**BLOSSOMS VIDEO LESSON TRANSCRIPT**

**The Art of Making Layer Cakes:**

**Proper Construction of Bituminous Roads and Highways**

Hi, I’m Dr. Norhidayah

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Today, I am going to talk about

The art of road construction

And causes for problematic roads.

I hope that by the end of this video,

You will learn the correct procedure

In road construction.

In this video,

We will use the art of baking a layered cake

Which is a common delicacy in Malaysia

As an analogy to highlight the importance

of using quality materials

and following the correct procedure

in road construction.

Mum, what happened?

The way you are driving

might ruin my cake

Sorry my dear,

There is a big hole

in the middle of the road

Look at this pothole.

This is one of the common problems

that we experience

when we are driving on the road.

We can find many types of road defects.

There are various causes for those defects.

Among them

is due to improper road construction procedure

such as using low quality materials,

inappropriate mixing of materials

and ignorance in following the proper steps

for mixing materials

for road construction.

To help you understand

The basic engineering concept

of road construction,

we will use the analogy of looking

at the correct procedure

for baking a layered cake.

Let us now look at what happened

to the children and their cakes.

Happy Teachers’ Day Ms Aida

I’ve baked a cake for you

Happy Teachers’ Day Ms Aida

I’ve a cake for you,

but

is not as nice as Aminah’s

Thank you Aminah and Asiah

For the lovely cakes.

Ooo…Asiah

You don’t have to worry about the

cake you gave me.

Asiah would you like me to show

you the right way to bake a layered cake?

Yes teacher.

I would love to improve my baking skill.

Can you come to my house this Saturday?

Yes

After watching the video,

Can you discuss in small groups

Why is the outcome of the layered cakes

Between Aminah and Asiah different

Although the ingredients used are the same.

**Activity break #1**

A few possible reasons

For the outcome of the layered cake

To be different although the ingredients

Used are the same

are due to ingredients selection

in terms of the quality

and ratio.

Did you get it right?

If the ingredients used are of low quality

or the ratio used is not the right proportion,

you could end up baking a cake

which does not rise adequately.

Similarly, in road construction,

the selection of quality materials is

one of the important factors

to ensure thet the constructed road

is long lasting and comfortable

for road users.

To further explain this phenomenon,

lets go back to our analogy,

which is the process of

baking the layered cake.

Aminah and Asiah,

To bake a layered cake,

First

we need to have

all the ingredients

in the right proportion.

We should have

350 gram butter

half tin of condensed milk

1 teaspoon of full mixed spice

1 teaspoon of golden syrup

1 teaspoon of vanilla essence

18 egg yolks

3 white eggs

100 gram of flour

180 gram of sugar

1 tablespoon ovalette

25ml of water

Similar to the process of

baking a layered cake,

the materials required for road construction

should meet the standard specification.

The materials should be of qualified

and measured in the right proportion.

The ingredients used for road construction

are a combination of two main materials.

There are bitumen

Sometimes referred to as asphalt

And aggregates.

Bitumen is a semi-solid materials

Obtained from petroleum refinery

Through the process of petroleum distillation

On the other hand,

aggregates are basically stones

of different sizes

taken from quarry.

They are categorized as

coarse aggregates,

fine aggregates

or filler.

Aggregates being obtained

from a quarry and activities such as,

aggregate crushing,

grinding,

separating into different sizes

and aggregate stockpiles.

There materials are then mixed

to produce a premix which is called

bituminous mixture or asphalt mixture.

This proportion of bitumen

in the premix is around 4%-6%

whereas the aggegates is 94%.

Now that we know about the materials

that can be used for road construction,

your teacher will provide you

with sample of photos.

Based on your general knowledge

about roads

and the information provided earlier,

you will have to name

the type of road for each photo.

Also,

You will have to visualized

what are the materials to be found

underneath of the road structure?

**Activity break #2**

If you answer is bituminous road,

concrete road

and interlocking concrete block pavement,

you are right.

Let us learn more about road construction.

There are five main road layers

involved in road construction.

The first layer is called the subgrade

which is the existing soil.

The second layer is called the sub-base

which consists of coarse aggregates.

The third layer is called the road base

which is also made of aggregates

but it is finer than the aggregates

in the second layer.

The following two layers

which are the fourth and fifth layers

are commonly known as the surfacing layers.

The fourth layer

is referred as the binder coarse

wheares the fifth layer

is named as the wearing coarse.

Both layers

are made of a mixture of bitumen

and aggregates.

The binder coarse layer

has a higher percentage

of coarse aggregates

than fine aggregates

but

the wearing coarse

has a higher percentage

of fine aggregates

than coarse aggregates.

Based on previous explanation on road layers

and the picture shown,

why do you think we have

to lay the coarse aggregates

prior to fine aggregates

in road construction?

Next,

do you think roads are constructed as levelled

or slightly inclined

and why?

Discuss the answer to these questions

with your teacher and friends.

**Activity break #3**

If your answer for the first question

Is to enable the fine aggregates

To fill the gaps between

The coarse aggregates particles

And ensure smooth ride

on the road.

You are right.

For the second question,

Look at the diagram shown.

If you think that

the road is slightly inclined,

your are right.

This is to prevent water accumulation

on the road surface

or to channel the water

to the nearest drainage.

Now that we understand

that roads have several layers

and consist of different materials.

Let us discuss further

on the quality of materials used

for road construction.

We have to ensure

that the quality of the materials used

have achieved the standard specification.

One of the materials

for road construction is the aggregates.

There are several basic test

that can be conducted

to check the properties of aggregates.

In road construction,

it is important to inspect

the materials properties

to ensure that the materials

have achieved the standard specification.

This is because

in some countries,

unscrupolous contractors have been known

to dilute materials

or to use substandard materials

so that they can keep more money,

since substandard materials are cheaper

than what is required by specification.

For example,

to test the quality of the aggregates

we can use the following tests.

Please look at this

Another material for

road construction is the bitumen.

In order to test the quality of bitumen,

we can use the following tests.

Please look at the table shown

Based on the information described earlier,

imagine that you are given the task

of checking the aggregates shape property

and then decide whether they are suitable

to be used in road construction.

Using the tools

And information given by

your teacher,

complete the following task.

**Activity break #4**

So, after comparing your result

with the specification,

don’t forget to discuss with your friends

If the Flakiness Index is more than 15%

the aggregates provided

are considered not suitable

to be used in the road construction.

This is because,

the presence of high amount of flaky aggregates

are consedred as undesirable

in road construction

because of their tendency to break down

during compaction and affect

the aggregate interlock within road structure.

As a result

It will reduce the strength

and durability of the road.

Now we know the materials

that should be used

for road construction.

Through the previous explanation

and activity provided,

you should be able to identify

the quality of material

through various tests.

At this stage,

the students are expected

to have the knowledge

and ability to make decisions

on basic materials selection.

Another important factor

that will be highlighted

on road construction is

procedure.

Let us go back

to the scene in the kitchen

with the teacher and her students,

Asiah and Aminah,

to show the important of

following the right steps

in the process baking a layered cake.

The same process applies

to road construction,

where the road is constructed

layer by layer

following the right sequence of procedure.

Now, the ingredients are ready.

We have to mix all of them.

However,

we have to follow the correct sequence

to make sure they are mixed well.

After that,

cake will be prepared layer by layer.

We have to make sure

each layer is well cooked

is attached to each other.

In road construction,

there are a few steps

that have to be followed correctly.

First,

it starts with the process of

preparing the materials

in the correct proportion.

Next,

the materials are mixed together in a plant.

Then, the prepared premix

will be delivered

to the road construction site

based on the materials

and instruction given,

students work in small groups

to solve a case study

which is related to the topic.

**Activity break #5**

Asiah and Aminah,

the cake is now ready.

You can see the cake

has a very nice texture

and different layers.

Now you know the importance

of using the right

proportion of materials

and procedure

during the process of baking a cake.

As a conclusion,

this lesson has tried

to highlight the importance of

following the correct specification

for road construction

using the analogy of

baking a layered cake.

Based on what we have learnt

from the process of baking a layered cake,

we can relate it to the situation

in which it has been applied

in the engineering field of road construction.

As an engineer,

you have to take the responsibility

from the design to construction work.

This is to ensure

the structure is constructed

according to the specification,

safe and in good condition for the user.

It should be noted that this video

only highlights on the perspective

of using quality materials

following the correct procedures

in road construction.

Please take note

there are many layers in the cake

but each layers consists of similar materials

yet in real road construction

each layer contains different materials.

I would also like

to highlight

that there are other factors

to be considered in constructing road,

not only those

that have been shown earlier.

Can you think of the factors?

I shall leave to discuss the answers

with your teacher and friends.

Have fun.

**Activity break #6**

The other factors

that should be considered

for road construction are

the traffic volume

soil properties

weather condition

and machineries

For example,

the traffic volume and

soil properties

should be properly estimated,

because

the road must be adequately designed

to accommodate the accumulated traffic.

This is to avoid the

structural damage of the road.

Another factor is the weather condition

the construction of road

should be avoided

during the periods of high rainfall

to prevent the deterioration of the road

In addition,

selection of the machineries to be used

for the road construction is also very

important

that determines the effectiveness

and the quality of the road structure.

The aim of this module

is to show the students

the art of road construction

and causes for problematic roads.

They need to understand

the importance of carrying out

road construction in a proper way.

The techniques adopted

are not complex but

based on a simple concept.

The main activity is to ensure

the students can understand

the process of materials selection

in road construction,

which involve the materials proportion

and quality of materials.

Generally,

the students will be given simple activities

which is aimed to ensure the students

discover a simple concept of road construction

by comparing it to the layered cake.

In order to continue with the module,

the students need to know the basic knowledge

of flexible pavement.

They will also need to know basic algebra

and simultaneous equation

in order to compute

an expression for the uncertainties.

All the end of the module,

students will be given activities

to solve for a better understanding of the concept.

The module

should not take more than 50 minutes

to complete,

if the students have

the basic knoeledge as mentioned.

The first activity asks the students

to come out with a few reasons

on the problem related to the layered cake

as shown in the video.

This is to answer:

Why is the outcome of the

two layered cakes are different

although the ingredients used are the same.

In second activity,

the students are divided into small groups

are required to find

the right aggregate proportion

for the given problem.

The students will be given

question sheets and instructions.

In the third activity,

within the small groups,

the students have to conduct

a few aggregate tests.

the students are given aggregate samples.

They are required to conduct

simple aggregate tests

to determine the quality

of the aggregate given.

Based on the test,

the students need to come out

with comments and recommendations.

During the fourth activity,

in groups,

the students will be given a case study

where they are required to build a small

scale road model

for the given problem.

The materials and tools are given.

In this task,

they need to apply

all the aforementioned knowledge

to solve the problem.

Finally,

this module needs

to be summarised in term of the fact

that the materials selection

and its quality as well as

following the correct procedure

are important in road construction.

Additionally,

the teacher have to mention

the other factors that have

to be considered in road construction.