STEM in SACE

Developing a STEM Approach to Learning through Research, Student Voice and a Touch of Neuroscience.

Dr Rogan Tinsley
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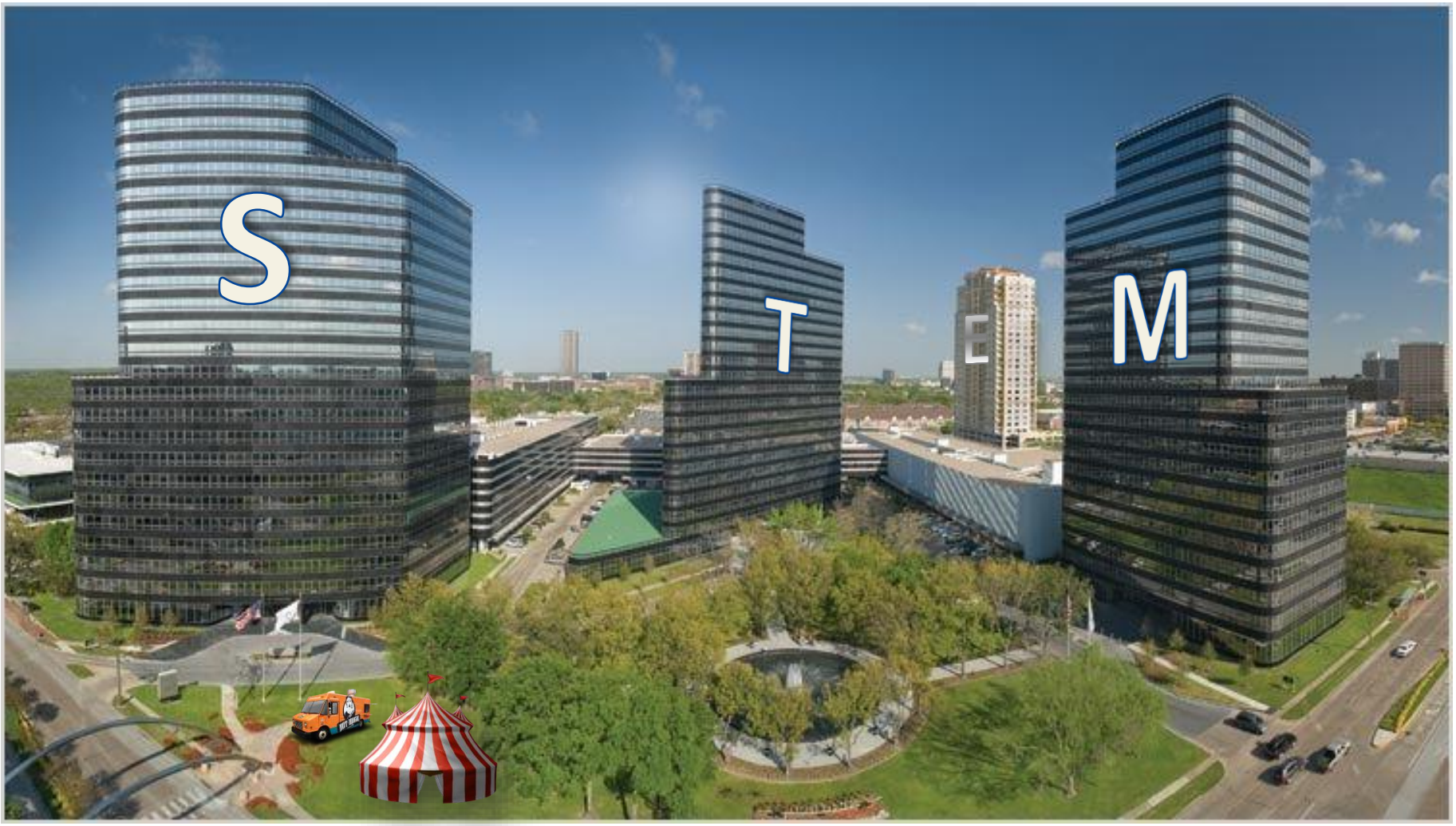
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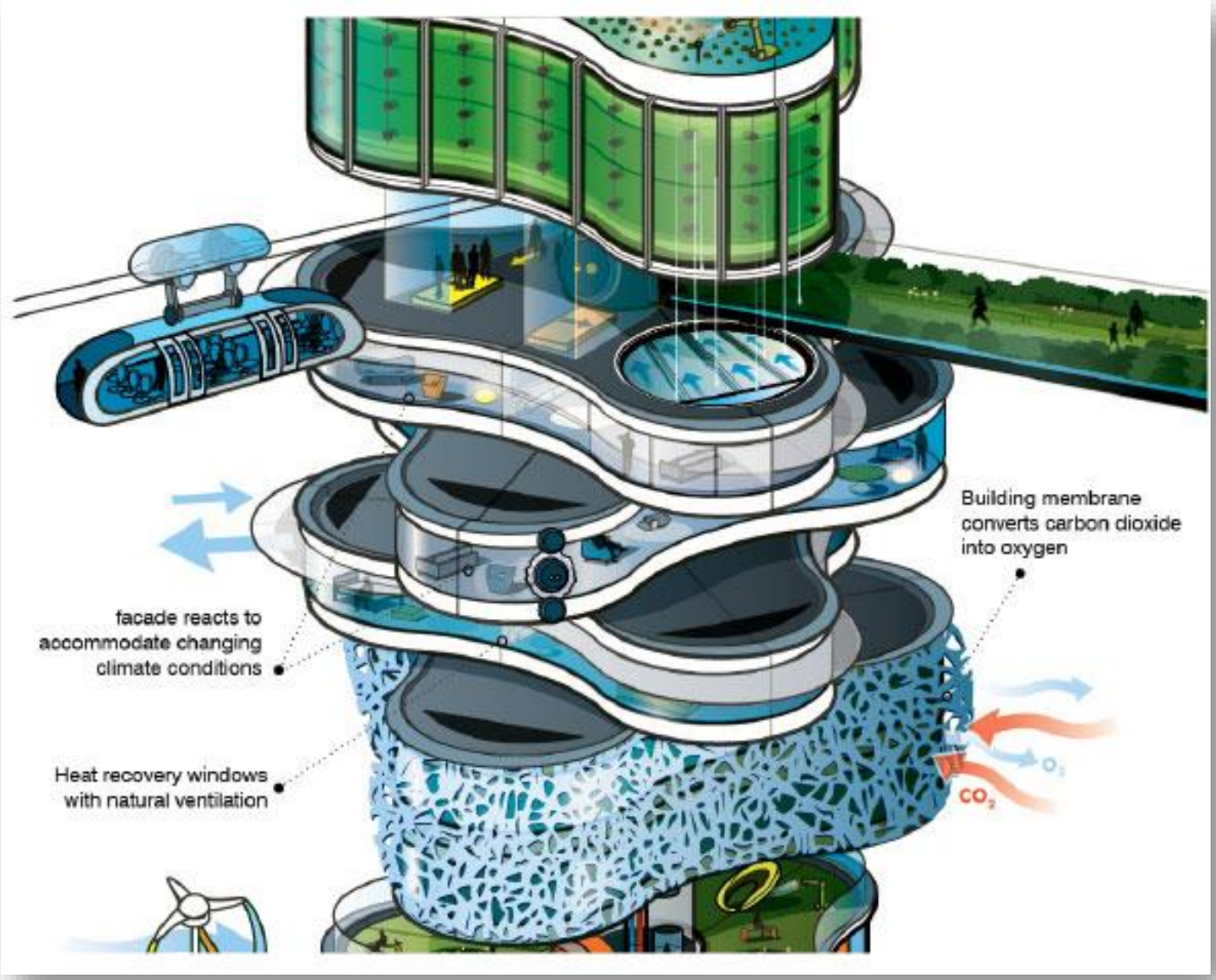
Table discussion:

Why are the four STEM disciplines connected?

What are the core principles which connect them?

Why should we invest in STEM education?


Building membrane converts carbon dioxide into oxygen
facade reacts to accommodate changing climate conditions
Heat recovery windows with natural ventilation
O_2
CO_2

STEMLearning
not only STEM
ricebar
not only rice

Dr Rogan Tinsley (Assistant Principal – STEM and Advanced Technologies) Seaview High School

Tower of Hanoi

The goal of the puzzle is to move all the disks from the leftmost peg to the rightmost peg, adhering to the following rules:

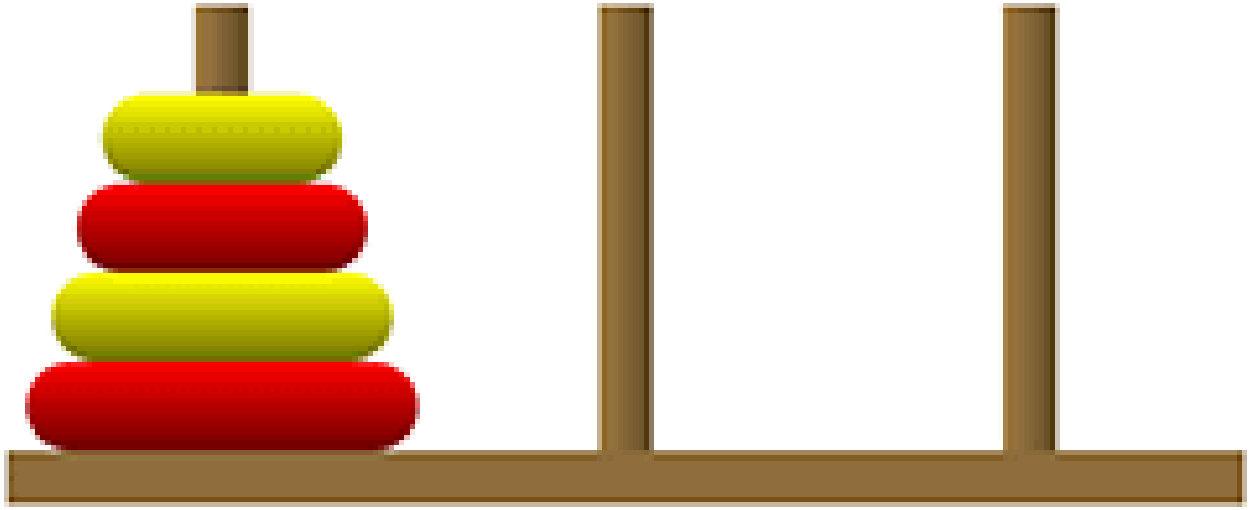
1. Move only one disk at a time.

2. A larger disk may not be placed on top of a smaller disk.

3. All disks, except the one being moved, must be on a peg.

Tower of Hanoi

Solution:



What I learned from Tower of Hanoi

1. Progress is a tricky business
2. Change requires a strategy
3. Sometimes you have to move backwards in order to move forwards
4. Be mindful of which structures support other structures

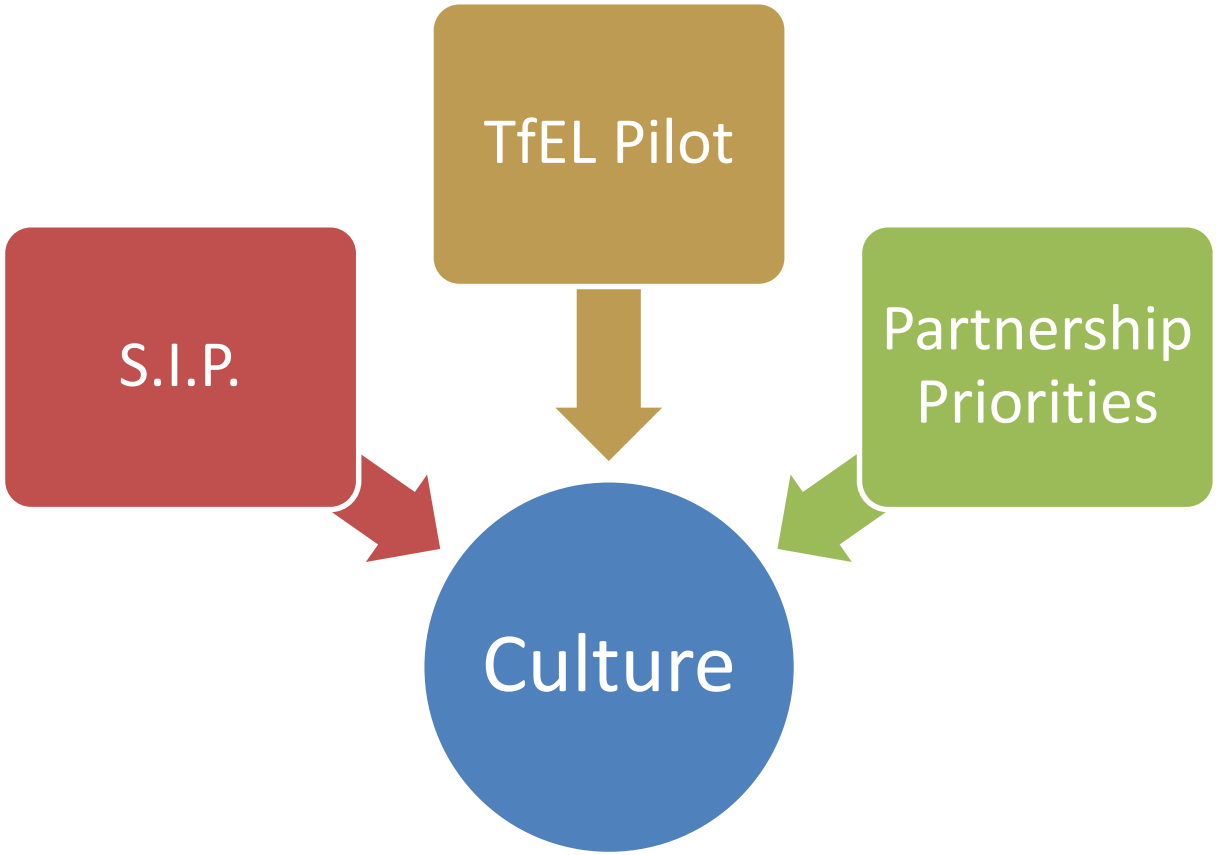
Where	Infrastructure
What	Syllabus
How	Pedagogy
Why	Culture

The STEM Approach

The Neuroscience Bit

1. Be careful of extrapolating neuroscience research
2. The emotional centres of the brain influence the cognitive centres
3. Wellbeing influences learning
4. Learning is social
5. Learning is not passive
6. There are temporal elements to learning

Infrastructure
Syllabus
Pedagogy
Culture



<u>Empowering Students</u>
Activating Student Voice
Fostering Growth Mindsets
Building Resilience
Improving Leaner Dispositions

Infrastructure
Syllabus
Pedagogy
Culture

Growth mindset

Early Years Fixed Mindset	**48%**
Primary Years Fixed Mindset	**46%**
Secondary Years Fixed Mindset	**31%**

- The TfEL research average for fixed mindset is approximately 40%. Marion Coast Secondary students have approximately 70% Growth Mindset while Early and Primary Years students' Growth Mindsets are closer to the average.

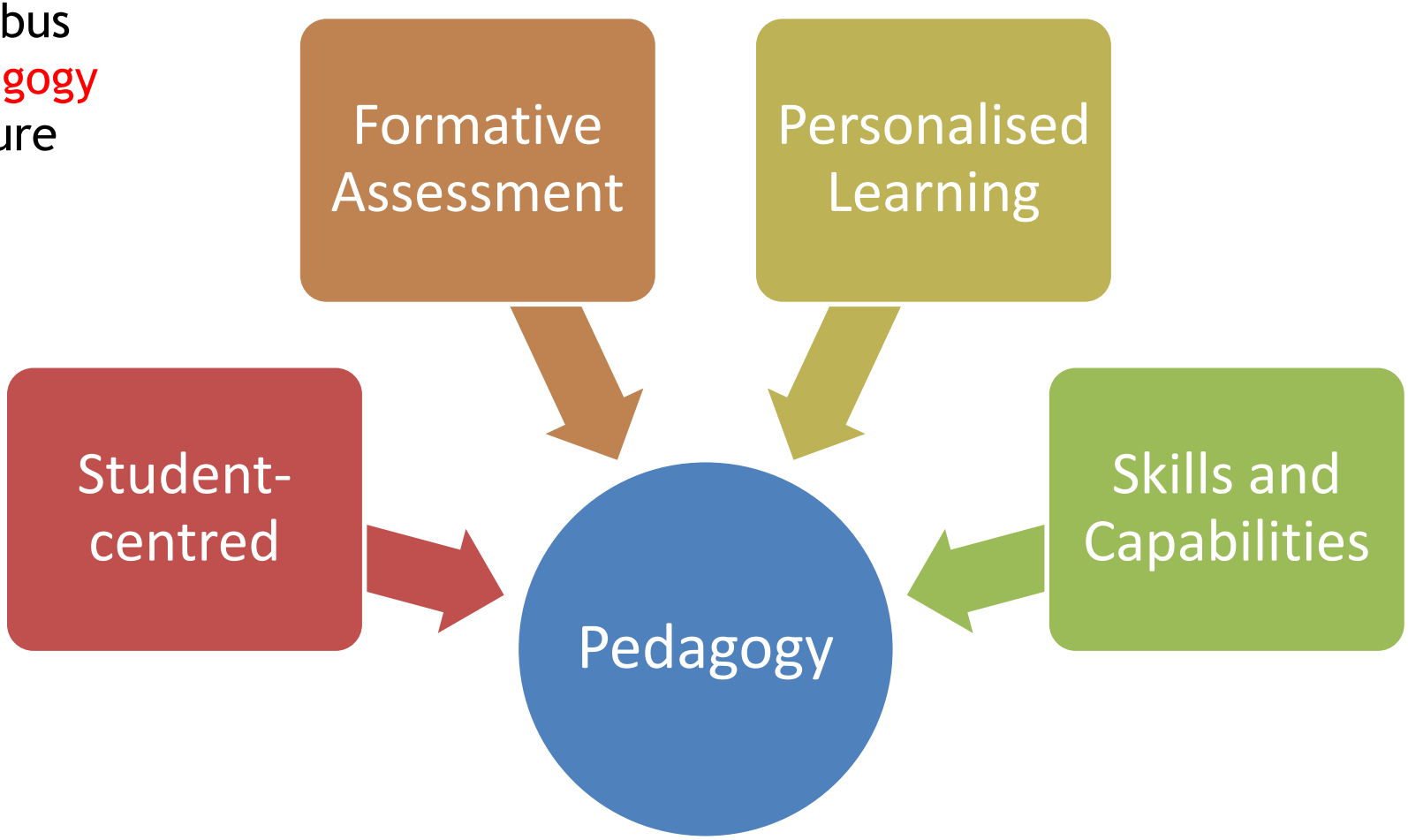
Table discussion:
Your School's Culture

What aspects of your current school culture support a STEM Approach?

How could this be improved?

How will you know if you are successful?

Infrastructure
Syllabus
Pedagogy
Culture



Stretch Thinking
Project-based Learning
Flipped Learning

How is your thinking stretched or challenged in Maths?

- Maths is about questioning ourselves and finding the answer. I strongly believe that maths is also about using different strategies and showing how we worked our answer and explaining why we did that. Some of the questions don't have a direct solution which is easy to understand
- Usually when I learn something new, my thinking starts to stretch. It also does when I learn to do something in a different way because I'm not doing something I would usually do.
- By having to solver harder questions that are only just above our level but not too hard
- Thinking is challenged because you have to find new perspectives and look at thinks differently

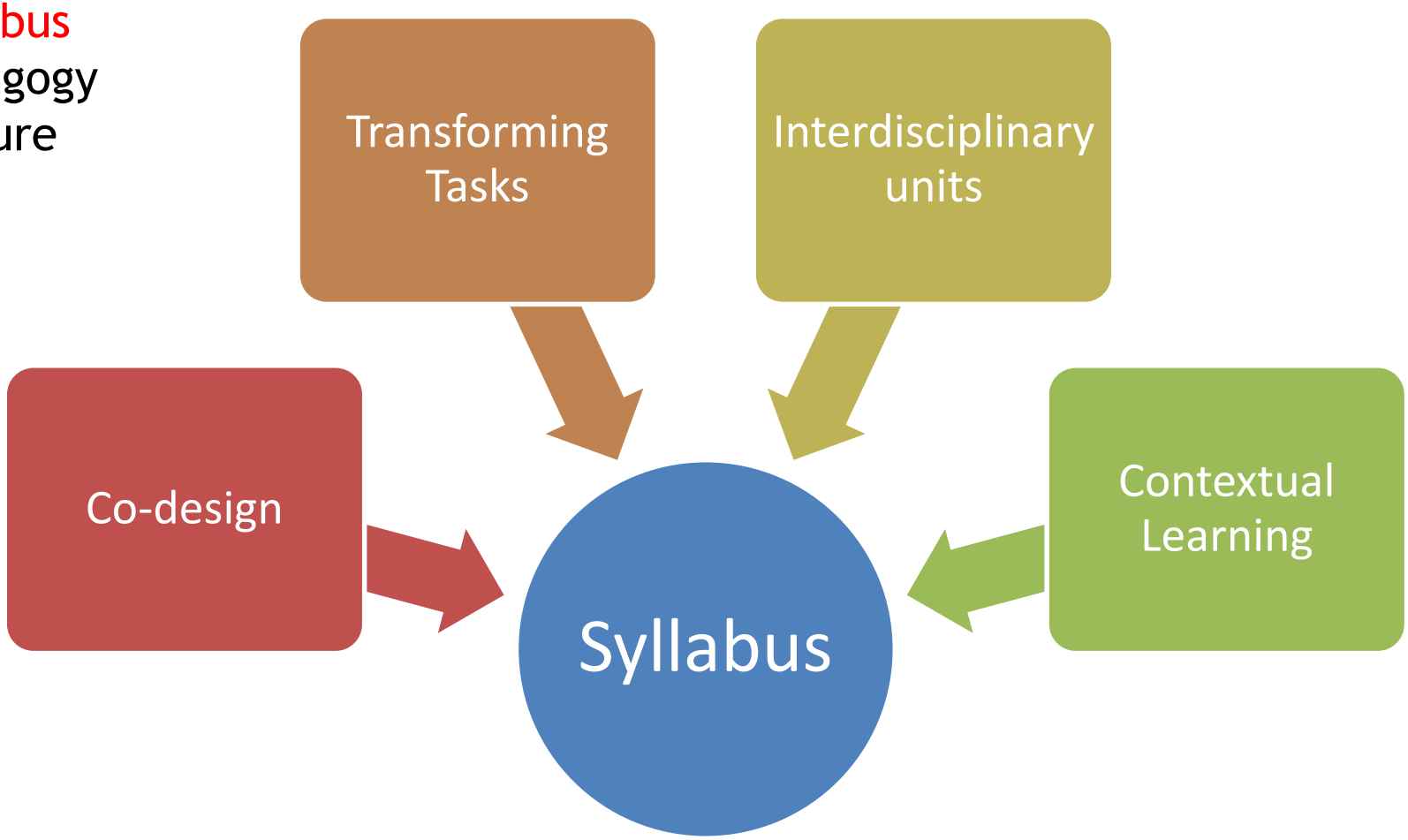
Table discussion:
Your School's Pedagogy

How does culture influence pedagogy at your school?

What are the current dominant pedagogies?

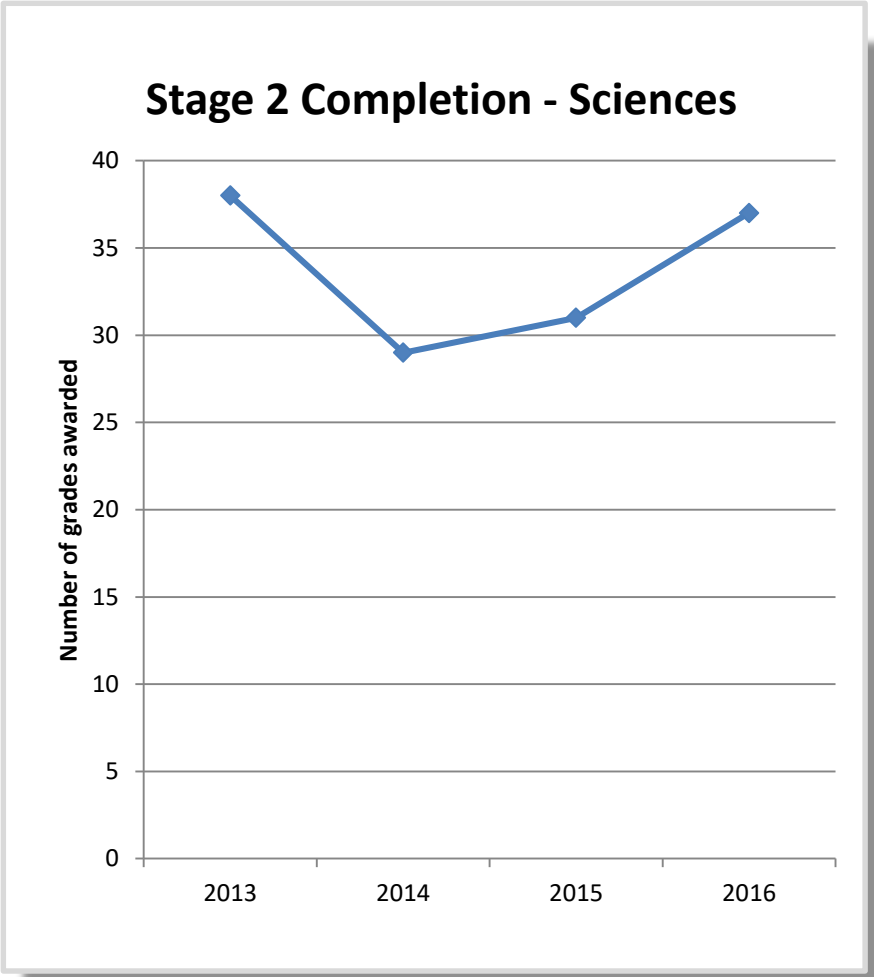
What ways of teaching need to be developed?

Infrastructure
Syllabus
Pedagogy
Culture



Flexible syllabus
Multiple Entry/Exit Points
Future Focus and Careers

SACE Completion and Achievement



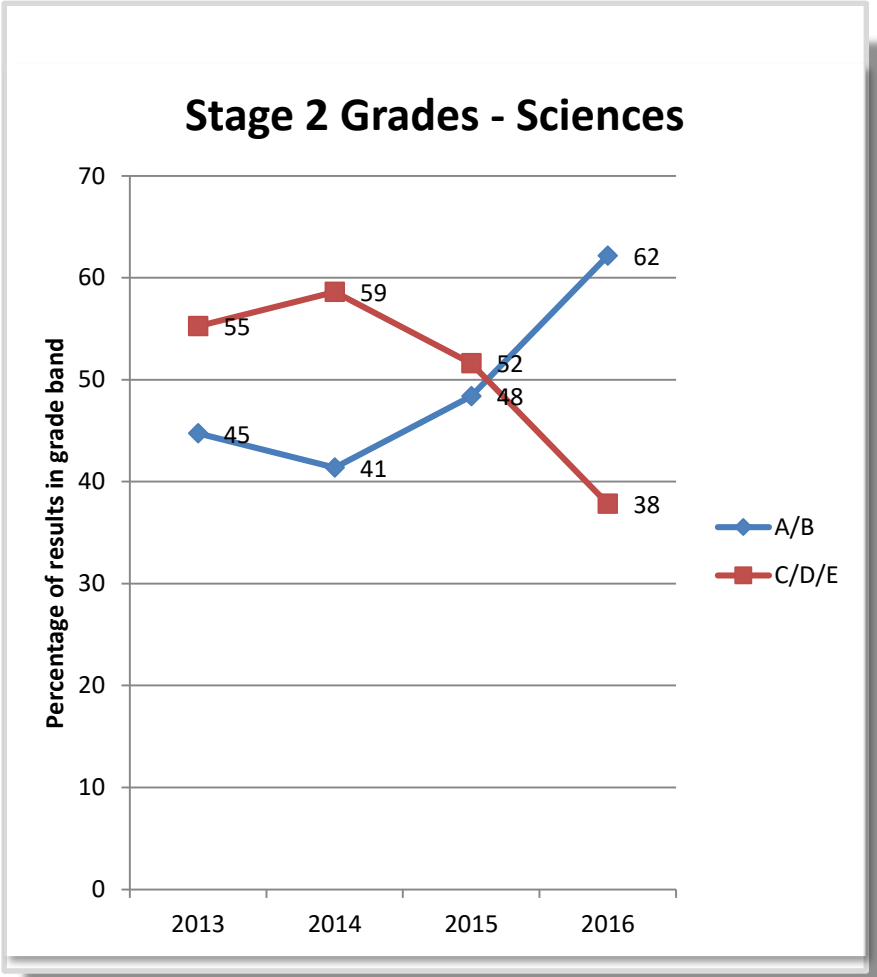
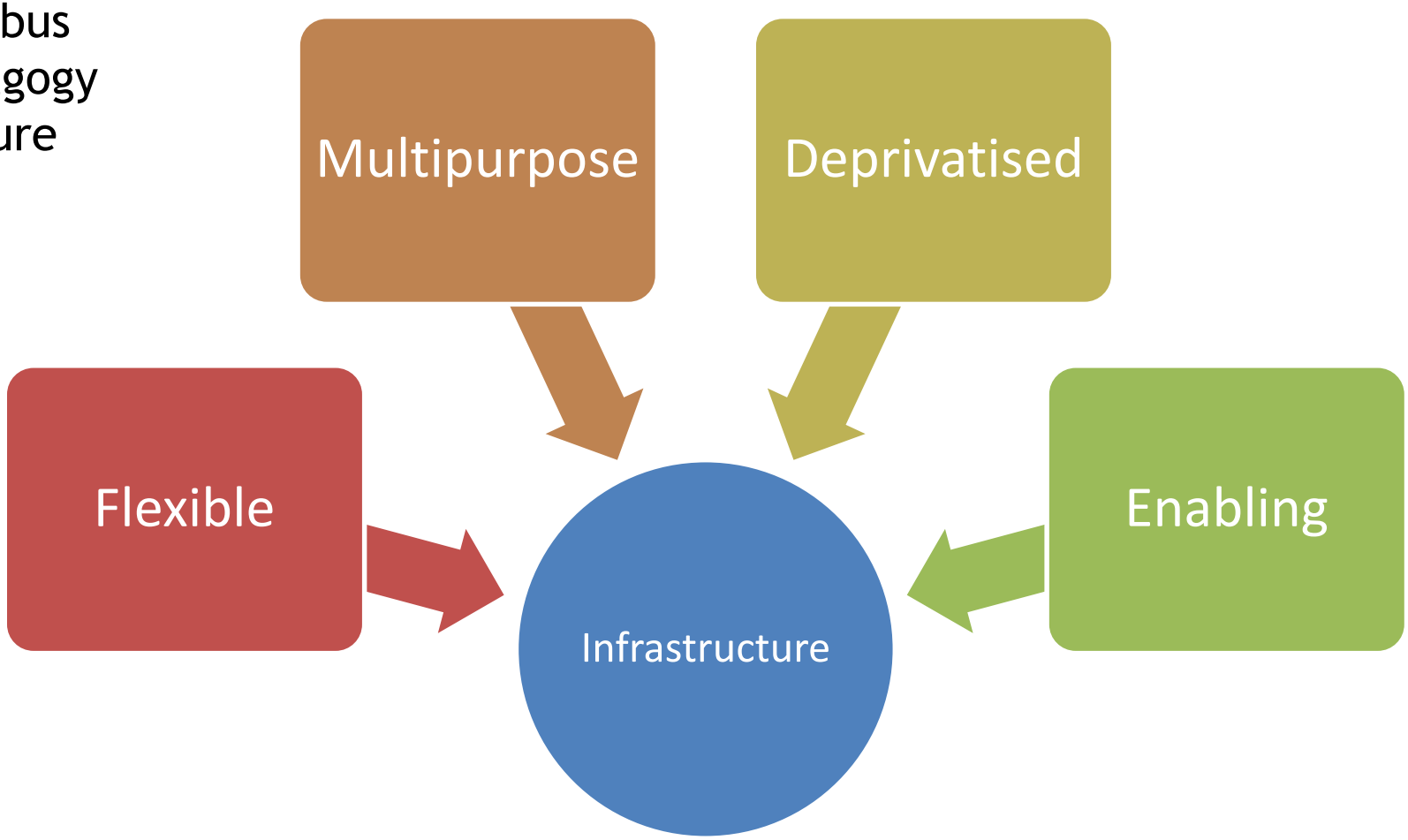


Table discussion:
Your School's Syllabus

Does the syllabus support innovative pedagogies?

What are the main challenges to creating a syllabus which supports a STEM Approach to learning?

Infrastructure
Syllabus
Pedagogy
Culture



Flexible spaces
Shared resources
New timetable models
Rethinking use of classrooms

Table discussion:
Your School's Infrastructure

How well does the current physical and digital infrastructure support teaching and learning?

What (small) changes could be made to turn existing barriers in to enablers of teaching and learning?

TIME TABLE

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CAUTION
Speedy 100
trotec
trotec
STEM

A flexible variety of learning spaces that support STEM learning.

STEM Approach

Infrastructure driven by needs

A flexible and tailored syllabus

Pedagogy that creates conditions for personalised and rigorous learning

A culture that focuses on students' needs, innovation and continual improvement

Infrastructure
Syllabus
Pedagogy
Culture

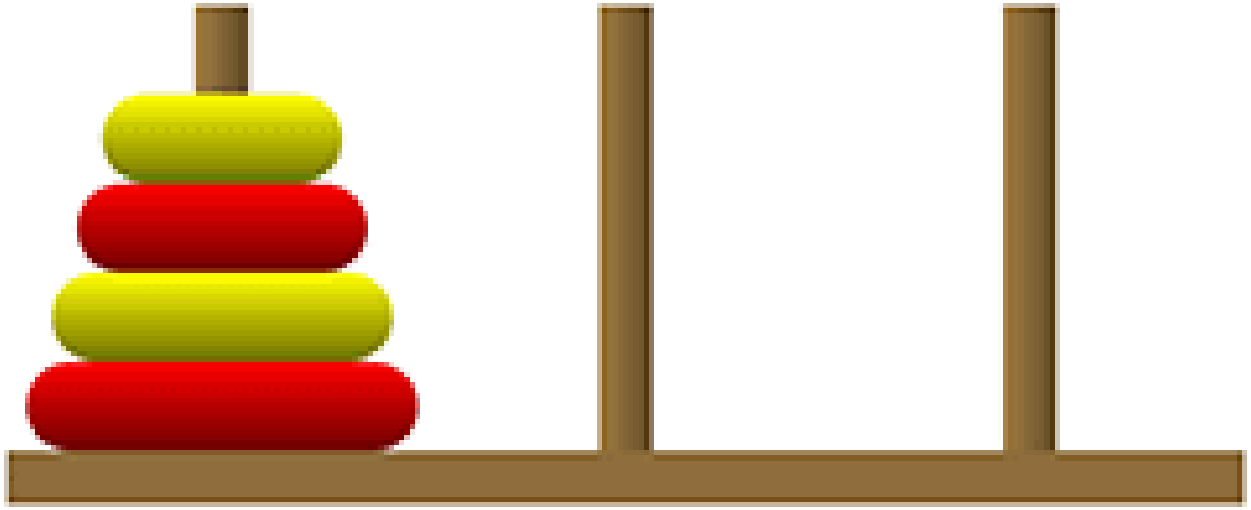
Variety of learning environments

Student-centred pedagogy

Growth Mindsets (Staff and Students)

Willingness to innovate

Flexible timetable

Focus on General Capabilities

8	9	10	11		12
Mathematics	Mathematics	Mathematics	Essential Maths		Maths Applications
			General Maths A	General Maths B	Maths Studies
			Maths Stage 1 A	Maths Stage 1 B	Maths Methods
			Spec Maths A	Spec Maths B	Specialist Maths
Science	Science	Science	Biology A	Biology B	Biology
			Chemistry A	Chemistry B	Chemistry
			Physics A	Physics B	Physics
			Psychology A	Psychology B	Psychology
Adv Tech A	Adv Tech A	Adv Tech A	Adv Tech B	Adv Tech A	Adv Tech B	System and Control P
Adv Tech B	Adv Tech B	Pedal Prix A	Pedal Prix B			
		Target Works		Target Works		Workplace Practices
Dig Tech (1 term)	Dig Tech (1 Term)	Digital Photography		Comm Prod A	Comm Prod B	Comm Prod (Photo)
		Graphic Design		Info P&P A	Info P&P B	Info P&P
3-day Projects		PLP	FutureMakers	Research Practices and Research Project