怎樣建構不同情境的物理課堂

引發興趣、教學及評估

Content:

(1) Some strategies to motivate students

(2) Sharing of learning and teaching activity

(3) Assessment plan

Current trend of assessment

- Transfer of knowledge to a new context.
- However, students may have little experience in applying knowledge to a new context.

Students should be given with chances to apply knowledge in new context.

Motivating S by

story sharing

When having dinner with my family member…

Lay

?

My family member

Because the ice cream will melt slower…

ice cream

waffle

metal dish plate

on waffle?

on metal plate?

We could only enjoy the dessert after we finished the main dishes.

Where should the ice cream be put so that it melts slower?

Motivating S by

interesting photo

A photo can sometimes be a good lead in

What did you notice?

What if…?

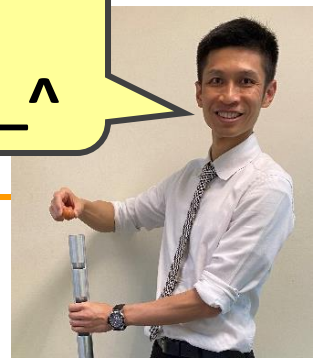
Why is it possible?

Motivating S by

eye-catching activity

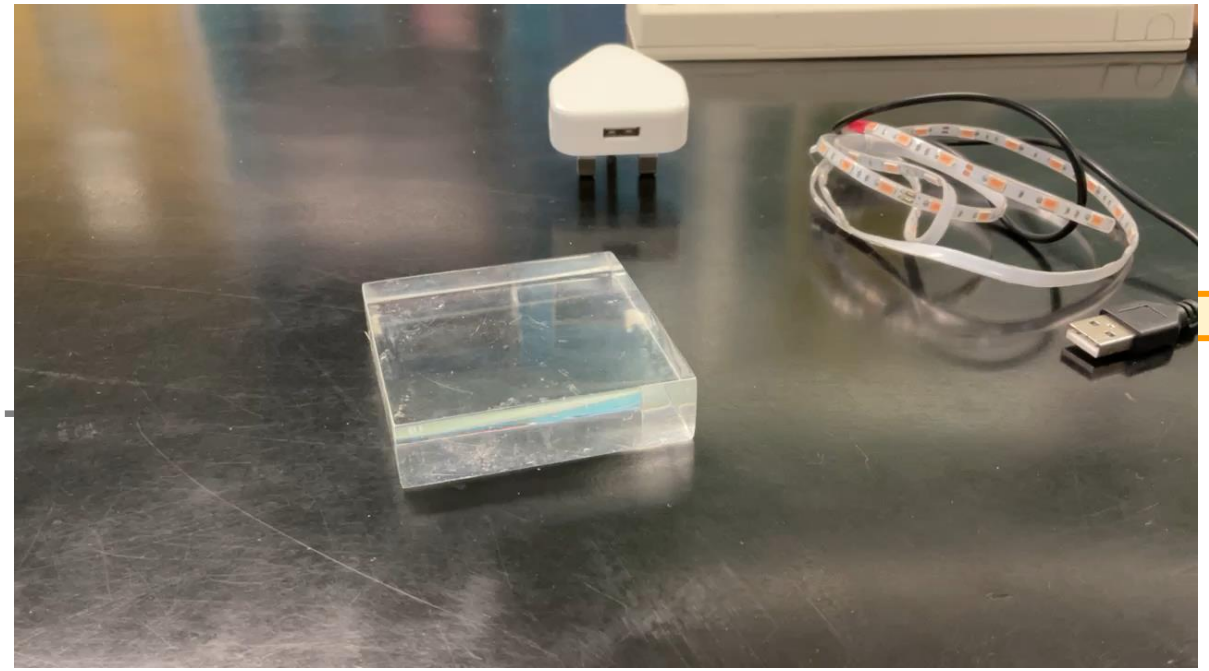
Gift making...

It can also be a STEAM activity ！ ^_^

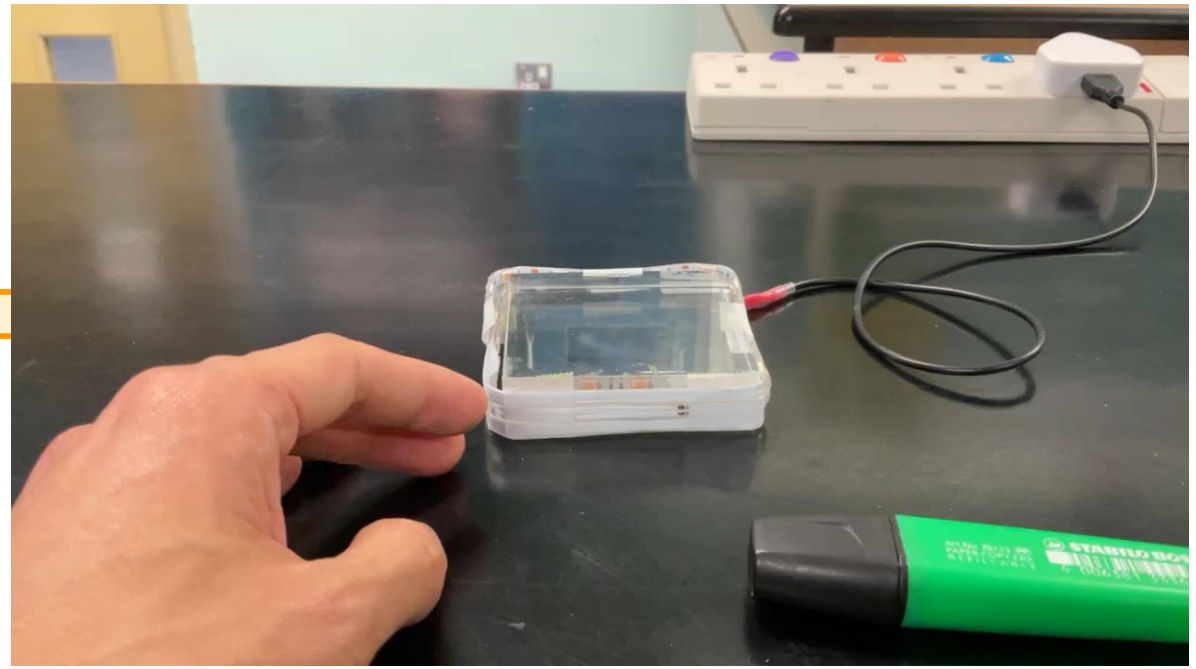


with Lay style! ^_^

Step 01



Step 02

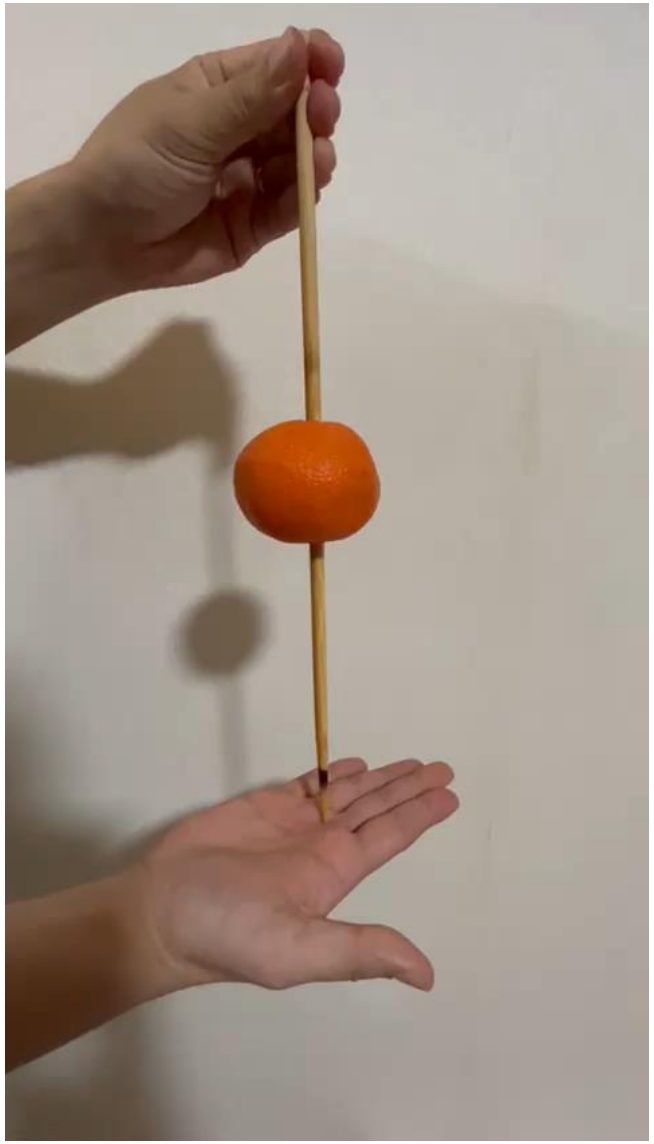


Unpredictable apple...

A good activity...

not only motivate students to learn,

but also stimulate students to think



Motivating S by

interesting gadget

Lazy glasses...

Head leans down

Reading book for a long time

The view through lazy glasses

Other gadgets...

司南

飛機

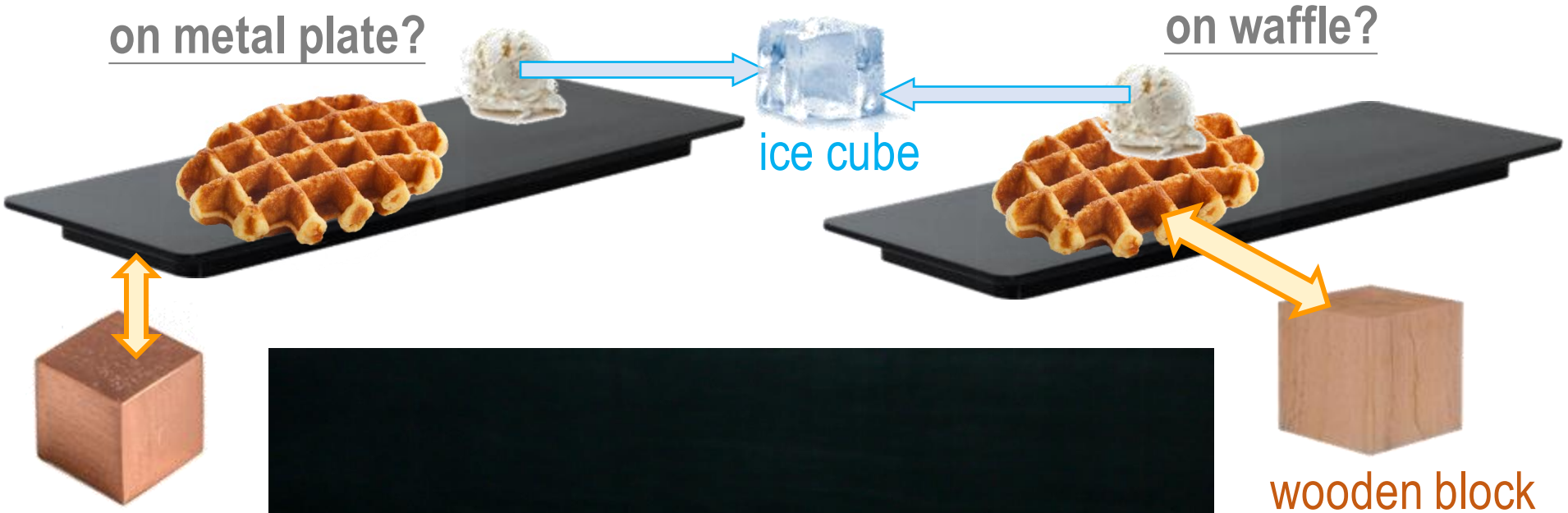
Make one by yourself if not too difficult:

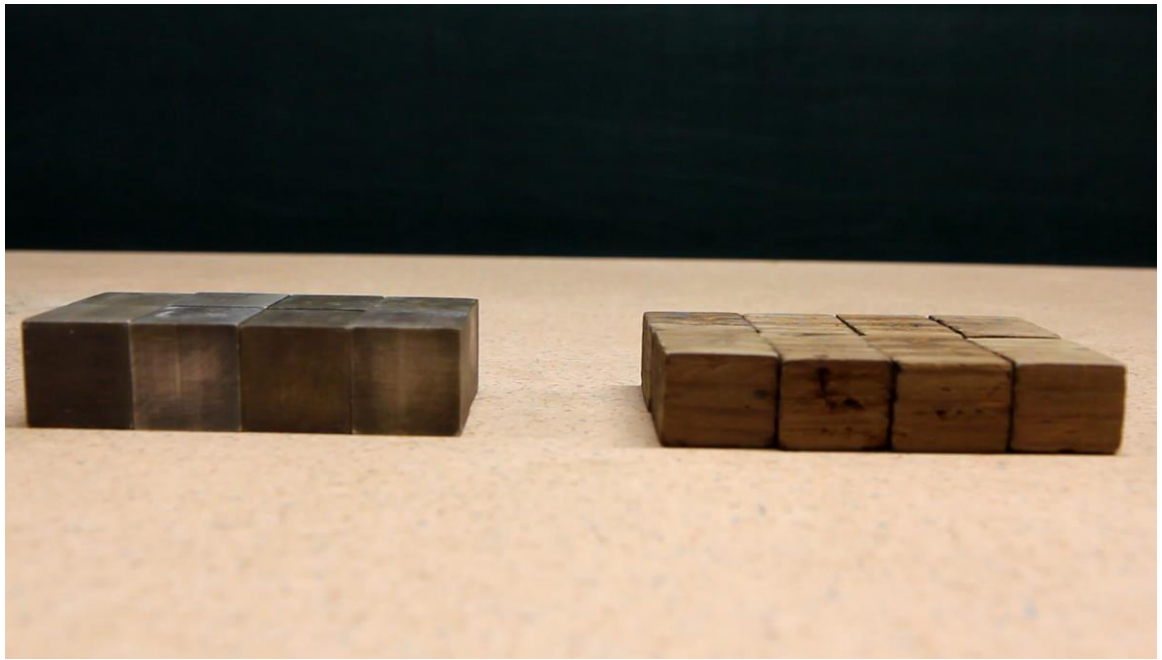
teaching S with

interesting demonstration

Ice cream problem...

& family problem... >_<





Super Lay...

Thanks colleagues for sharing! ^_^

electromagnet

+

ONE
D battery

hang on ceiling

勁! ^_^

Super egg...

hang on ceiling

large cloth

thick cushion

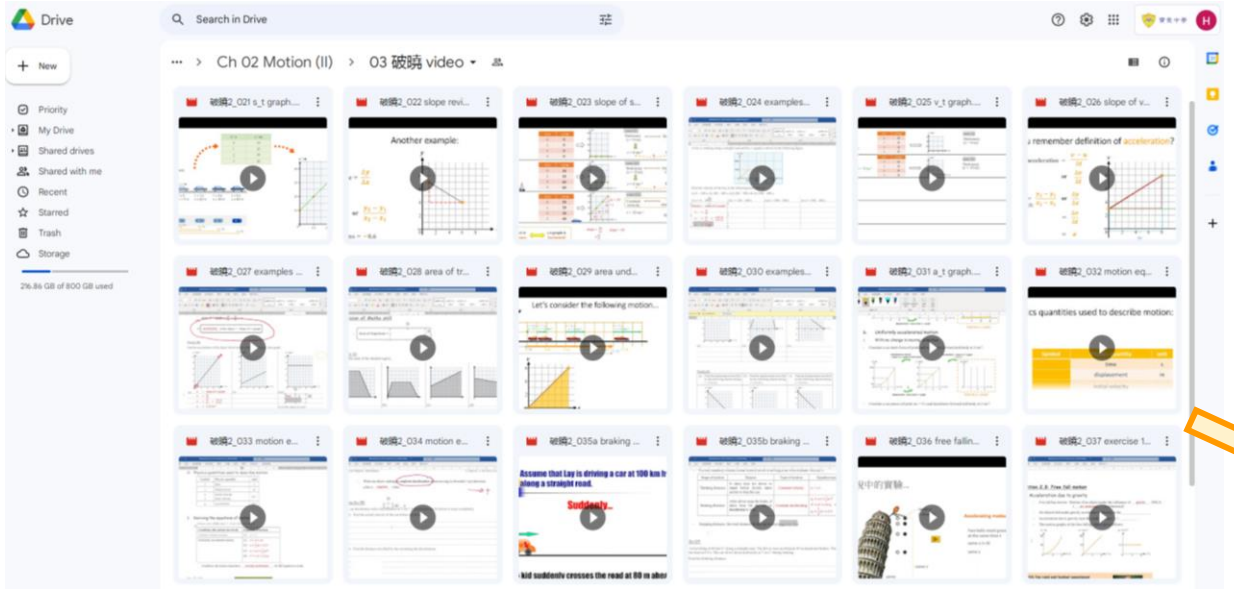
egg

Throw egg to cloth ⇨ not broken!

