Engage Teacher Conference

Top tips for inclusive science teaching

Discover simple practical ways to make your teaching, interactions, and classroom as inclusive as possible. For secondary teachers.

Eleanor Wylie
Professional Support Coach, Institute of Physics
Suzanne Woolhouse
Professional Support Coach, Institute of Physics

Engage Teacher Conference

Engage

Welcome, please be aware:

- Talks are recorded
- There will be time for questions at the end
- You can send messages in the chat or raise your hand.

Top Tips for Inclusive Science Teaching with Eleanor and Sue

https://www.mentimeter.com/app/presentation/al1ujsr3fs46negdniyv48qfv9dzvgbn/view?question=81stw1pxg6az

Mentimeter

IOP's Campaign - Limit Less underrepresented groups

- Girls
- Young people from disadvantaged backgrounds
- Disabled young people
- LGBT+ young people
- Young people of Black Caribbean descent

IOP Institute of Physics

Think of a student in one or more of these under-represented groups. What barriers might they encounter when trying to make progress in physics?

Lack of role models

Maths

Not knowing about careers in physics

Historically Physics seen as for Men

Lack of role models

No model in the family

Few Female physics teachers

Physics is seen as a 'hard' science

Negligible science capital in household, don't feel 'smart' enough, unsure of possible career outcomes, not as many teachers from physics background to encourages uptake.

Think it's too hard

Peer pressure Parents not aware of opportunities

Not aware of Physics careers

Creating an inclusive classroom culture	1	Enable all students to participate
	2	Model inclusive language and expect it from students
	3	Examine and challenge stereotypes, biases and assumptions
Making the learning relevant	4	Value students' existing knowledge and experience of science
	5	Teach about a range of jobs and careers that use science and science skills
	6	Give students opportunities to make links between their learning and their lives, interests and local area
Building numeracy and literacy for science	7	Build scientific vocabulary
	8	Get students talking and listening
	9	Make time for maths

the poster - https://www.iop.org/sites/default/files/2023-02/Inclusive-Science-Teaching-Poster.pdf

Revised Top Tips for Inclusive Teaching - the booklet https://www.iop.org/sites/default/files/2023-02/iop-top-tips-for-inclusive-science-teaching.pdf

Build numeracy and literacy for science

Build scientific vocabulary

There's a correlation between students' literacy levels and their science attainment.

Ideas to try...

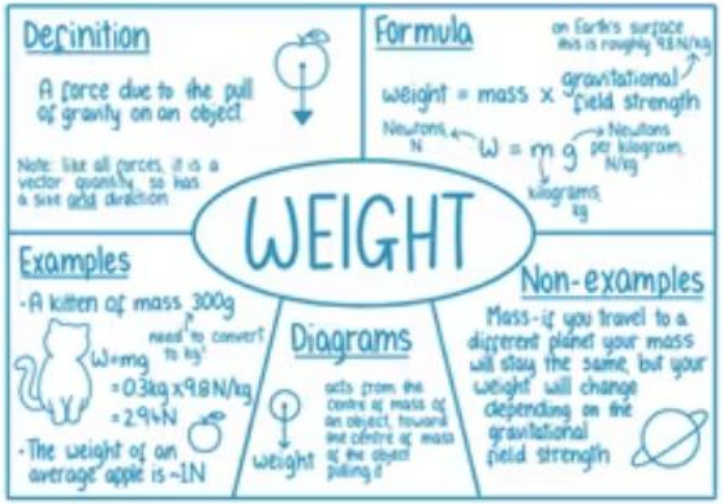
Start with everyday language, models and analogies to build understanding of concepts before introducing technical language.

Identify key words for each topic and explore their meaning with students; for example, using Frayer models.

Share the construction, roots and stories behind key words.

Regularly review vocabulary from previous topics.

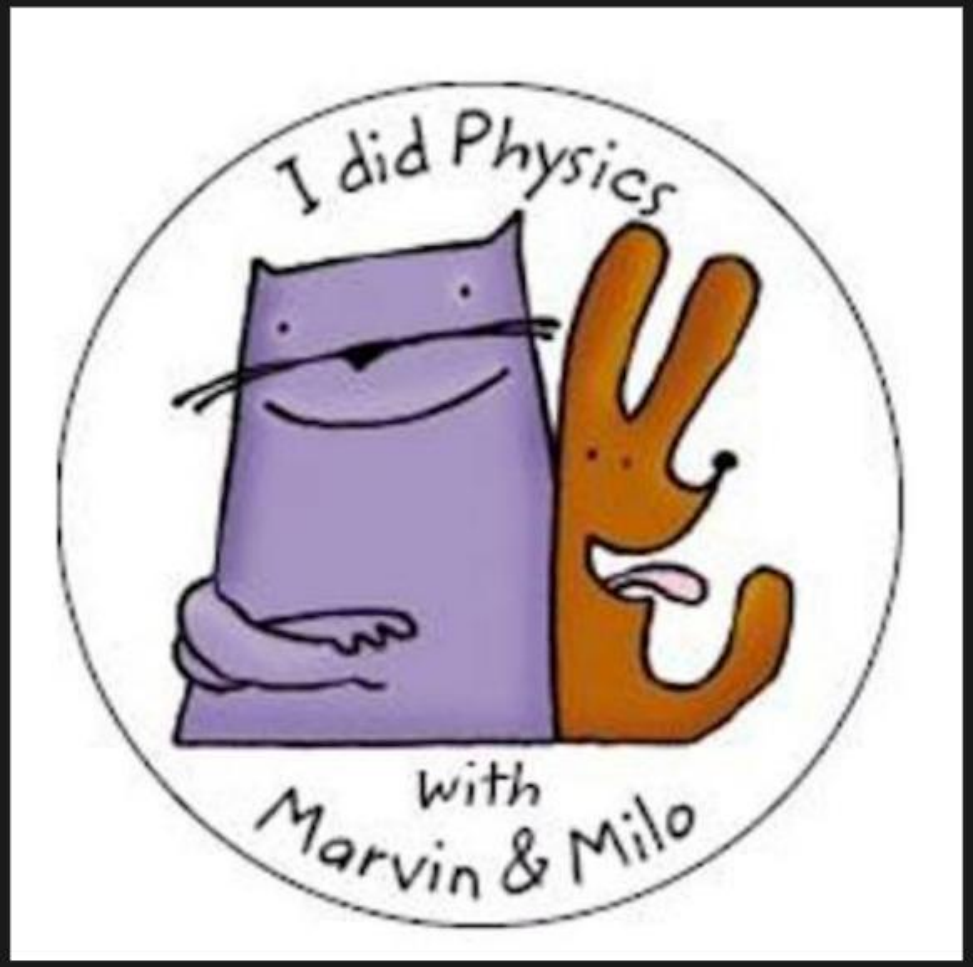
Use quizzes, spelling/meaning tests and synoptic questions to regularly review key vocabulary.



Use Frayer models, such as this one, to help students develop their understanding of key words.

Build numeracy and literacy for science - build scientific vocabulary

What do the tips look like in the classroom?



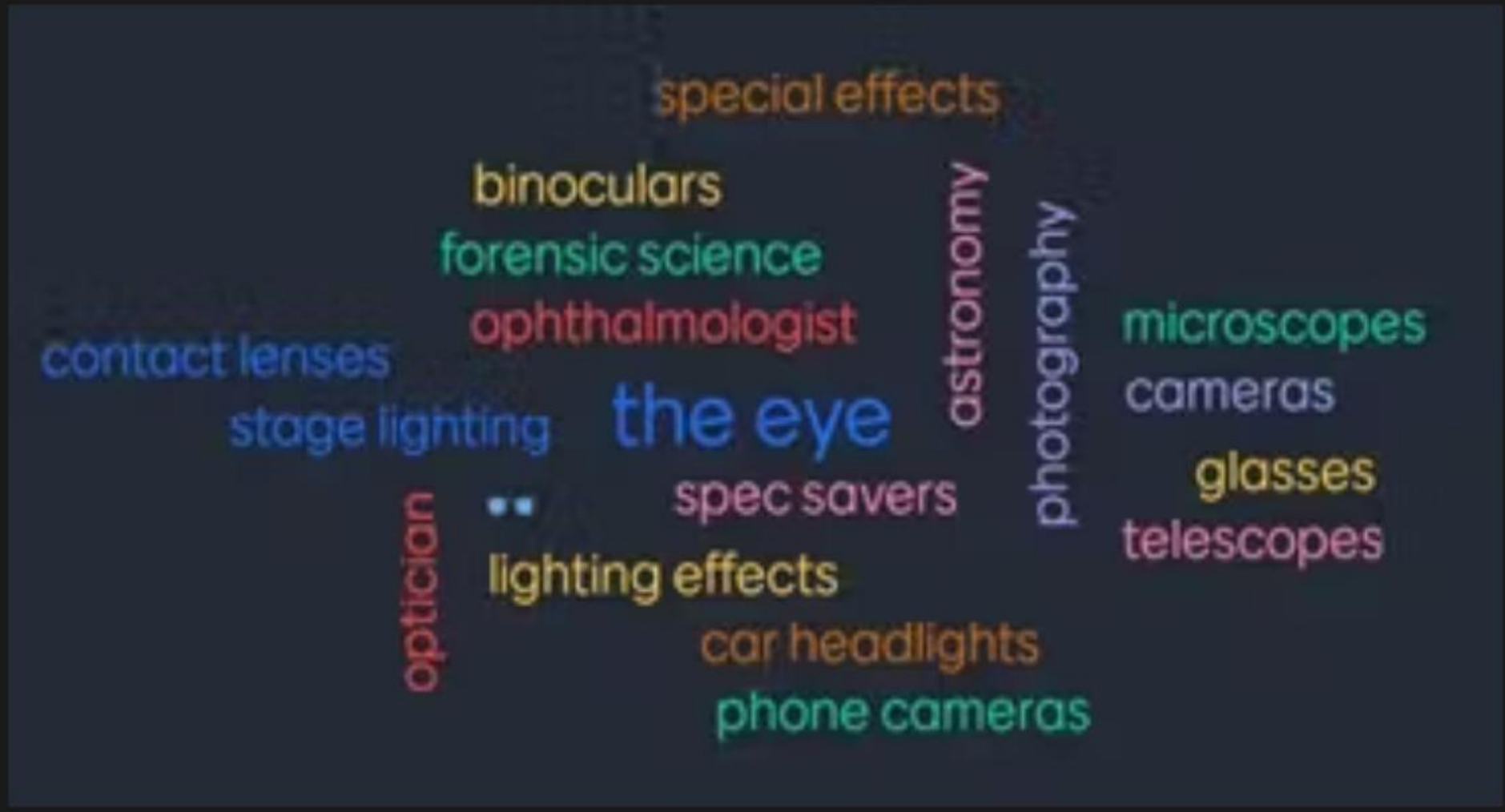
MAKING THE LEARNING RELEVANT https://spark.iop.org/collections/marvin-and-milo

Reversing Arrows https://spark.iop.org/reversing-glass

https://www.iop.org/explore-physics/at-home

context and careers for lenses and refraction (reversing arrows)

swimming pools opticans
astronomy - telescopes
stage lighting
engineer
microscopy
optician
opticians
animators
optometry
swimming pools



context and careers for lenses and refraction (reversing arrows)

Thinking about tip 3 – Ibn Saul discovers the Law of Refraction 984 CE

https://www.historyofinformation.com/detail.php?entryid=2413

Another example!

Flame Balloons https://spark.iop.org/flame-balloons

https://youtu.be/l3ta8x5cBq4

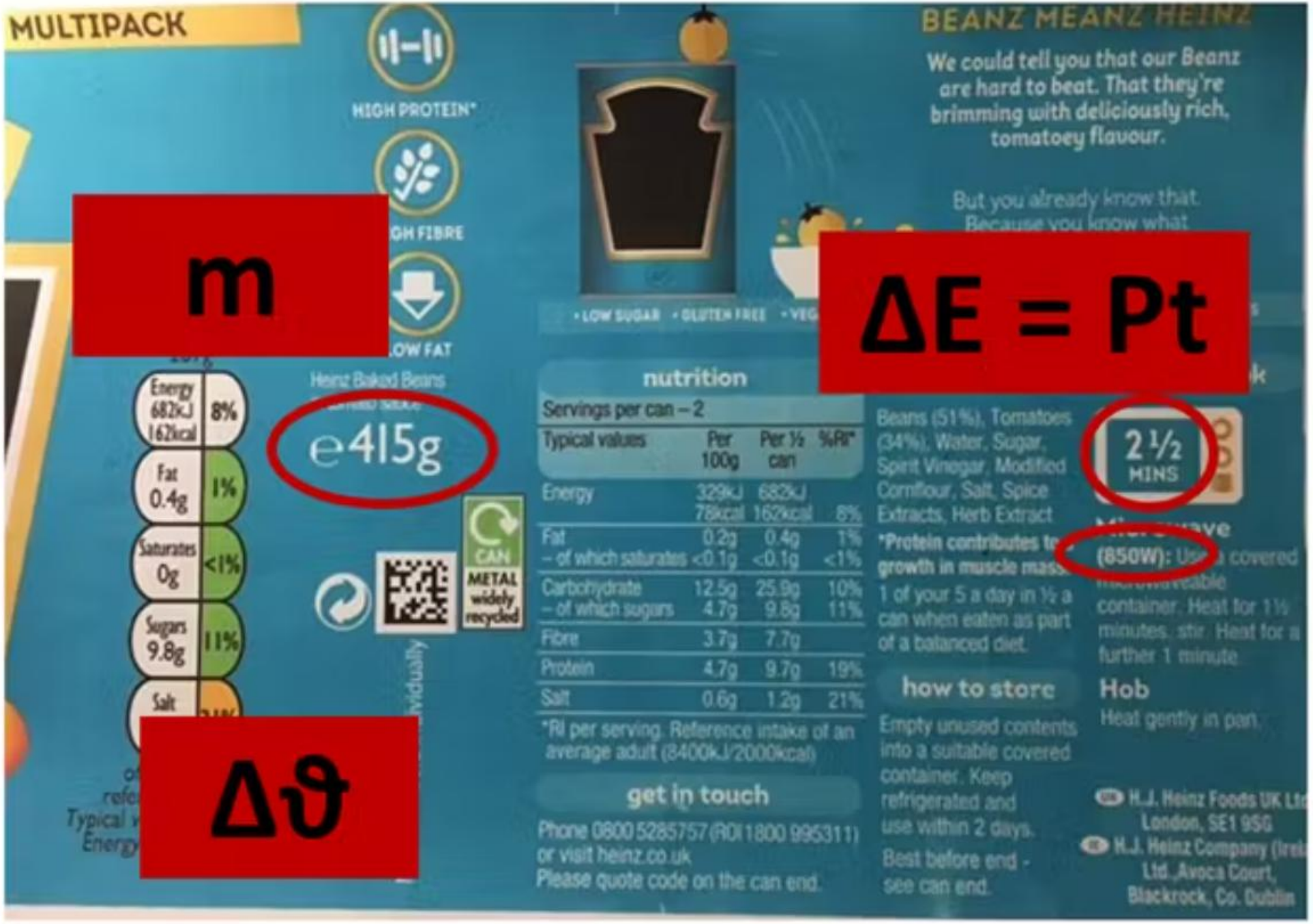
Marvin and Milo Bursting Balloons - introducing specific heat capacity - water balloon doesn't pop because of water's high SHC!

