

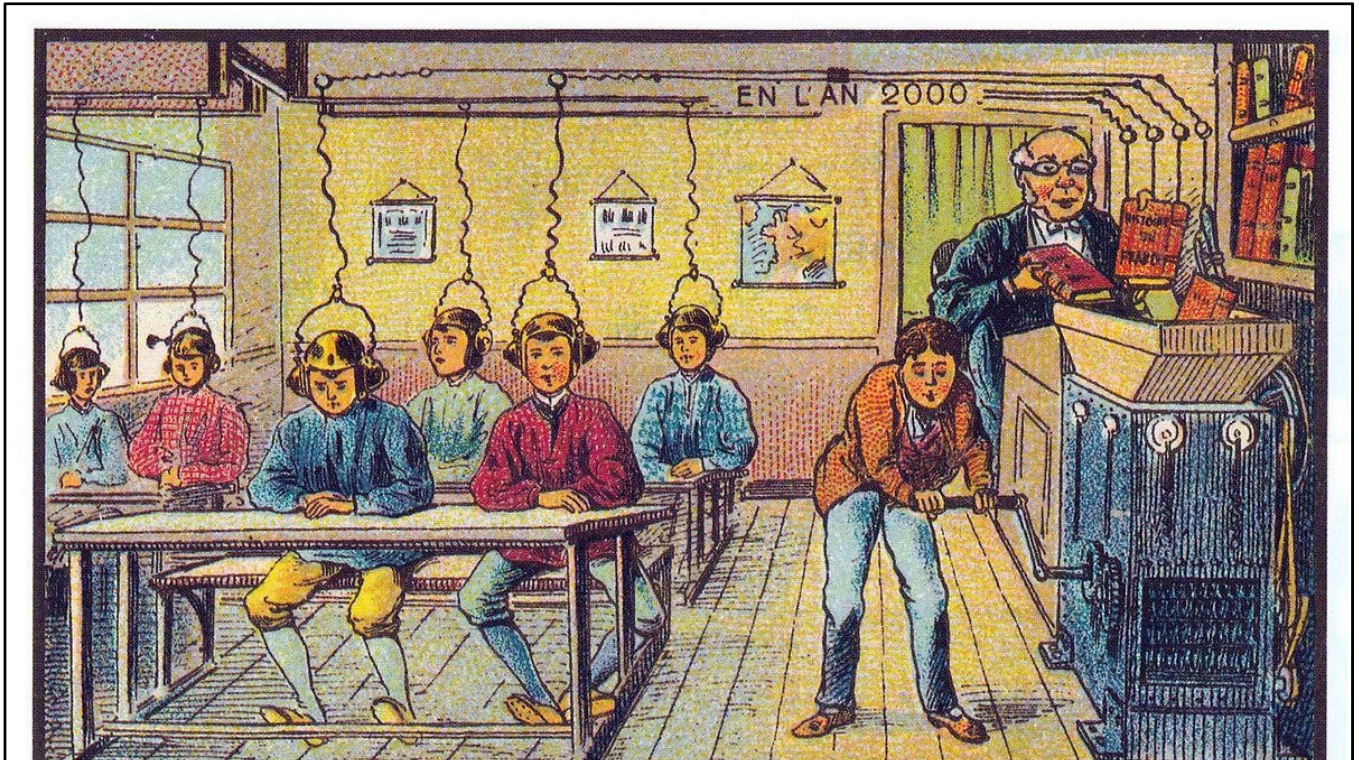
Over the Horizon

A few future educational scenarios

By

Peter Hutton

Educator and Futurist



No Wireless, mechanical, hierarchy, male, sparse, serious business, seated,
separate from outside world,
Done in a specialist room, individual pursuit, unpleasant, direct instruction

Either Jean Marc Cote (if 1901) or Villemard (if 1910)

À l'École

Chromolithographie

Paris, BNF, Estampes http://expositions.bnf.fr/utopie/grand/3_95b1.htm

Held captive by mental models



A recepie

Held captive by mental models

- Factory
- Cooking
- Journey
- Garden
- Ecosystem



A recepie

Held captive by mental models

- School
- ATAR
- Uni
- Job
- Mortgage
- 2.1 Kids

The good life!



A recepie



(1 or 2 slides)

Use this and the following slide to show that the original design of schools was very appropriate for the workforce they were preparing students for.



2 of 2 slides)

Use this and the following slide to show that the original design of schools was very appropriate for the workforce they were preparing students for.

Interestingly the business owners did not put their own children through such a system.
– They were educated by private tutors or in small private schools of less than 50 students in total.

The problem is that modern workplaces do not work like this



Lecture at the University of Pennsylvania School of Medicine in 1888, when the school was already 123 years old

Job Shift

- Almost **5 million** Australian jobs (40% of the workforce) will be replaced by computers by 2035.
- **60%** of young people are currently studying for jobs that will be radically altered by automation.

Source: The Committee for Economic Development of Australia 2015



40% of jobs are highly likely to be automated. Another 18.6% have a medium probability of being automated. (p. 8)

Durrant-Whyte, H. McCalman, L. O'Callaghan, S. Reid, A. and Steinberg, D. "The Committee for Economic Development of Australia" (CEDA), (2015), Australia's Future Workforce, Ch. 1.4, pp. 60. Available from: <http://adminpanel.ceda.com.au/FOLDERS/Service/Files/Documents/26792~Futureworkforce_June2015.pdf>

<https://www.fya.org.au/wp-content/uploads/2015/11/How-young-people-are-faring-report-card-2015-FINAL.pdf> (p.2)

and their likely future...

Today's learners are the most formally educated generation in history. They are starting education younger and are projected to stay in education for longer.

But...

when 'Generation Z' learners leave education they are predicted to have 17 employers across 5 separate careers, working in jobs that don't even currently exist.



Source: AITSL

Portfolio Employment

Up to **30%** of Australians are now in “flexible work”, that include multiple jobs, using a mixture of skills and capabilities.

Forbes

18,831 views | Oct 17, 2017, 09:32pm

Are We Ready For A Workforce That is 50% Freelance?



Elaine Pofeldt Contributor @

If freelancing continues to grow at its current rate, the majority of U.S. workers will be freelancing by 2027, according to projections in the Freelancing in America [Survey](#), released today by the Freelancers Union and the giant freelance platform Upwork. The survey found that 50.9% of the U.S. population will be freelancing in 10 years if a current uptick in freelancing continues at its current pace.

Airtasker

Prediction 50% Portfolio by 2030

How Are Young People Faring in the Transition from School to Work? FYA, 2015

<https://www.fya.org.au/wp-content/uploads/2015/08/fya-future-of-work-report-final-lr.pdf> (p. 17)

Since the 1990s almost 60% of the growth in jobs across the OECD has been temporary, part-time or self-employed

Young Health Professionals

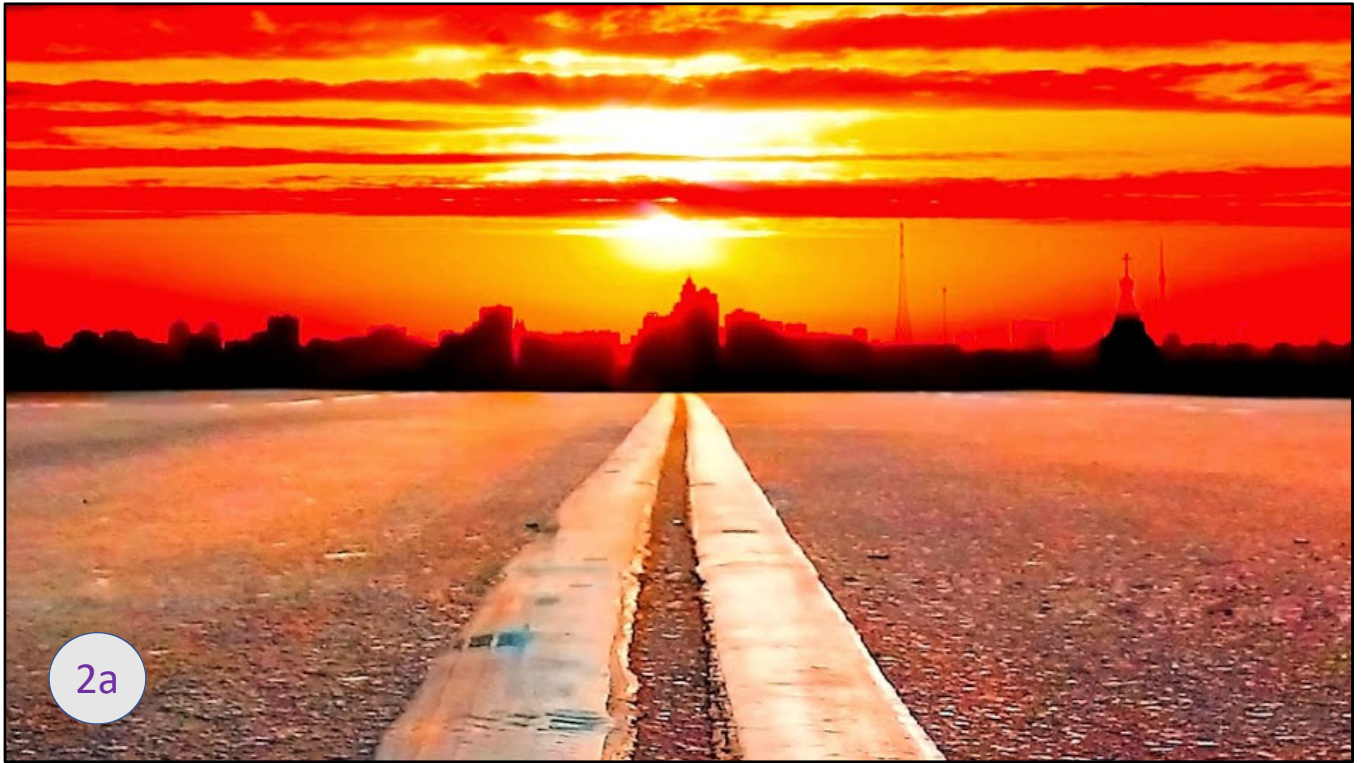
- How do they want to be treated?
- How will their pathway differ from yours?
- What will they retain from their time with you?



Over the Horizon













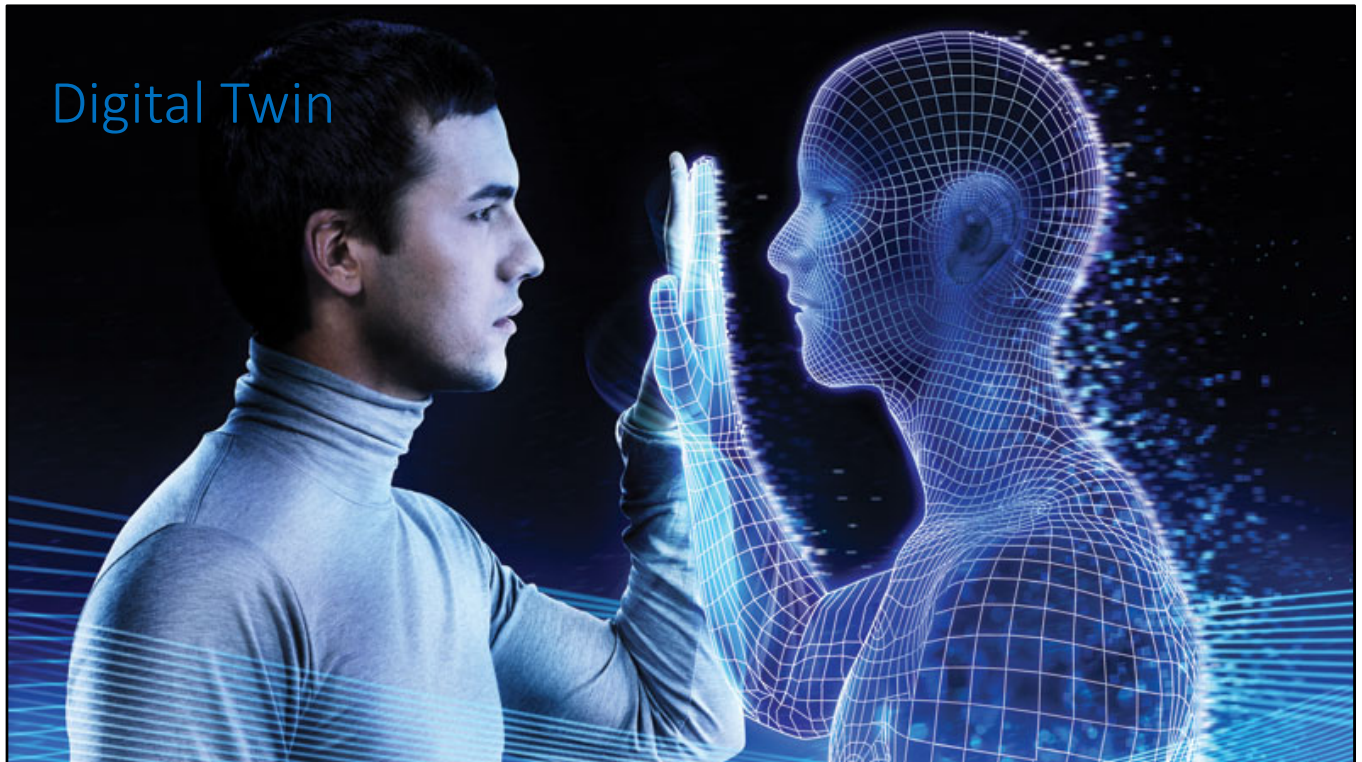
Picture by Banksy

“School is basically preparing students to be second class robots”