勁! ^_^

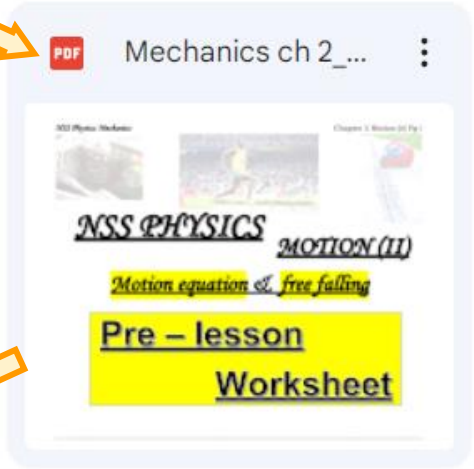
let S learn basic idea with

pre-lesson videos

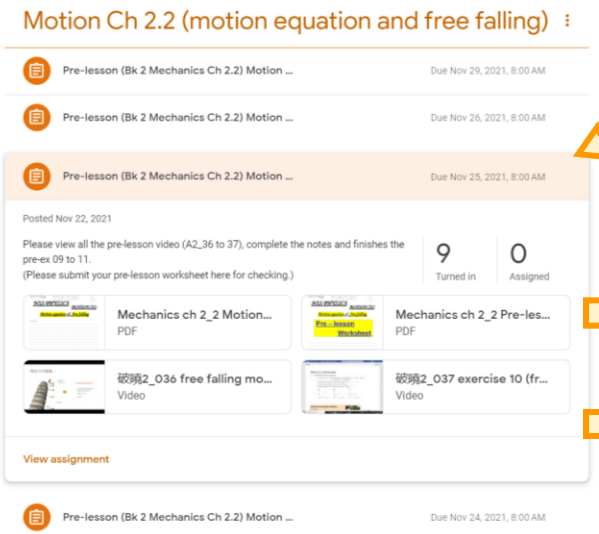


(1) Pre-lesson video

(2) Pre-lesson WS



Google Classroom



(3) Submit Pre-lesson Ex

(4a)

(4b) Remedial teaching

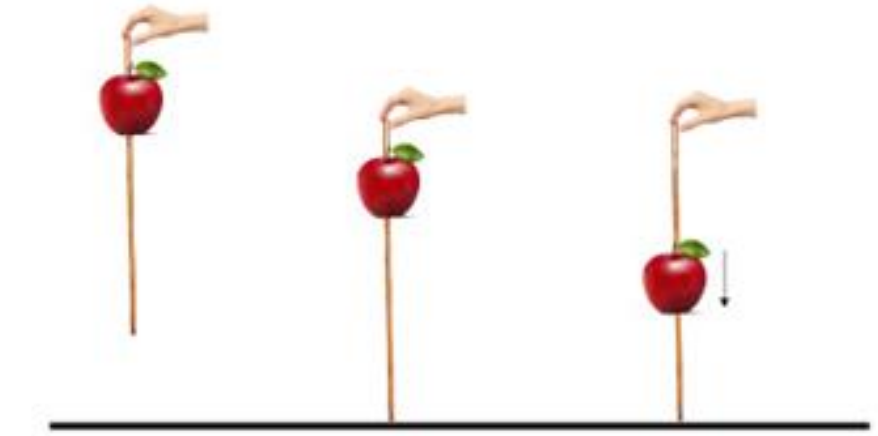
Notes for lesson

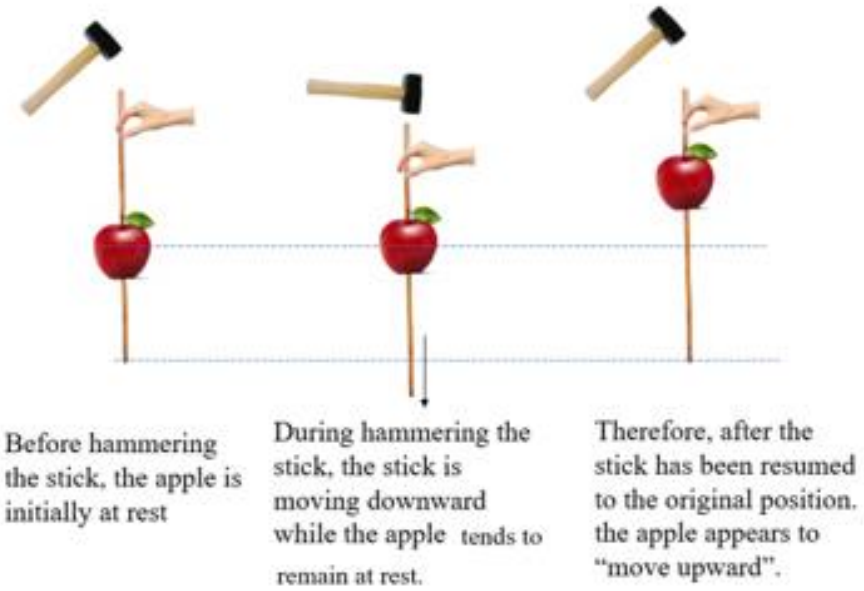
Medium to high level Ex

Linking activity with organized teaching

The apple trick...



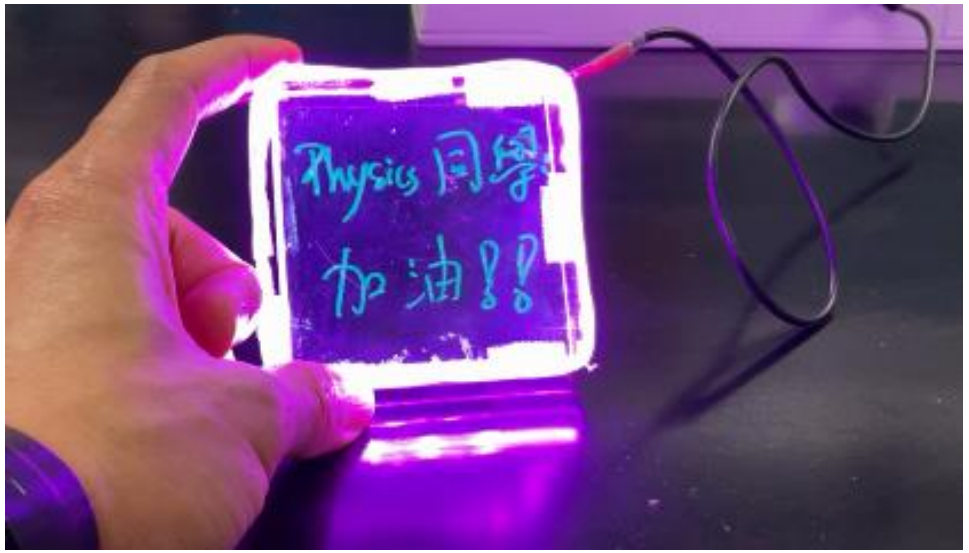



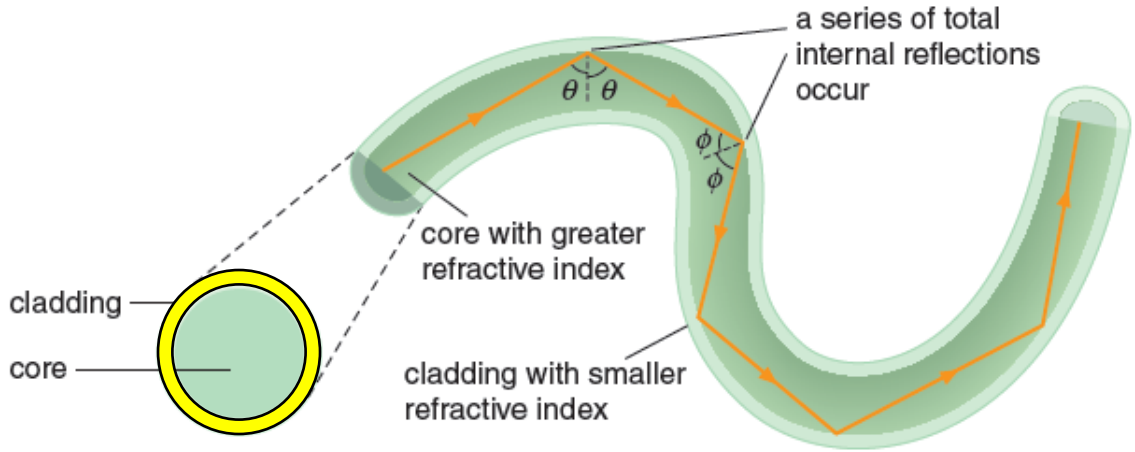


Instead of just using the term "inertia", it is more important for students to understand and learn to apply.

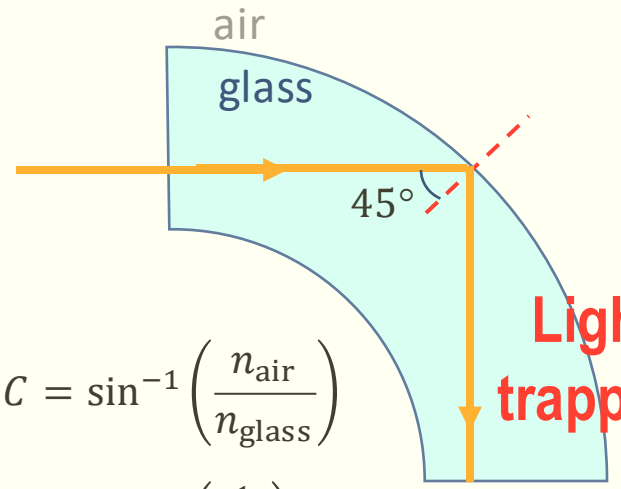
Fluorescent writing board...

link with teaching of optical fibre & cladding





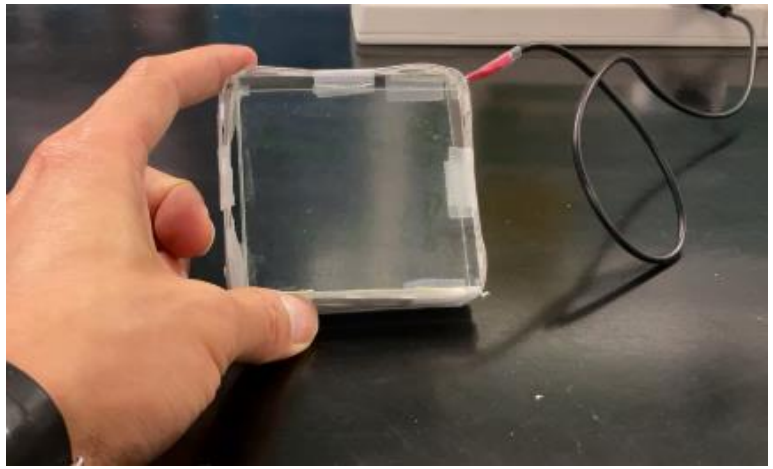
Ordinary situation



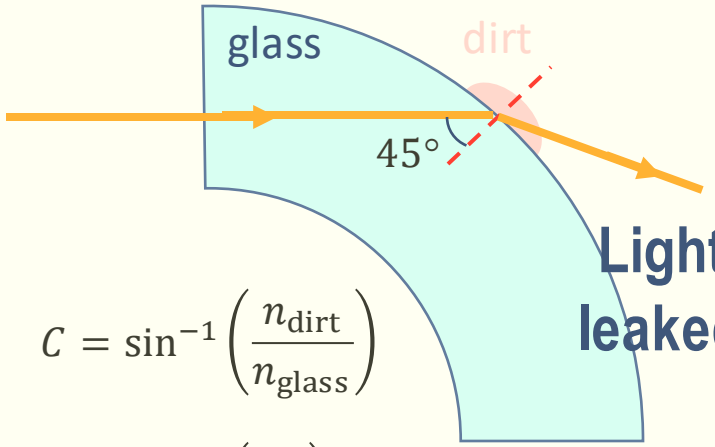
$$C = \sin^{-1}\left(\frac{n_{\text{air}}}{n_{\text{glass}}}\right)$$

$$C = \sin^{-1}\left(\frac{1}{1.7}\right)$$

$$C = 36.0°$$



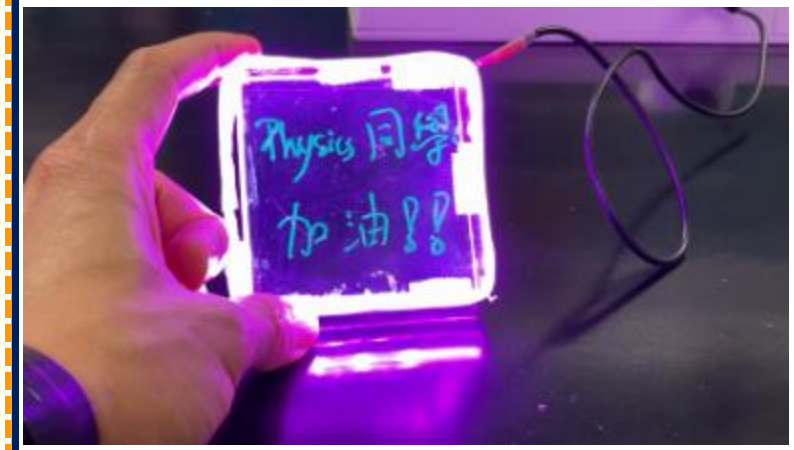
Situation with dirt

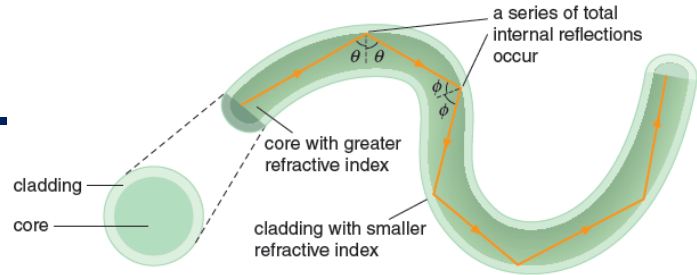


$$C = \sin^{-1}\left(\frac{n_{\text{dirt}}}{n_{\text{glass}}}\right)$$

$$C = \sin^{-1}\left(\frac{1.5}{1.7}\right)$$

$$C = 61.9°$$





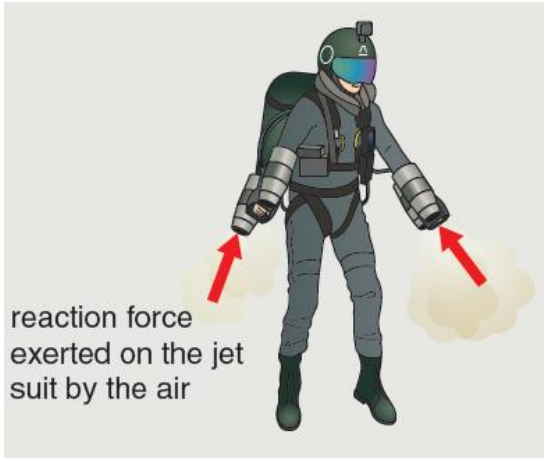
Turning something from familiar into something unfamiliar

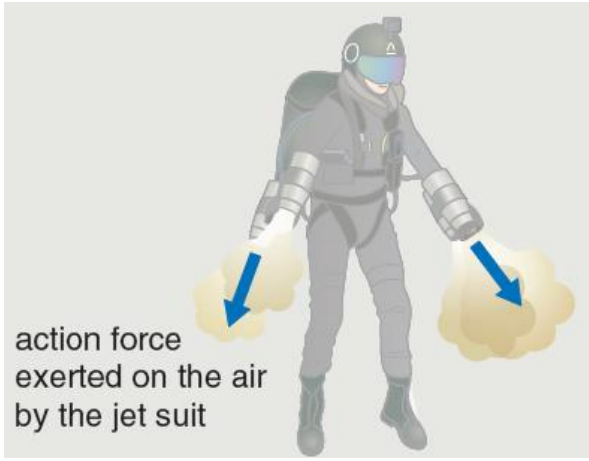
Turning from something familiar into something unfamiliar

unfamiliar situation

familiar situation

transfer of knowledge: explanation





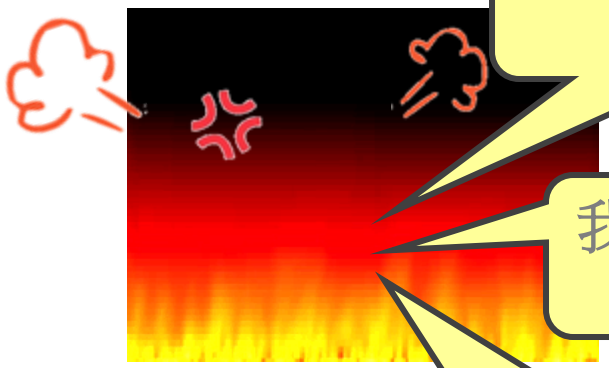
十萬個激嬲 family member 的方法

妳會將雪糕放喺邊？^_^

咁叻既？邊個教妳？^_^

咁點解雪糕放窩夫上面熔慢啲既？^_^

放窩夫上面囉！>_<



我自己唸到架！>_<

>_<###

Interesting learning and teaching activities ≠ S learning the concept

然後，
family member 嬲咗我！

結論：要叫同學解釋！

continuous assessment！

Assessment

Ice cube problem

3.

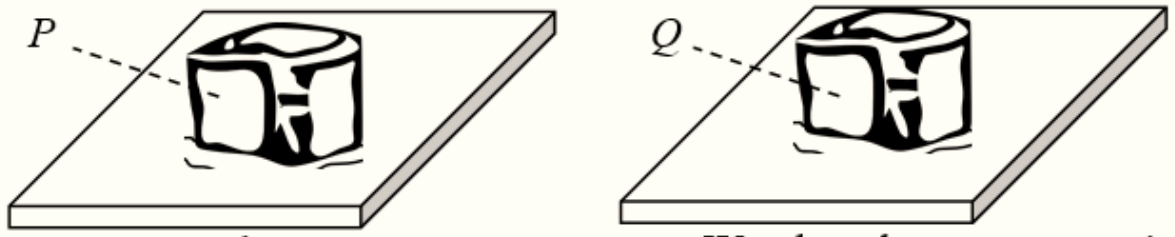


Fig 3.1

Fig 3.1 shows two ices P and Q of the same size. They are put on a copper plate and wooden plate respectively. The two plates have the same temperature.

(a) Which ice melts faster? (1 mark) .....