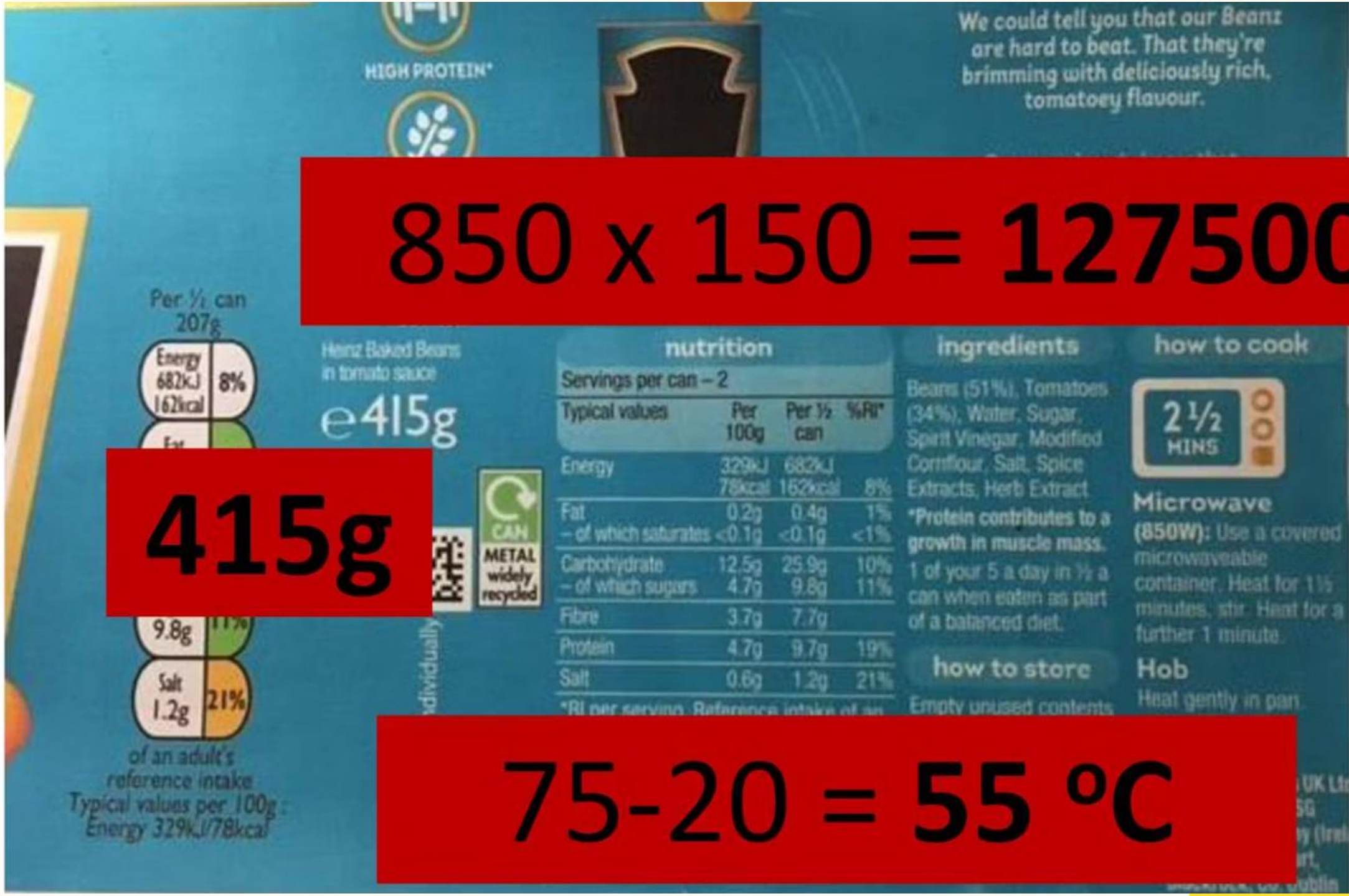

Mentimeter


m
Δϑ
ΔE


ITALIAN RECIPE
INACH &
ICOTTA
NNELLONI
sta tubes filled with
pinach and ricotta in a
y béchamel sauce with
ture Cheddar cheese
SUITABLE FOR FREEZING
CUMBERLAND
PIE
Minced beef and carrots in
a rich gravy topped with
buttery mash and
toasted breadcrumbs
Per 100g
Energy
Per pack as prepared provides
ALOO GOBI
SAAG
GOOD
HEALTH

Can we work out the specific heat capacity of the beans?


MULTIPACK
HIGH PROTEIN*
m
ΔE = Pt
BEANZ MEANZ HEINZ
We could tell you that our Beanz are hard to beat. That they're brimming with deliciously rich, tomatoey flavour.
But you already know that.
• LOW SUGAR • GLUTEN FREE
Heinz Baked Beans
e415g
Energy 682kJ 162kcal 8%
Fat 0.4g 1%
Saturates 0g <1%
Sugars 9.8g 11%
Salt
Δϑ
CAN
METAL widely recycled
nutrition
Servings per can – 2
Typical values | Per 100g | Per ½ can | %RI*
Energy | 329kJ 78kcal | 682kJ 162kcal | 8%
Fat | 0.2g | 0.4g | 1%
– of which saturates | <0.1g | <0.1g | <1%
Carbohydrate | 12.5g | 25.9g | 10%
– of which sugars | 4.7g | 9.8g | 11%
Fibre | 3.7g | 7.7g
Protein | 4.7g | 9.7g | 19%
Salt | 0.6g | 1.2g | 21%
*RI per serving. Reference intake of an average adult (8400kJ/2000kcal)
get in touch
Phone 0800 5285757 (ROI 1800 995311)
or visit heinz.co.uk
Please quote code on the can end.
Beans (51%), Tomatoes (34%), Water, Sugar, Spirit Vinegar, Modified Cornflour, Salt, Spice Extracts, Herb Extract
1 of your 5 a day in ½ a can when eaten as part of a balanced diet.
how to store