Charles Leadbeater,

Author of *The Problem Solvers:*
The teachers, the students and the radically disruptive nuts
who are leading a global learning environment





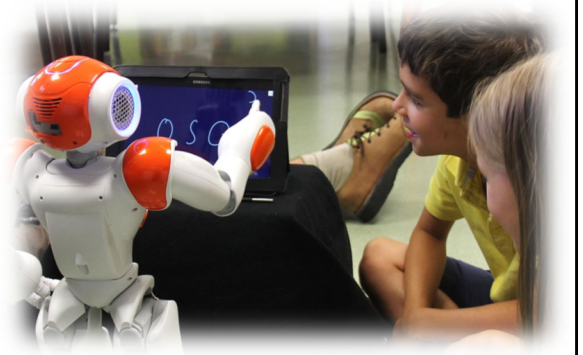
Compassionate Digital Twin in education

- Knows you better than you
- Sees the world more accurately than you
- Can read behaviour better than you
- Knows how you actually function best
- Monitors your frustration vs engagement level (Vygotsky)
- It will even deliberately frustrate you to stop satisfaction normalisation

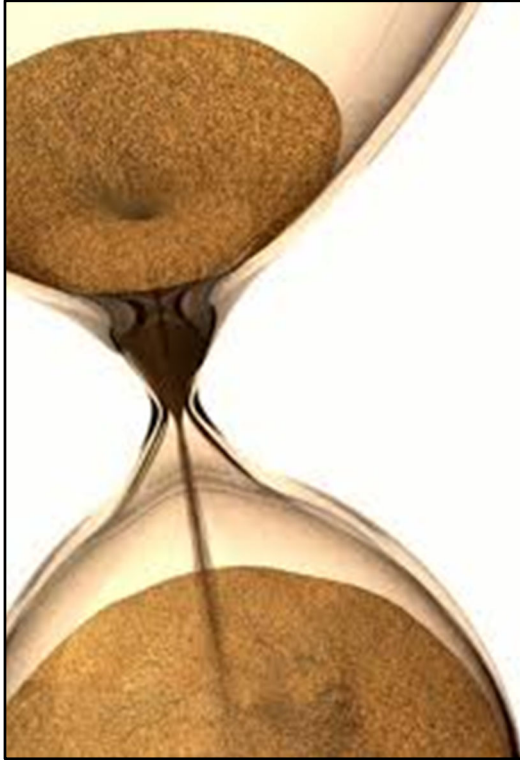
- Will it become your best friend?

What could this mean

- Humans have almost no physical 'value to add'
- The end of privacy – You are known universally.
- The end of “experts”
- True individualisation - 'small data'
- The 'rush' to learn & earn ceases
- Do we become virtual children?



Artie – Affective Robot Tutor Integrated Environment, or ARTIE
<https://bold.expert/the-social-robot-teacher/>



Time

- Published discoveries lag published research by 3-4 years in commercial environments
- Medical journals publish over 500,000 papers each year.
- Doctor would have to read 167Hrs per week to stay fully informed
- Medical information doubles every 3 years

Source: Dr Hui Lei CTO 2018 IBM Corporation

It obviously does not include reading all the papers or that would equate to 6min per article

Google Health

AIM: Increase availability, accuracy & reduce the cost of medical care

E.g. Predictive factors for cardiac event in next 5yrs

Machine Learning 0.7 accuracy Doctors =0.5

- Support professionals to read scans = top quality professionals
- Big Data and Small Data of health
 - Electronic Medical Record
 - Continual biological monitoring
 - Personalised treatment
 - Personalised pharmacy



Neural Networks get better the bigger the data sets rather than getting bogged down
Far more accurate particularly where professional is under time restraints

