times more likely to reach the advanced threshold than students with just a few.

Of course, it's one thing to have books in the home – it's another thing to use them.

So, Vital Technology Number One is The Book.

But it has to come with Vital Technology Number Two: The Teacher.

Steve Jobs, Jeff Bezos and Bill Gates all had the benefit of teachers.

Their first teachers were their parents, who fed their hunger to learn. Who taught them to read. Who gave them books. Who made it normal to talk about books and facts and history and science and global affairs and new technologies, in the home.

Their next teachers were the professionals. Every one of them had at least one teacher who helped them to channel their brilliance.

They weren't necessarily the easiest children to teach.

Steve Jobs had a reputation for what we now call "disruption". We encourage it in entrepreneurs, we frown on it in children: particularly when those children are easily bored and highly creative.

Jeff Bezos was a challenge at the opposite end of the spectrum. He was so invested in his own education that he developed a Teaching Excellence Metric and statistical survey to rate his teachers on outcomes rather than popularity. He was twelve.

In high school he founded his first business, called the Dream Institute, an educational summer camp for fourth, fifth and sixth graders.

Yes: he was trying to disrupt the education market.

Gather the data, disrupt the established players: the Amazon playbook.

Bill Gates sold his first computer program at the age of 15. He made $20,000. At which point he decided his ambition was to drop out of school, start a software company and become a billionaire.

His parents thought he should go to Harvard and become a lawyer. Or at least go to college. Or at least finish school. Please Bill, stop making money, just go to class.

No, these were not easy children to teach.

But no child is truly "easy to teach", if by that we mean straightforward, textbook, programmed, predictable.

Every child is astonishing – and you wouldn't be in this audience if you didn't agree.

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We place an enormous weight of expectation on our professional teachers, and rightly so.

When we ask "what makes a good teacher?" we are really asking "what does it take to make a great future?"

- What skills will our students require?
- What values should they honour?
- What should we consign to the past?
- What should we preserve in memory?
- What should we carry forward, together?

All of them, difficult questions.

Most of us can ignore them, shrug our shoulders or take a raincheck.

Most of us can make the future someone else's problem – even if we shouldn't.

But not teachers.

Every day, when you stand up in front of a classroom, the future stares you in the face. It speaks your name. It looks to you for guidance.

Yes, being a teacher is an awesome responsibility.

So how do I define a great teacher?

Let me put the question back to you.

Imagine for a moment that you were asked to *build* a teacher: a robot for teaching.

Think of all the content you would need to upload into the robot's memory banks.

Think of all the features you would include: facial recognition. Long-life batteries. Real-time communication with parents. Multiple directional microphones and video recording facilities.

Every week, this robot would power down to install the upgrades: to incorporate new data on evidence-based teaching, or the latest podcasts and audiobooks.

We could add laser sensors so the robot teacher could go on playground patrol.

And a team of Robot Teacher On-Call Support Officers, who would scan for malware and ward off cyber-hackers.

This robot could not possibly be any better: it is the best possible teaching robot human beings could possibly build.

Then ask yourself: would I want that robot teaching my child?

And in almost every instance, the answer will be NO. NO! Keep your robot: I want a human.

Yes, I want humans who can harness technology: I want evidence to guide their teaching practice. I want my child to have role models who embrace change, rather than resist it.

And I also want the things that a robot can't provide.

Insight. Empathy. A deep human investment in my child as an individual.

And above all, the capacity to speak human: as a human, who understands what it is like to strive, to fail, and to strive again.

That is my definition of the great teacher.

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Is it important to train great teachers? It is more than important: it is imperative.

I know that many groups are calling for teaching to require a masters-level qualification.

It would mean that every teacher brings discipline expertise, life experience and a masters of education to the classroom.

I support those calls: I welcome the recognition that teaching is just as demanding as practising law or accounting.

But *training great teachers is not enough*.

It's not enough.

Education has to begin in the home.

It has to begin with our parents, our first teachers, and an environment rich with questions, with language, with numbers, and above all, with books.

Parents matter enormously.

As Chief Scientist, I can give speeches and publish reports about the importance of education. I like to think that parents listen: I believe at least some of them do.

But I don't have what you will have as teachers: daily contact.

I look at you not just as future leaders in the classroom, but leaders in the community as well.

You are the ambassadors for learning.

You can empower parents to embrace *their* role as teachers, and set the expectations high for every child.

You are role models for teaching.

You can make the future an exciting place.

And you can help us to get there together!

But you can't do it alone.

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In my two years as Chief Scientist, I've been overwhelmed by offers of help. Business leaders, universities, individual scientists, politicians: everyone wants to invest in the future.

They know the best investment is in teachers and schools.

But they don't know how to go about it.

I hear the same message from parents and teachers: they want to access support, but they don't have the resources or time.

My first response was the STAR Portal.

It’s a website where individuals, companies and universities can post information about their activities for students.

It’s easy for teachers to search, and it’s made it easy for providers to see the gaps.

It’s prompted many companies to think about doing more – or doing better.

And that fed into my second opportunity to respond, a report for the state, territory and Commonwealth education ministers on optimising the ways that industry can help schools with their STEM teaching. The aim is to inspire Australia’s next generation.

The panel supporting me on this report is a network of businesses, governments and educators, projecting ahead to 2030 and working backwards to the opportunities we offer in schools today.

Many of the participants are multinational companies, or their leaders have experience working overseas.

They see incredible potential in Australia

They see incredible ambition in other countries.

They want to marry the level of ambition they see overseas to the scope of potential they see at home.

And they know from experience: it is easy to establish a program that attracts the best of the best, the top cohort of high achievers.

It is difficult to shift the culture at scale: to raise all of our students to race to 2030, in the knowledge that the country is running with them.

Students want jobs: they want a future.

If they see Australia as a place where science is valued, where people are prepared to take risks, where technology is embraced, where the world looks for leaders… then that will guide their choices.

And if they see science as the path to many careers, then they might pursue it, and work out that they enjoy it…

And they might infuse their new thinking across the economy.

At scale.

And finally, let me mention a third response: a small one, my favourite.

It’s about books.

I call it the Storytime Pledge.

Last year I joined the throng of leaders putting out their holiday reading lists. This year I’m not promoting books for adults. My focus this year is on children.

But I am not calling on children to read more.

Instead, I'm calling on adults to read books to children. Starting early. And every day.

I read to my two sons while they were still in the womb!

I read to them every night that I could, often drifting off to sleep with them, and I admit it, occasionally even dozing off before they did.

They've done well, my two boys. They were fortunate to have great teachers. And their teachers were fortunate to have two young children enter their classes with a love of reading that started early, seriously early.

I've recruited some of my colleagues – amongst them a few Nobel Laureates – to recommend their favourite children's books, and pledge to read them to a special child in their lives.

Look at the great leaders inspired by books and contributing to this campaign!

Great scientists, like Michelle Simmons. Nobel Laureates, like Peter Doherty.

So I'm ending the year with a simple message: adults, read to children!

And I'm going to call it now: comic books COUNT. Even if my dad didn't agree.

The pictures, the colours, the plotlines… and yes, even in comic books, there were *words*… for me, they brought big concepts to life.

And they can be more prescient than you know.

After all, think back to Captain Science. Captain Video. V-Man.

Their reigns were short and glorious. But their legacy is unfolding to this day.

They really did help to save the world… they sparked ideas.

They nurtured brains.

They were superheroes who were teachers.

You are teachers who will be superheroes.

In the words of Captain Video: Be STRONG. BE FEARLESS.

And in the words of your Chief Scientist: INSPIRE YOUR STUDENTS.

THANK YOU