Empty unused contents into a suitable covered container. Keep refrigerated and use within 2 days.
Best before end - see can end.
2½ MINS
(850W):
container. Heat for 1½ minutes, stir. Heat for a further 1 minute
Hob
Heat gently in pan.
H.J. Heinz Foods UK Ltd London, SE1 9SG
H.J. Heinz Company (Ireland) Ltd., Avoca Court, Blackrock, Co. Dublin


HIGH PROTEIN*
We could tell you that our Beanz are hard to beat. That they're brimming with deliciously rich, tomatoey flavour.
Per ½ can 207g
Energy 682kJ 162kcal 8%
9.8g 11%
Salt 1.2g 21%
of an adult's reference intake
Typical values per 100g: Energy 329kJ/78kcal
Heinz Baked Beans in tomato sauce
e415g
CAN METAL widely recycled
nutrition
Servings per can – 2
Typical values | Per 100g | Per ½ can | %RI*
Energy | 329kJ 78kcal | 682kJ 162kcal | 8%
Fat | 0.2g | 0.4g | 1%
– of which saturates | <0.1g | <0.1g | <1%
Carbohydrate | 12.5g | 25.9g | 10%
– of which sugars | 4.7g | 9.8g | 11%
Fibre | 3.7g | 7.7g |
Protein | 4.7g | 9.7g | 19%
Salt | 0.6g | 1.2g | 21%
*RI per serving. Reference intake of an
ingredients
Beans (51%), Tomatoes (34%), Water, Sugar, Spirit Vinegar, Modified Cornflour, Salt, Spice Extracts, Herb Extract
*Protein contributes to a growth in muscle mass.
1 of your 5 a day in ½ a can when eaten as part of a balanced diet.
how to store
Empty unused contents
how to cook
2½ MINS
Microwave
(850W): Use a covered microwaveable container. Heat for 1½ minutes, stir. Heat for a further 1 minute.
Hob
Heat gently in pan
850 x 150 = 127500 J
415g
75-20 = 55 °C

