HOW HOT IS HOT TRANSCRIPT

Hello, I'm Zaid
I'm a chemistry teacher from Hulu Terengganu science school in Malaysia
Today we are going to learn about the concept of heat and temperature
but first, let's watch
an amazing video taken at the
beautiful island of Langkawi Malaysia.
Let's take a look
Welcome to MH Saujana
What's this?
This is Gamat Oil
What is Gamat?
gamat is a species taken from the sea and being processed into oil.
It will be cooked with coconut oil and some herbs for a week.
this is the result after being cooked for a week
we finally produced the Gamat Oil
Gamat
commonly known as sea cucumber,
is a species of invertebrates which are
popular today for its nutritional
alues and unique healing properties.
It is said that the medicinal properties of gamat
were much sought-after by our
ancestor since 300 years ago
to heal various body ailments.
Gamat hails from the group of Ecchinodermates
that is a phylum rather than a family.
The are more than 2,000 species
of sea cucumber worldwide
and 49 of them are found in Malaysian waters.
The traditional ingredients that we used to produced Gamat provide the cooling effects
Are you brave enough to dip your finger in this boiling gamat oil?
Are you for real?
Why don't you give it a try
Now,
please discuss with your friends and answer these questions:
What can you observe regarding the surface of the oil?

Why do you think the tourists are not willing
to dip their fingers in the boiling oil?
What do you think is the temperature of the boiling gamat oil?
Can you guess?

Activity 1

From the previous scene,
you can see vapor came out from the surface of the oil.
This has restricted the tourist
from dipping their fingers in the boiling gamat
because they may think that the oil is hot!
The tourist must have also thought
the temperature of the boiling oil
is terribly high.
Did you have the same assumption?
Some say that,
the temperature of oil is higher than water
even though same amount of heat is supplied.
Let's see whether this is true.
Look!
Wow…
Don't you feel hot?
Don't you want to try?
I can't believe it!
Don't you think that was amazing?
But please do not simply try this at home.
This situation is ONLY experienced for gamat oil processed in
Langkawi island, Malaysia.
To further understand the situation,
let us perform simple experiment
to compare the temperature of the water and oil.
You will have to follow your teacher's instructions.
You will also need some materials for the experiment
such as, two test tubes,
the same amount (volume) of oil and water,
and a thermometer.
Have fun with the experiment!

Activity 2

Before we discuss the answer to our second activity,

I want you to first watch this next scene.
What do you think will happen
if hot oil from the fried banana pan
spilt on the hawker's hand?
There is high possibility that it will injure the hawker's hand
because boiling oil is hotter than boiling water.
Can you see the relation between the experiment
you did earlier and the scene you just watched?
It is proven that
the temperature of boiling oil is higher than boiling water.
That is why the hawker will feel more painful
after touching hot oil as compared to touching hot water.
To further understand the concept of heat and temperature,
let's discuss this.
Do you know that water and oil have different heat capacities?
Heat capacity, or thermal capacity, is the measurable physical quantity of heat energy required to change the temperature of an object by a given amount.
For an example,
the specific heat capacity of water is
4.2 Jg -1oC-1
whereas oil is
2.0 Jg -1oC-1
This means that the same mass of water and oil
can transfer different quantities of heat
even if their temperatures change by the same amount.
Heat capacity for oil is lower than water
yet the temperature of boiling oil is higher than boiling water.
Why is this?
To answer this question,
let's continue our next activity of measuring the temperature
of the boiling water and oil.
Again, please follow your teacher's instructions.
In the activity,
you will have to compare the amount of energy supplied
by the boiling water and figure out
why is the temperature of oil higher than the temperature of water.
The heat capacity of oil is the ratio of the energy absorbed to the associated temperature rise.
For example, the specific heat of oil is 4.2 Jg/kgC so it takes 4.2 Jg to raise the temperature of 1 kg of oil by 1 degree C.
So the heat capacity of a kilogram of oil is 4.2 Jg/C