(b) Explain why the ice melts faster? (2 marks)

.....

.....

.....

.....

Egg problem

apply to new context

+

repeated assessment

crumple zone

mesh fruit cover

bubble wrap

A little step further...

Photo voice: changing the learning role of students

Students pick their experience and apply the physics knowledge.

The monster is fat so he was punched by others,he may not get hurt and feel pain easily because his belly can reduce the force of the punch as the time of contant is increase when the change in momentum is constant

I think everyone has their own smartphones nowadays. There are lots of brands in the smartphone market too ,likeSameSungIphoneSony ,etc. But all of the screen of the smart phone aremake up of glass and the body of it is also can be easily destroyed. Besides each smartphone may cost you several thousand dollars. So a smart phone case act as an important role to protect our smart phone . In fact the smart phone case helps increase the time during collision and the

A little step further...

During playing waterpolo , when the shooter try to shoot the ball to goal ,they will grab the ball and put their hand back ,the time of contact that the ball contact with hand increas , the momentum increase , and the force is constant and remain unchanged . When the time of contact increase , the change of momentum will be larger .

Lazy glasses

Assessment with different type of question

3. Fig 3.1 shows a gadget called 'lazy glasses'. People wearing the glasses can read a book for a long time without leaning the head down and causing neck strain (Figs 3.2 and 3.3).

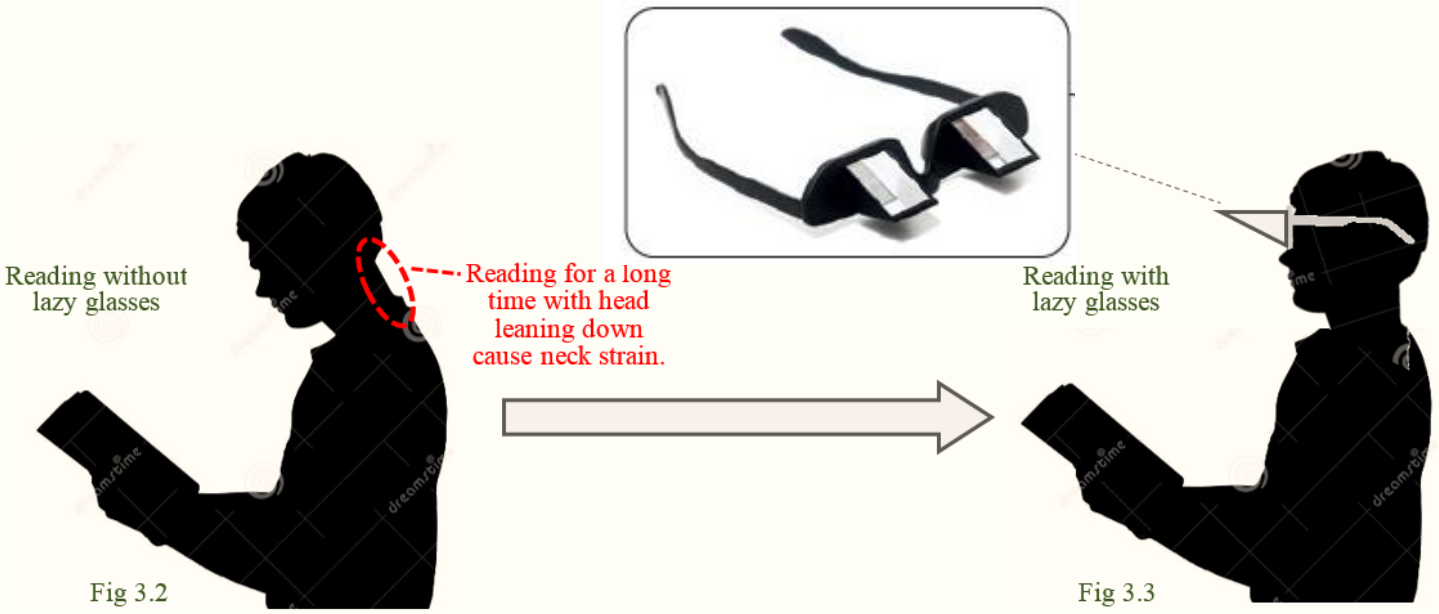


Fig 3.2 Fig 3.3

~ ~ ~ Question 3 continues on the next page ~ ~ ~

Lazy glasses

assessment with different type of question

(a) A student Cindy would like to make a similar gadget by using a 45-90-45 glass prism. She puts the prism above a paper with a letter 'F' as shown in Fig 3.4. A light ray from the letter 'F' incidents normally on one side of the prism. The refractive index of the glass is 1.64.

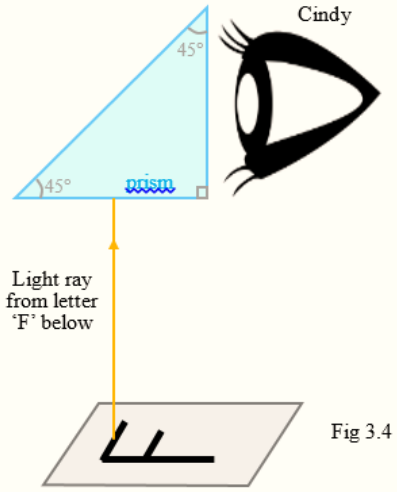


Fig 3.4

(i) Find the critical angle of the glass-air interface. (1 mark)

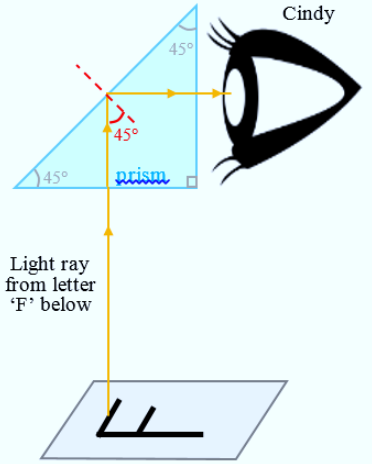
(ii) Complete the path of the light ray until it finally emerges from the glass prism. (2 marks)

(iii) By sketching the shape of the image (in the following space) seen by Cindy, explain why the design of the 'lazy glasses' now is NOT appropriate. (2 marks)

(a) (i) Critical angle for the glass-air interface:

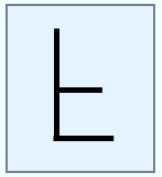
$$C = \sin^{-1}\left(\frac{1}{n}\right) = \sin^{-1}\left(\frac{1}{1.64}\right) = 37.6°$$

(ii)



(iii) The image observed is as shown in Fig f.