Specific Heat Capacity and Baked Beans

127500 J for 415 g by 55 °C

Specific Heat Capacity and Baked Beans

127500 J	for	415 g	by	55 °C
127500 ÷ 55 = 2318 J	for	415 g	by	1 °C

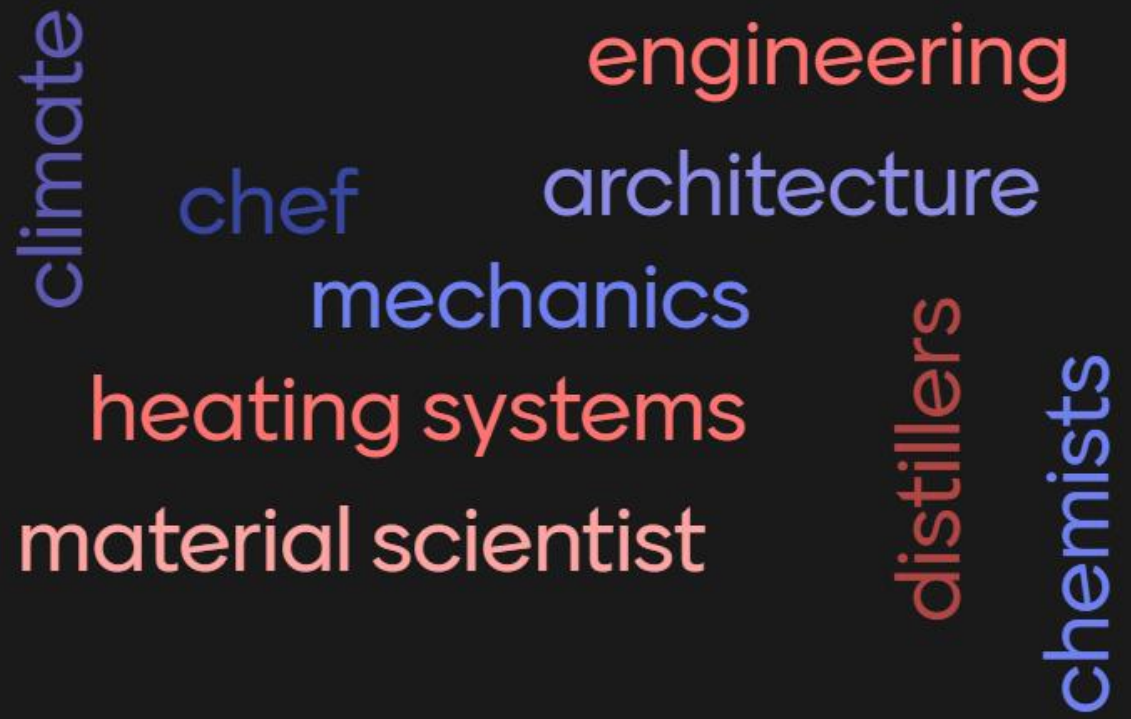
Specific Heat Capacity and Baked Beans

127500 J	for	415 g	by	55 °C
127500 ÷ 55 = 2318 J	for	415 g	by	1 °C
2318 ÷ 415 = 5.6 J	for	1 g	by	1 °C

Specific Heat Capacity and Baked Beans

127500 J	for	415 g	by	55 °C
127500 ÷ 55 = 2318 J	for	415 g	by	1 °C
2318 ÷ 415 = 5.6 J	for	1 g	by	1 °C
5.6 x 1000 = 5600 J	for	1 kg	by	1 °C

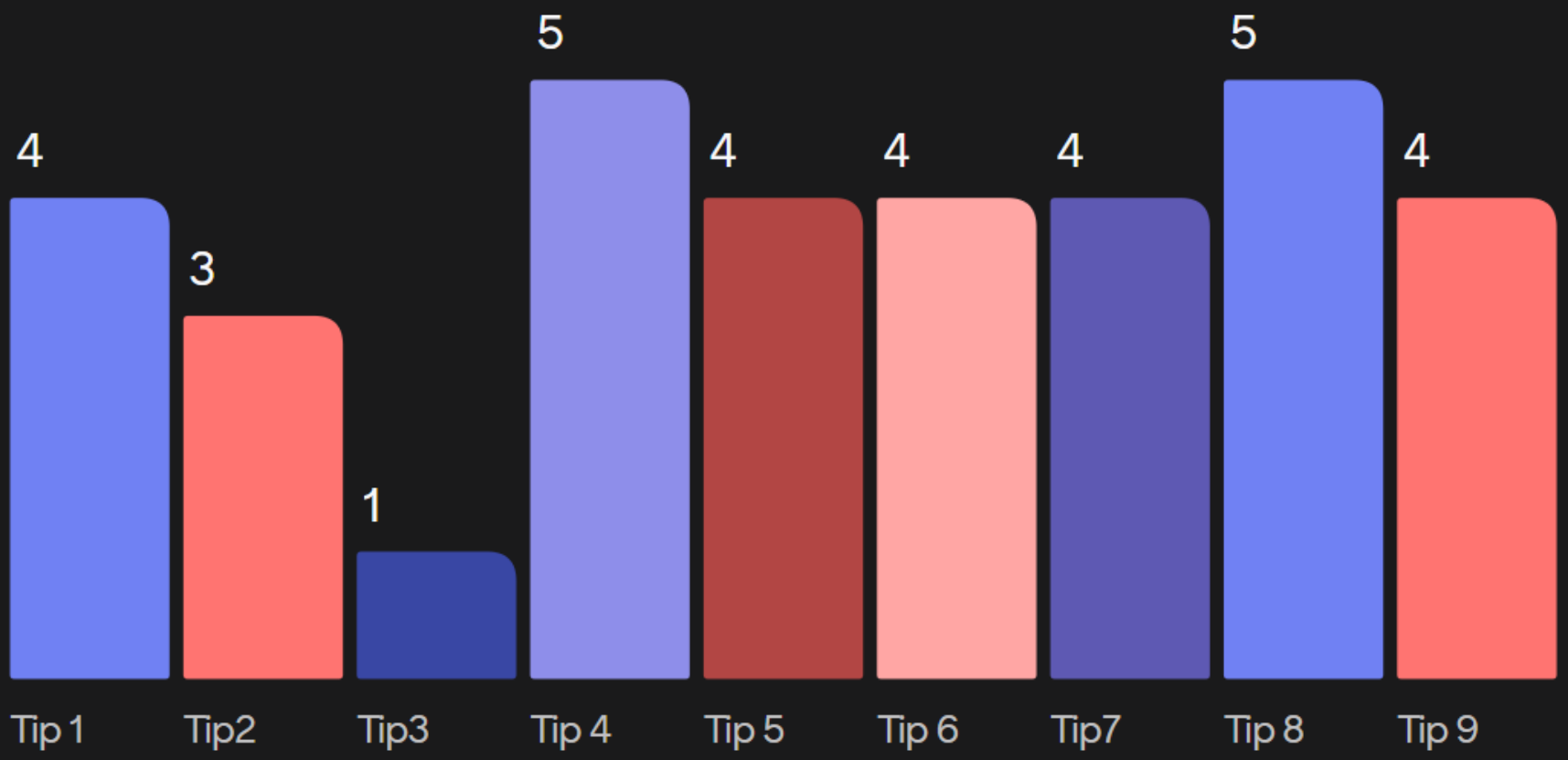
Context and Careers for Specific Heat Capacity



Mentimeter

Context and Careers for Specific Heat Capacity

For specific heat capacity which Top Tips have we covered?



l students to participa

clusive language and e

and challenge stereot

dents' existing knowle

out a range of jobs an

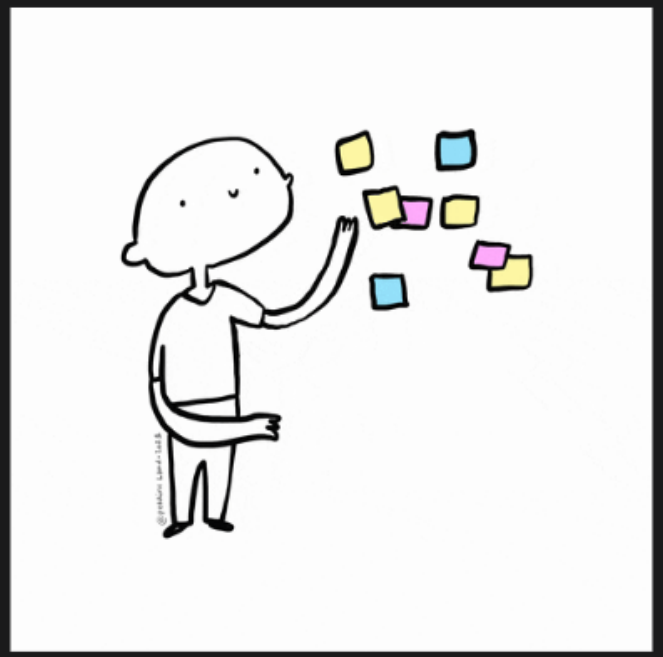
lents opportunities to
and local area

entific vocabulary

ents talking and listen

e for maths

Share examples of your own ideas/good practice or ideas you'd like to try!



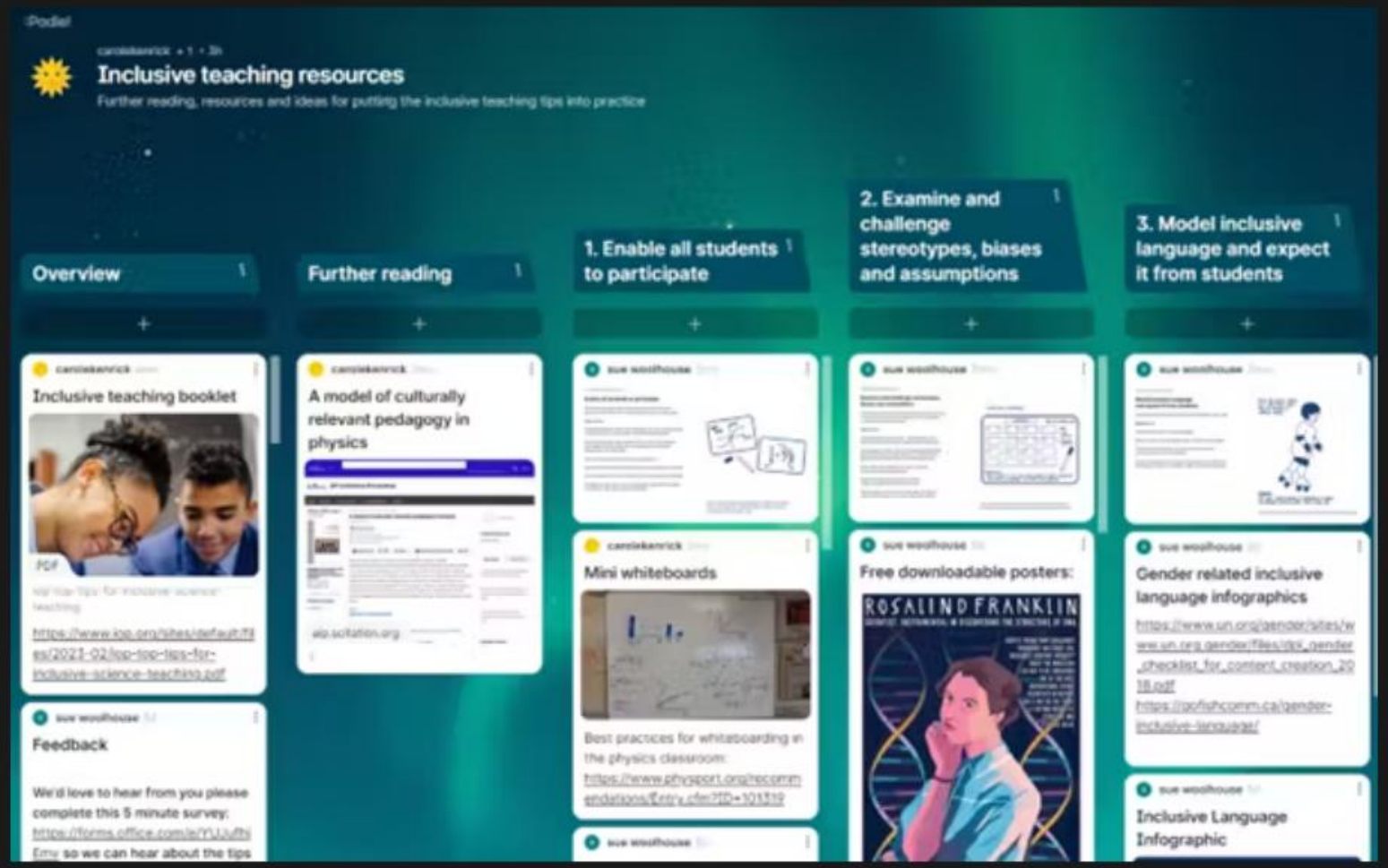
Try to link more practicals to students everyday lives

Give the short experiments a try at home with kids

Look for diverse role models

Posters showing a diverse range of role models

Connect the experiments to potential careers



https://padlet.com/carolekenrick/inclusive-teaching-resources-36xirew780r3fv3h

Thank you!

eleanor.wylie@iop.org
suzanne.woolhouse@iop.org

Keep in touch – http://iop.org/community

Join our professional community for teachers of physics and their supporters. Sign up for a free monthly update with news, resources and events information.

Engage Teacher Conference

Thank you

Complete the **5-minute feedback form** for the chance to win one of ten **£10 Amazon vouchers**!
www.tfaforms.com/5181926

crestawards.org/engage

crest@britishscienceassociation.org

Run by BRITISH SCIENCE ASSOCIATION

Managed by CREST AWARDS