Activity 3

Did you manage to get the answer to the experiment?
let me repeat the question,
why is the temperature of oil higher than the temperature of water in the experiment
although the heat capacity for oil is lower than water?
how do we explain the situation?
Let's watch this animation.
The same amount of heat given
will raise different temperature.
because of different heat capacity.
Heat capacity is the amount of heat
required to raise
the temperature of an object
or substance one degree.
Meaning,
different objects would warm up
at different rates because
each object has its own
specific heat capacity
Object with lower heat capacity
will cause the temperature
to raise quickly.
The increase of internal energy
will often be associated
with a corresponding increase
in the speed of the particles
which would imply
an increased kinetic energy,
thus the temperature of the body increases.
Temperature is the measurement
of the average kinetic energy
in the substance when heat
energy is absorbed or released.
The absorption of heat also depends
on types of substance
and the mass of substance.
The heat absorbed
or released by a substance that is
$Q=mc\theta$

$Q=m*c*(\theta)$
Q=heat energy
m=mass
c=specific heat
θ = change in temperature
(=final – initial temp)
Heat is different from temperature.
They are not identical ideas but they are related.
Heat is the total amount of energy
possessed by the molecules in a piece of matter.
Heat is measured in Joules.
Temperature is not energy.
It relates to the average (kinetic) energy
of every particle in the system.
It is measured in Kelvin (K)
or Celsius (C)
of Fahrenheit (F)
When heat is transferred to a substance,
the substance can sometimes experience a rise in the temperature or phase change
as a result of an increase in the averange
kinetic energy of the particles in the substance.
When we apply this concept
to everyday life such as pots and pans,
we need to understand the term
Thermal Diffusivity
A high thermal diffusivity means that a
materials conducts more heat rather than stores it.
When I say conducts heat, I mean that it transfers from the source of energy through the material
to the other side and the substance in contact with it,
say water in a pot that you want to boil.
A low thermal diffusivity means high heat capacity so that more of the energy is stored internal to the material.
For example, a metal cooking pan would have a
high thermal diffusivity when compared to the wooden handle on it.
Now, the interesting part of processed Gamat oil
as compared to normal oil is that,
it has a high specific heat capacity.
So, when it is heated, the increase in temperature is low.
if the same amount of 1kg of sunflower oil
and Gamat oil are heated

at the exact same heat
and in the same type of cooking pan
the result may indicate this
This is why you don't feel hot dipping
your finger in boiling gamat oil.
Nevertheless, there are other ingredients
used during the boiling process
to lower the temperature such as
coconut oil and some traditional herbs.
From this lesson,
you have learned about the difference
between heat and temperature.
Substances having a small specific heat capacity
can be quickly heated up,
it also experience a big
change in temperature
even though only small amount of heat is supplied.
The same concept also applies in everyday life,
for examples:
Substances having a small specific heat capacity
are very useful as material in cooking instruments
such as frying pans, pots and kettles.
This is because,
they can be quickly heated up
even when small amount of heat is supplied.
Sensitive thermometers
also must be made from materials
with small specific heat capacity
so then it can detect
and show a change of
temperature rapidly and accurately.
Substances that have a high specific heat capacity
is suitables as a materials
for constructing kettle handles,
insulators and oven covers,
because a high amount of heat will cause
only a small change in temperature
otherwise the materials will not get hot faster.
Water as a cooling agent
acts excellent as a cooling agent in engines.
Water is also used in houses
in cold climate countries

because as it is heated up (boiled)
it tends to retain heat and warm the house
due to its high specific heat capacity
I hope you enjoy watching this video
and getting to know more about the concept
of heat and temperature.
Thank you
and have a nice day.

Teacher's Guide

this lesson will take about 50 minutes.
The earlier shot of this video was taken in Langkawi, Malaysia where gamat oil is produced.
the video will be followed by an experiment
to clarify about the concept of heat and temperature.
It also shows the concept of specific heat capacity,
the affect and the amount of heat absorbed by different materials.
Student should watch the animation
showing the vibration and movement of particles
in different liquids
when the same amount of heat is applied.
Other than carrying out experiment,
teacher can also use demontration method
if the apparatus and materials are not suffucient.
I would also suggest for you to watch
blossoms video entitled
"how cold is cold"
These are the links to the video: