THE UNIVERSITY OF MELBOURNE

When creativity meets creativity in the Australian multicultural mathematics classroom

Wee Tiong SEAH

What is creativity?

- Many definitions

- Three things about creativity
  - Unleashing the potential of the human mind
  - Conceiving new ideas
  - Subjective

Mathematical creativity - Giving change

THE GLOBAL CREATIVITY INDEX — OVERALL RANKINGS (APPENDIX 4)

Rank	Country	Technology	Talent	Tolerance	Global Creativity Index
1	Australia	7	1	4	0.970
2	United States	4	3	11	0.950
3	New Zealand	7	8	3	0.949
4	Canada	13	14	1	0.920
5	Denmark	10	6	13	0.917
5	Finland	5	3	20	0.917
7	Sweden	11	8	10	0.915
8	Iceland	26	2	2	0.913
9	Singapore	7	5	23	0.896
10	Netherlands	20	11	6	0.889
11	Norway	18	12	9	0.883
12	United Kingdom	15	20	5	0.881

Creativity vs Innovation

Bloomberg 2018 Innovation Index

2018 rank	2017 rank	YoY change	Economy	Total score	R&D intensity	Manufacturing value-added	Productivity	High-tech density	Tertiary efficiency	Researcher concentration	Patent activity
1	1	0	S. Korea	**89.28**	2	2	21	4	3	4	1
2	2	0	Sweden	**84.70**	4	11	5	7	18	5	8
3	6	+3	Singapore	**83.05**	15	5	12	21	1	7	12
4	3	-1	Germany	**82.53**	9	4	17	3	28	19	7
5	4	-1	Switzerland	**82.34**	7	7	8	9	11	17	17
6	7	+1	Japan	**81.91**	3	6	24	8	34	10	3
7	5	-2	Finland	**81.46**	8	16	10	13	19	6	4
8	8	0	Denmark	**81.28**	6	15	11	15	26	2	10
9	11	+2	France	**80.75**	12	35	14	2	10	21	9
10	10	0	Israel	**80.64**	1	27	9	5	41	1	19
11	9	-2	U.S.	**80.42**	10	23	6	1	42	20	2
12	12	0	Austria	**79.12**	5	8	15	26	12	12	5
13	16	+3	Ireland	**77.87**	22	1	1	18	20	14	33
14	13	-1	Belgium	**77.12**	11	22	13	10	37	13	21
15	14	-1	Norway	**76.76**	19	37	19	11	23	8	14
16	15	-1	Netherlands	**75.09**	17	26	20	6	47	15	18
17	17	0	U.K.	**74.54**	20	40	23	14	8	18	15
18	18	0	Australia	**74.35**	14	46	16	17	17	3	20

The design of the Victorian Curriculum F–10 is set out below:

Learning areas	Capabilities
The Arts • Dance • Drama • Media Arts • Music • Visual Arts • Visual Communication Design English Health and Physical Education The Humanities • Civics and Citizenship • Economics and Business • Geography • History Languages Mathematics Science Technologies • Design and Technologies • Digital Technologies	Critical and Creative Thinking Ethical Intercultural Personal and Social

Fostering creativity thinking in mathematics education …

Victorian Curriculum: Maths

	Number and Algebra	Measurement and Geometry	Statistics and Probability
Understanding			
Fluency			
Problem-solving			
Reasoning			

Creativity and the proficiencies

The proficiency strands describe the actions in which students can engage when learning and using the content of the Australian Curriculum: Mathematics.

Understanding

Students build a robust knowledge of adaptable and transferable mathematical concepts. They make connections between related concepts and progressively apply the familiar to develop new ideas. They develop an understanding of the relationship between the 'why' and the 'how' of mathematics. Students build understanding when they connect related ideas, when they represent concepts in different ways, when they identify commonalities and differences between aspects of content, when they describe their thinking mathematically and when they interpret mathematical information

Fluency

Students develop skills in choosing appropriate procedures; carrying out procedures flexibly, accurately, efficiently and appropriately; and recalling factual knowledge and concepts readily. Students are fluent when they calculate answers efficiently, when they recognise robust ways of answering questions, when they choose appropriate methods and approximations, when they recall definitions and regularly use facts, and when they can manipulate expressions and equations to find solutions.

Problem-Solving

Students develop the ability to make choices, interpret, formulate, model and investigate problem situations, and communicate solutions effectively. Students formulate and solve problems when they use mathematics to represent unfamiliar or meaningful situations, when they design investigations and plan their approaches, when they apply their existing strategies to seek solutions, and when they verify that their answers are reasonable.

Reasoning

Students develop an increasingly sophisticated capacity for logical thought and actions, such as analysing, proving, evaluating, explaining, inferring, justifying and generalising. Students are reasoning mathematically when they explain their thinking, when they deduce and justify strategies used and conclusions reached, when they adapt the known to the unknown, when they transfer learning from one context to another, when they prove that something is true or false, and when they compare and contrast related ideas and explain their choices.

(ACARA, np)

The multicultural classroom

Creativity between cultures

What was found …

FL: fluidity	UGA higher
FS: flexibility	ITA higher
O: originality	no difference
E: elaboration	no difference
T: title	no difference

In fact …

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NEWS 03

Let them get bored

Kids benefit when they're not kept entertained

SUSIE O'BRIEN

IT'S good for kids to be bored because it fuels creativity and problem-solving, parenting experts say.

"Boredom teaches children to push themselves, boosts resilience and helps contribute to positive self-esteem," said Associate Professor Julie Green, Raising Children Network director and acting CEO of the Parenting Research Centre.

The network, a government-funded resource for parents, has released a new video on how boredom is beneficial for children's development.

"Parents often feel as if they have to entertain their kids all the time, but they don't," Prof Green said.

"Children benefit from working out what to do with themselves. They can explore ideas and do something that matches their mood.

"It's a fantastic catalyst for kids using their imagination and creating different play scenarios," she said.

Brothers Luis, 12, Charlie, 10, and Felix Bettinsoli, 7, don't have much time to be bored.

"They don't have a lot of down time and manage to keep themselves entertained most of the time by playing among themselves," said their father, Pablo, 40.

"Sometimes, they pull out the 'I'm bored' line and I tell them they'd better find something to do or I will find something for them. That usually means they get busy."

In the video, posted online at raisingchildren.net.au, play specialist Cat Sewell says kids learn to rely on themselves when they get bored.

"They learn resilience. They got through something that is a little bit stressful and a little bit tough — but it is not the end of the world," she said.

Prof Green said it didn't cost much money to help kids find a way out of boredom. "Playing indoors or outdoors is free," she said.

She said more sedentary video games such as PlayStations or Xboxes "offered some learning" but parents needed to set boundaries and provide a balance of activities.

Other researchers have found not all boredom is good for kids, limiting their ability to learn at school.

David Putwain, of Liverpool John Moores University, found boredom, defined as an "unpleasant deactivating emotion", led to lower levels of mathematic achievement in grades 5 and 6 in the UK.

In a Learning and Instruction journal article, he said "higher enjoyment and lower boredom predicted greater subsequent achievement". In turn, he found "greater academic achievement predicted subsequent greater enjoyment and lower boredom".

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his five-month-
l kitten and
other with
er care worker

HELP A CAT
IN A HAT

BRITTANY GOLDSMITH

Universal mathematical activities

Every culture

- ✓ counts
- ✓ locates
- ✓ measures
- ✓ designs
- ✓ plays
- ✓ explains

and in the process, mathematical ideas and practices are produced (Bishop, 1988)

How the affordances / constraints of different cultures foster mathematical creativity

Universal mathematical activities

How the affordances / constraints of different cultures foster mathematical creativity

We will be looking at three contexts today:

- Indegenous Australian culture
- Islamic religious culture
- Confucius Heritage Cultures

Counting

Mathematics in the service of Islam

In what your wives leave, your share is a half, if they leave no child; but if they leave a child, ye get a fourth; after payment of legacies and debts. In what ye leave, their share is a fourth, if ye leave no child; but if ye leave a child, they get an eighth; after payment of legacies and debts. If the man or woman whose inheritance is in question, has left neither ascendants nor descendants, but has left a brother or a sister, each one of the two gets a sixth; but if more than two, they share in a third; after payment of legacies and debts; so that no loss is caused (to any one). Thus is it ordained by Allah; and Allah is All-knowing, Most Forbearing.

— Qur'ān, surah 4, verse 12

Counting

Muhammad al-Khuwārizmi in the early 800s posed the following:

Suppose that a man dies leaving two sisters and a wife and has willed that a certain stranger be given a share equal to the difference between each woman's share and 1/8 of their total share. What should be the stranger's share?

Designing

muqarnaṣ at Masjid-i-Shykh, Isfahan, Iran

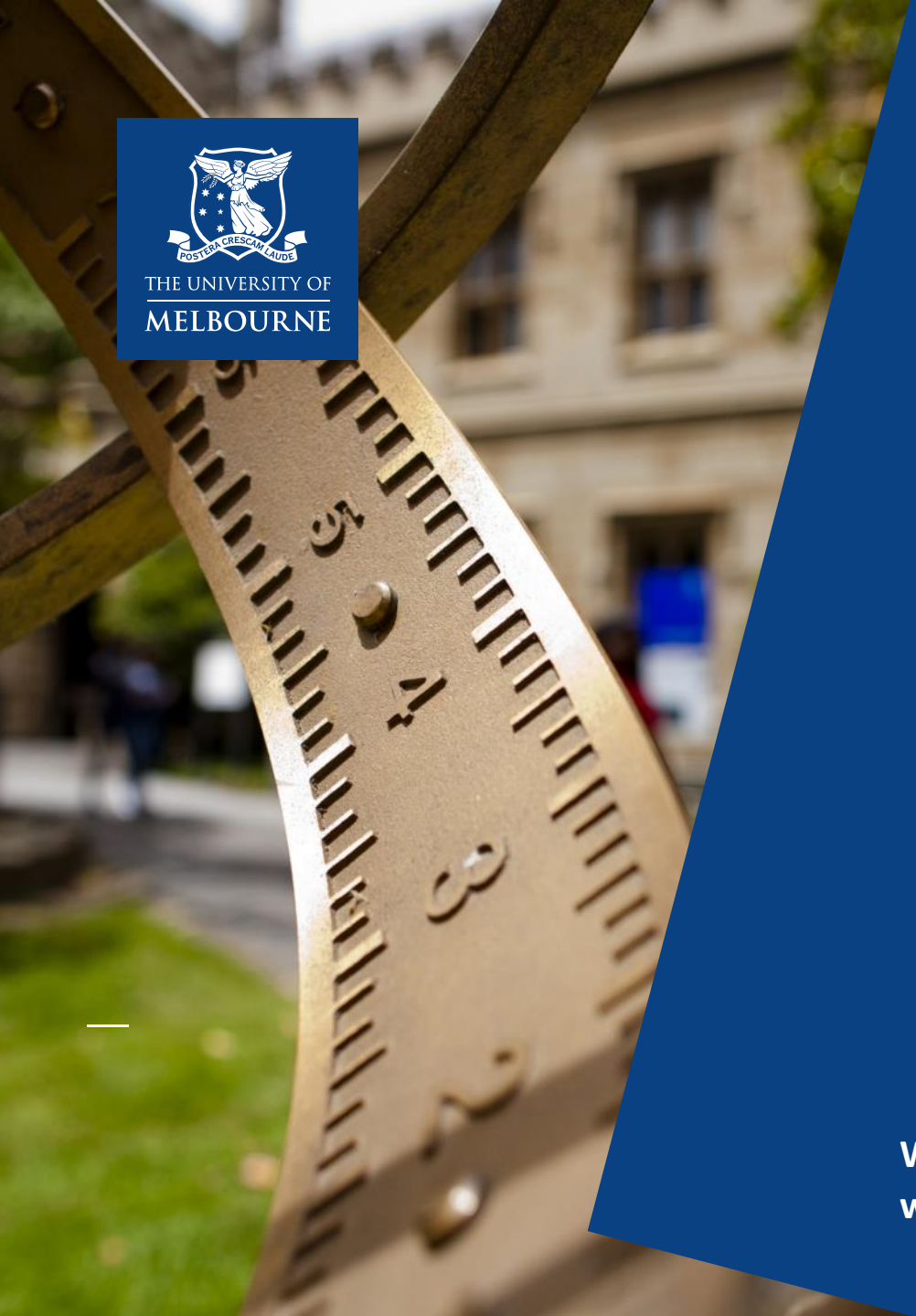
Creativity in the CHCs …

CHC	'West'
Can be acquired (throughout life)	Innate capacity
Based on understanding and connection to tradition; appropriateness	Novelty
Incremental change	Radical and revolutionary
Hardwork and practice Purposeful engagement	Endowing early inspiration
Responsibility to environment	Individual-focused
Top-down	Bottom-up

Counting, measuring, designing, etc

Eg: The valuing of *efficiency*

- Creative solution approaches
- Creative means of memorising something



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Thank you

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