The image is inverted and is difficult to be read.



Lazy glasses

assessment with different type of question

(b) The glasses make use of a 30-90-60 glass prism and a mirror facing down on top of the prism (Fig 2.4). A light ray from a letter 'F' incidents normally on one side of the prism. The critical angle of the glass-air interface is 38°.

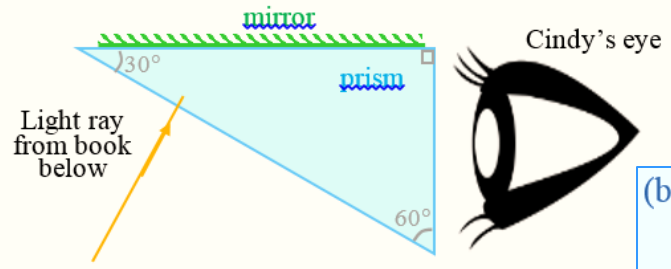
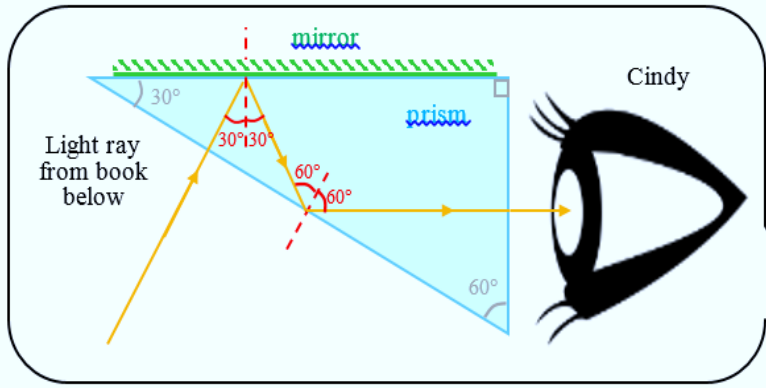


Fig 2.4

(i) Complete the path of the light ray in Fig 2.4 until it finally emerge

(ii) Explain why the image observed is not inverted even light ray is r

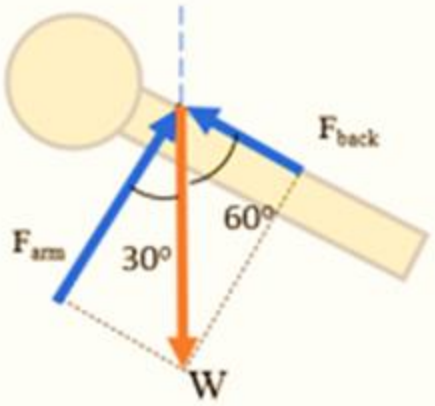
(b) (i)



(ii) Since the light ray is reflected twice, the image is inverted twice. The letter 'F' restores to its original shape and can be read easily.

Flying jet suit

A man is flying with the flying jet suit at constant velocity. The following shows the free-body diagram of the man. The thrust provided by the back engine F_{back} is at an angle 60° to the vertical while the thrust from the arm engine is at an angle 30° to the vertical. Given that $F_{back} = 440N$ while $F_{arm} = 765N$, estimate the total mass of the man and the flying jet suit.



Lightboard (used for video lecture)

Transfer knowledge to a new context

2. Read the following article about Lightboard and answer the questions that follow.

Lightboard

The Lightboard (Fig 2.1) is now commonly used for recording video lecture (Fig 2.2). It consists of a large glass which is lighted up from the upper and lower edges by bright white LEDs. Light is trapped inside the glass until it reaches the edge at the opposite side.

Ink in a fluorescent marker glows when it is illuminated by the light of the LED. When someone writes on the glass with a fluorescent marker (Fig 2.3), ink mark is left on the glass surface. Some light from LED passes through the glass-ink interface and illuminates the ink, causing the mark to glow.

Source: https://lightboard.info/

Lightboard (used for video lecture)

(a) Fig 2.4 shows the schematic diagram (side view) of the Lightboard. Light ray p from a LED enters the glass through the lower edge. Given that the refractive index of the glass is 1.49. The critical angle of glass is 42.2°.

(i) Sketch, in Fig 2.4, the subsequent path of the light ray. (2 marks)

(ii) Explain why the light ray is trapped inside the glass before it reaches the upper edge. (2 marks)

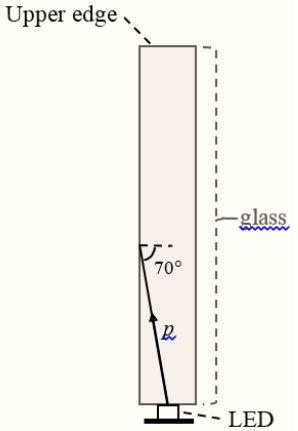


Fig 2.4

(b) A teacher writes with fluorescent marker on the Lightboard. Ink mark is left on the glass surface (see Fig 2.5). The refractive index of the ink is 1.41.

Explain why the ink mark glow. (3 marks)

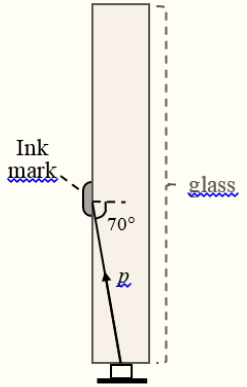


Fig 2.5

Summary

- Instead of giving more example to students about the application of knowledge, it is more valuable for us to create opportunities for students to apply.
- The power of teaching can be strengthened when the assessment is aligned with teaching.

Thank you!

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