Diabetic Retinopathy

A treatable condition if detected early enough



Diabetic Retinopathy is a treatable condition

10,000

Picks up micro aneurisms

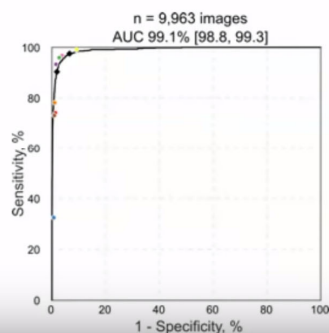
https://www.youtube.com/watch?v=JzB7yS9t1YE&ab_channel=GoogleDevelopers

Deep Learning is now approaching the accuracy of health care specialists for certain tasks

1.75

JAMA | Original Investigation | INNOVATIONS IN HEALTH CARE DELIVERY

Development and Validation of a Deep learning Algorithm for detection of Diabetic Retinopathy in Retinal Fundus Photographs



F-score

0.95

Algorithm

0.91

Ophthalmologist
(median)

"The study by Gulshan and colleagues truly represents the brave new world in medicine."

Dr. Andrew Beam, Dr. Isaac Kohane
Harvard Medical School

"Google just published this paper in JAMA (impact factor 37) [...] It actually lives up to the hype."

Dr. Luke Oakden-Rayner
University of Adelaide

In May 2016 equal with generalist ophthalmologists by Jan 2018 drew level with Retinal specialists

F score is sensitivity and specificity

Sensitivity – Did it get the diagnosis correct when the condition is positive. How many true positives out of all those who have it

Specificity – How accurate was the diagnosis. How many true negatives.

Diabetic Retinopathy is a treatable condition

https://www.youtube.com/watch?v=JzB7yS9t1YE&ab_channel=GoogleDevelopers

IBM Watson Health Cloud

AIM: Accurate, scalable, actionable solutions

- Approx 30% of healthcare budget wasted
- Deidentified data from FitBit & Healthcare providers
- Ecosystem. Patients, doctors, hospitals, insurers & Deep Learning research
 - Watson for Health Care
 - Watson for Genomics
 - Watson for Drug Discovery

IBM Watson Health

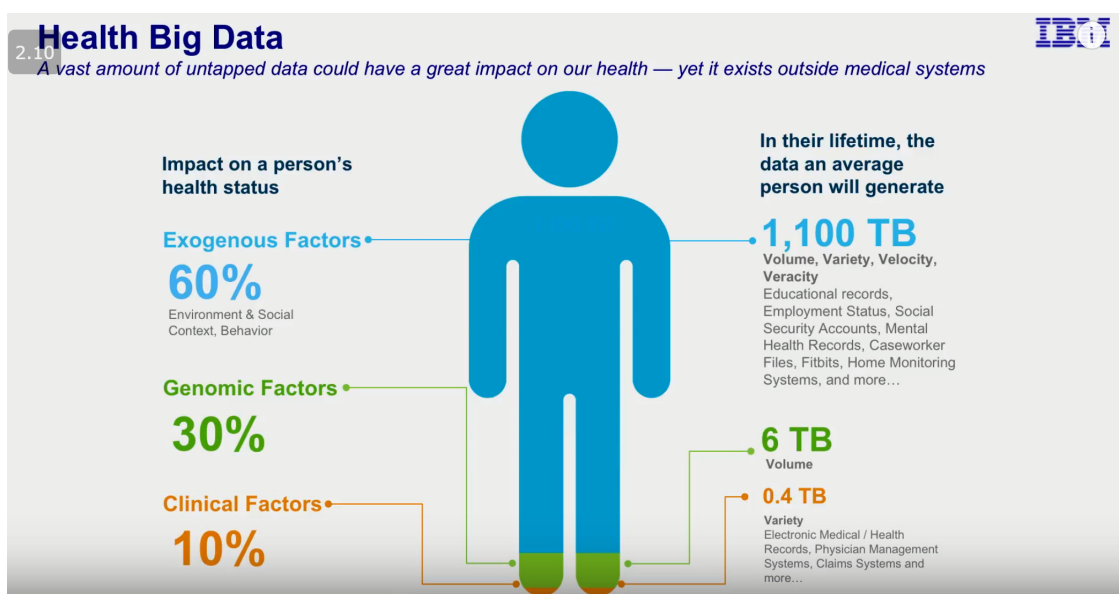
Neural Networks get better the bigger the data sets rather than getting bogged down

Far more accurate particularly where professional is under time restraints

Looks for use of drugs that are already approved...Parkinson's Disease

https://www.youtube.com/watch?v=ZPXCf5e1_HI&ab_channel=IBMThinkAcademy

https://www.youtube.com/watch?v=YmTJDnT1Jlg&ab_channel=SAIConference



Source: Dr Hui Lei CTO 2018 IBM Corporation

Dr. Hui Lei is Chief Technology Officer of IBM Watson Health Cloud, an IBM Distinguished Engineer, and an IBM Master Inventor. Previously he was Senior Manager, Cloud Platform Technologies at the IBM T. J. Watson Research Center, and led IBM's worldwide research strategies in cloud infrastructure services and cloud managed services. His technical interests include cloud computing, big data, mobile and pervasive computing, and enterprise computing. His technical vision and creative contributions have impacted many commercial software products and services, and have resulted in over 70 patents. He is a Fellow of the IEEE, Editor-in-Chief of the IEEE Transactions on Cloud Computing, and a past Chair of the IEEE Computer Society Technical Committee on Business Informatics and Systems. He has taken part in many international conferences as a steering committee chair, general chair, technical program chair, or keynote speaker. He was recognized with an IEEE Computer Society Technical Achievement Award in 2017 and an IEEE Computer Society Distinguished Service Award in 2014. He received his PhD in Computer Science from Columbia University. Upcoming Conference: <https://saiconference.com/FTC>

Robot Dentists

A robot dentist has carried out the first successful autonomous implant surgery by fitting two new teeth into a woman's mouth, mainland media has reported.

Although there were human medical staff present during the operation, they did not play an active role while it was being carried out.



**South China
Morning Post**

Source: South China Morning Post SEP 2017

Chinese robot dentist is first to fit implants in patient's mouth without any human involvement

Successful procedure raises hopes technology could avoid problems caused by human error and help overcome shortage of qualified dentists



Alice Yan

Published: 6:30pm, 21 Sep, 2017

110



<https://www.scmp.com/news/china/article/2112197/chinese-robot-dentist-first-fit-implants-patients-mouth-without-any-human>
https://www.youtube.com/watch?v=DcKFLYPBLI8&ab_channel=CCTVVideoNewsAgency

Dental AI – X-ray scanning in real time



Source: Martin Trust Centre SEP 2018

A US Start UP – identified 25% additional issues missed by busy general practice dentists but picked up by specialists

Greater patient confidence as a second opinion

https://www.youtube.com/watch?v=uzShTMLXsAc&ab_channel=MartinTrustCenter

[Martin Trust Center](#)

Published on Sep 10, 2018

SUBSCRIBE 206

DentistAI's software automatically detects pathologies in dental imaging, helping dentists avoid missing diseases and effectively communicating treatment recommendations to patients. Today, dentists miss up to 50% of pathologies in dental x-rays. Treatment delays or non-treatment often results in infections, which can migrate to the cardiovascular system and pose severe health risks to the patient. DentistAI increases revenue for dentists and reduces health risks for the patient in a \$134B U.S. industry.

[e.com/watch?v=uzShTMLXsAc&ab_channel=MartinTrustCenter](https://www.youtube.com/watch?v=uzShTMLXsAc&ab_channel=MartinTrustCenter)

Dentistry

- Machine Scanning & Recommended Treatment Plans
- Quality control/ accountability for care (How long does a crown last?)
- Robot teeth implants
- Clear liner treatment
- Auto teeth cleaning
- Big Data on treatment
- Fully integrated with total health care
- *“From technician to team leader”*



Source: Dr Marc Cooper NOV 2018

Dr Marc Cooper

https://www.youtube.com/watch?v=8H5xftHMrYo&ab_channel=BulletProofDentalPractice

Dentist AI scanning

https://www.youtube.com/watch?v=uzShTMLXsAc&ab_channel=MartinTrustCenter

China Performs Country's First-Ever 5G Remote Brain Surgery



A Chinese surgeon collaborated with Huawei and China Mobile to operate on the brain of a Parkinson's disease patient 3,000 km away using a 5G connection, the first time such an operation has taken place in China.

<https://interestingengineering.com/china-performs-countrys-first-ever-5g-remote-brain-surgery>

Current Health System Faces Serious Challenges



\$2.6 billion

Average cost to research and develop a new drug, which takes an average of 12 years to reach patients

2 million

adverse drug reactions that occur annually in the US and responsible for ~100,000 deaths/year

14 million

new cancer cases each year leading to a 42% increase in the demand for cancer care over the next 10 years

230,000

active clinical trials worldwide. 80% of clinical trials fail to meet enrollment time lines

60-90K

Expected shortage of physicians by 2025

167 hours

of reading required per week for a health professional to keep up with new professional insights

40%

growth expected from 2014-2030 for the US population age 65 and over

\$7.8 trillion

expended annually for health and social programs around the world. Up to 30% of every dollar is wasted.

Sources:

1. Bipartisan Policy Center, "Using Real-World Evidence to Accelerate Safe and Effective Cures"
2. AMFS, "Adverse Drug Reactions and Drug-Drug Interactions: Consequences and Costs"
3. ASCO, "The State of Cancer Care in America"
4. Applied Clinical Trials, "Enrollment Performance: Weighing the 'Facts' "
5. AAMC, "The Complexities of Physician Supply and Demand: Projections from 2013 to 2025"
6. World Economic Forum, "The Global Economic Burden of Non-communicable Diseases"
7. McKinsey&Company, "Healthcare's Digital Future"
8. Deloitte, "2015 Global health care outlook"

Source: Dr Hui Lei CTO 2018 IBM Corporation

https://www.youtube.com/watch?v=YmTJDnT1Jlg&ab_channel=SAIConference

Held captive by mental models



A recepie

What is your strength when knowledge is no longer your strength?

- Surgical robots
- Remote monitoring - ongoing & acute
- Personalised Treatment
- Smart Scanning
- Recommended Treatment Plans
- Outbreak prediction (informed by social media)
- Rise of the 'Pat-sumer'

The Patient consumer power balance. Particularly in dentistry and physiotherapy

What is your strength when knowledge is no longer your strength?

- Surgical robots
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- Outbreak prediction (informed by social media)
- Rise of the 'Pat-sumer'

Which students become 'the best candidates' under this new paradigm?

The Patient consumer power balance. Particularly in dentistry and physiotherapy



Preparing ourselves for “strategic uncertainty”

It's like training in a space program:
 You don't know how, or when, or with
 whom you will fly, but you are
 prepared
 ...this personalized methodology can
 be made accessible to everyone

GELP – Global Educators Leadership Program
 MOSCOW 2017



Summary Report GELP – Global Educators Leadership Program
 MOSCOW 2017

“Transforming Education for Complexity: Why, What and How”

Preparing ourselves for “strategic uncertainty”: personal resilience (physical / psychological health) + mindfulness (attention to attention) + metacognition (“training in a space program: you don't know how or when or with whom you fly but you are prepared” — this personalized methodology can be made accessible to everyone)

Embrace Complexity & Learn to sit with Uncertainty



- Identify your assumptions
 - Dig deep. Almost everything is built on assumptions
- Create mini-tests to explore them

Two genuine 2020 skills

Even a little anxiety



Building a new ecosystem

Students have far more
capacity than we give
them credit for.

They are still students
They are not little adults
They will make mistakes

“Yes” is the default

Any request made by a student, parent or member of staff, the response has to be ‘yes’ unless it takes too much time, costs too much money, or negatively impacts on anyone else.



Treating Students as Equals

- 'One Person Policy'
- First name basis
- Equal respect
- Equal behavioural standards
- Equal access to amenities
- Equal dress standards



Students help to run the school

- Curriculum Committee
- Welfare – excluding personal details scheduled for later in the meeting
- Grounds
- OHS Occupational Health and Safety
- Staff selection panels
- College Council/ Board



Students being employed by school

- School Newsletter Editors
- Social Media Managers
- Photographers
- 1:1 Afterschool Tutoring (\$16 per session)
- IT help desk
- Activities Leaders(\$10-20 per session)
- Office Administration
- Animal carers
- After school tutoring
- Classroom Assistants/ Tutors
- English Conversation Tutors
- Graphic Designers
- Gardeners
- Maintenance services
- Canteen Assistants
- Sound & Lighting technicians
- Catering Assistants
- Primary School Reading tutors
- Sports coaches
- Umpires
- Baristas
- Computer gaming teacher
- Educational consultants
- ...the list is growing

Student Welfare Supported by Students

- Student Health Ambassadors
- Appropriately scaffolded and monitored
- A genuine application of learning & chance for development
- A better utilisation of scarce staffing resource
- Has been successfully done in boarding houses, scouts & cadets for years

**Student
Health & Wellbeing
Volunteers Program**



ILPs for ALL

Individualised Learning Plans

- Written by students using a template
- Supported by Staff and Parents
- Signed off by Parent and Principal
- Subject choices straight into timetable



Student run businesses - ESTEAM

- Student Run Café
- Coffee Cart
- Snake Breeding
- Catering Services
- DJ Services
- Pop up shops
- Selling Excess School Equipment on Gumtree
- Running Activities & Excursions
- Conference Planning
- Bespoke Furniture production
- Handmade Guitar Production
- Graphic Design Service
- Custom Film Production
- Laser Cutting Business
- Name Badges and Door Signage
- Performing Arts Centre Hire
- Party Photographers
- Art Sales and Rental
- Custom Clothing
- Cupcake Art
- Tennis Coaching
- Bands and Busking
- Computer Gaming

Varied Learning Times

No 9.00am – 3.30pm for classes

Early starts

Late finishes

Open 6AM-6PM

Not done because of timetabling difficulties or to fit more learning in,
but simply because some students work better at these different times.

TC 360

6AM-6PM St Luke's Catholic College Marsden Park

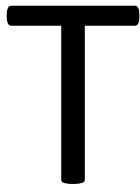
Hyper-specialization Programs

- Where students can spend half to two thirds of school time on a particular focus
- A particular sport, drama, music, dance, art, robotics, computing
- Students learn to develop deep skills and about the success formula



Nobody questions this for music, swimming, gymnastics

T profile



Combine unexpected specialities

T profile vs H Profiles

T

H

Combine unexpected specialities

Where to start?



Culture

From change management to...

Building an innovative, agile and adaptive culture

Innovative - introducing new ideas; original and creative in thinking.

Agile – able to move quickly and easily

Adaptive – having the ability to change to suit different conditions

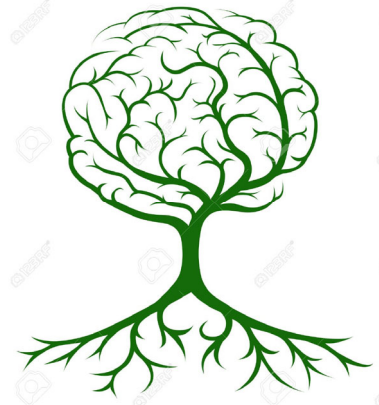
Change and even Innovation speak to a one off change

After which we can “All get back to normal”

The new world **change is a way of being**

Ways of the future

- Holding Uncertainty
- Embracing Complexity
- Radical Transparency
- Ecosystems not systems
- Democratisation
- Open Source
- Creative commons
- Unlock potential
- Rapid Build Out & Prototyping



The 2020 Skills

- Attunement - to bring into accord, harmony, or sympathetic relationship
- Intuition – understanding without conscious reasoning
- Nous - common sense; practical intelligence or wisdom
- Reflective
- Open enquiry
- Authenticity
- Self Awareness & Management – incl self care
- Micro-counselling skills





What potentials lie in the Horizon 3 space?

3

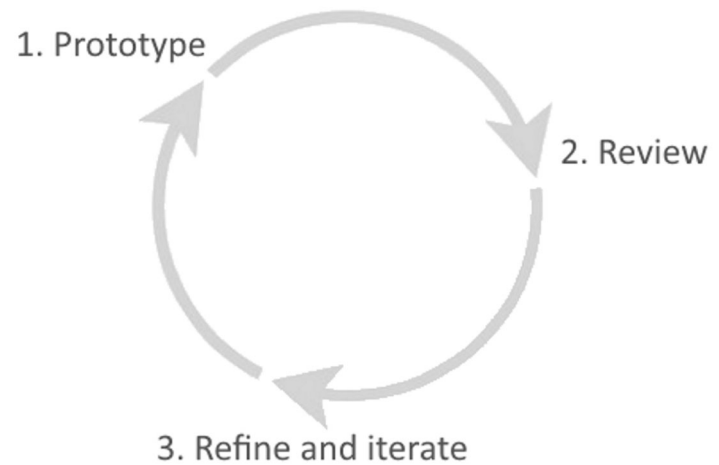
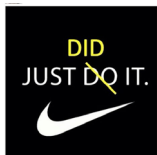
8 Principles for School Transformation

- Flexibility
- Deep integration with Community
- Success for ALL
- High Quality Adults
- Co-constructed Learning
- Student Empowerment
- Development of Self
- Ongoing Skill Development



Where could you start to innovate?

- Low cost
- Quick to implement
- Relatively low risk
- Smaller scale





Potentially hostile, dangerous atmosphere with lots of **unknowns**

But can be **researched**, prepared for, **risks mitigated** against

Must stay **connected** to the ship and the team.

Hard if not **impossible to accomplish things alone**

You create the **environment**

You determine the **resource**

You set the **mission**

You are Mission Control