Topic 4- Quality Water (Key Stage 2)

English voice over script and super:

Super: Topic 4 Quality Water Key Stage 2

FVO: Topic 4 Quality Water Key Stage 2

Super: Sha Tin Water Treatment Works

Water Save Dave: Welcome to Sha Tin Water Treatment Works, I am your tour guide Water Save Dave, or you can just call me Dave.

Boy & Girl: Hi Dave.

Water Save Dave: Before we start, let me show you something.

Boy: Huh! Is this a reservoir?

Super:
Raw water

Water Save Dave: That's right. This is where I stay before going to the shower. The water here is called raw water, which contains sediments and impurities, plus bacteria that can only be seen under microscope.

Boy: Really? Are we going to get sick after drinking this water full of sediments, impurities and bacteria?

Super:
Guidelines for Drinking-water Quality
Water Safety Plan
Before
After
Risk

Water Save Dave: Well, don't worry! Based on the World Health Organisation's Guidelines for Drinking-water Quality, WSD has established a Water Safety Plan to

ensure the drinking-water quality. In simple terms, a Water Safety Plan is to ensure a good drinking water quality from source to distribution, reduce the risk of contamination before and after water treatment, and to ensure the integrity of the water supply system.

Girl: So, first of all, should we keep water clean even before treatment?

Water Save Dave: You are absolutely correct. Do you know how water sources get contaminated?

Boy: I know I know! Heavy rainfall will carry sediments, pollutants and bacteria into catchwaters; but when there's a drought, the density of contamination in water increases due to the insufficient amount of water for dilution.

Super:
water quality

Girl: Also, man-made causes such as agricultural and industrial activities, changes of land use, residential developments, chemical spills and contamination incidents can all affect water quality.

Water Save Dave: Wow, you know better than I thought. But can you suggest ways to resolve these problems?

Girl: Well. I am not quite sure.

Super:
Catchment management
Set up a monitoring regime
Control land uses
Control activities and developments within water gathering grounds
Regular inspections
Enforcement of relevant ordinances and regulations

Water Save Dave: Actually, WSD has been implementing effective measures over water source contamination. Effective catchment management such as setting up a monitoring regime, controlling land uses, activities and developments within water gathering grounds, and carrying out regular inspections and enforcement of relevant

ordinances and regulations. As for you guys, remember not to swim in the reservoir because it is unlawful and will pollute our water source.

Boy: Yes sir.

Water Save Dave: In fact, there is another water source that Hong Kong needs to protect, which is Dongjiang water from Guangdong Province. In order to maintain the Dongjiang water quality, Guangdong authorities have established different measures to prevent contamination of water.

Girl: What are these measures taken by Guangdong authorities?

Super:
Dongjiang
Water source protection zone
Surveillance Station
Sewage Treatment Plant
Bio-Nitrification Plant

Water Save Dave: These measures range from preventive to pro-active. For example, restricted development in areas near the sources of Dongjiang, relocated manufacturing industries which are the sources of pollution, demarcated protection zones and installed surveillance system to ensure water quality. In addition, Guangdong authorities have also constructed sewage treatment plants near the river, so that sewage is treated before being discharged into the river. In addition, a bio-nitrification plant is built at the Shenzhen Reservoir to enhance water quality.

Water Save Dave: In order to comply with the Hong Kong Drinking Water Standards, in addition to the relocation of the intake points of Dongjiang water to a location of better water, the original open channel system transporting water from the Dongjiang intake to the Shenzhen Reservoir has been replaced by a dedicated aqueduct to segregate the source of water supply from the source of polluted water.

Girl: Guangdong authorities have done quite a lot...So what is the role of WSD?

Super:
Quality monitoring works of Dongjiang water
First station

Muk Wu Raw Water Pumping Station

Water Save Dave: WSD has been maintaining close liaison with the Guangdong authorities on the water quality of the Dongjiang water supplied to Hong Kong through regular meetings to review the monitoring of water quality works. Close monitoring of the Dongjiang water is undertaken as soon as the water reaches the first point of reception at the Muk Wu Raw Water Pumping Station. In case there is a problem, WSD will liaise with the concerned Guangdong authorities to decide if reduction or suspension of the Dongjiang water supply is required in the light of its actual quality conditions.

Boy: So the water should be clean enough and ready for drinking as we have so many measures for monitoring!

Water Save Dave: Not so soon. Before water is being pumped into your home, another treatment process will take place because impurities, germs and bacteria can still be found in the water.

Girl: What else can we do with the water?

Water Save Dave: This involves the second step of the Water Safety Plan, that is treating raw water to become drinking water that complies with standards, this is also relevant to today's visit.

Boy: I know. Water needs to go through water treatment processes.

Water Save Dave: You are correct. There are some living organisms such as fishes and phytoplankton in the reservoir. Therefore, the filter will first separate water from large impurities. Then water will be delivered by large transfer mains and tunnels to water treatment works for treatment.

Girl: What are water treatment works about?

Super:
Clarifiers
Filters

Water Save Dave: Come and see. From afar you can observe two different shapes of

pools. First, the big round pool which looks like a car wheel is called a clarifier. Second, the rectangular pool like a farming field is called a filter. Water from various sources will be gathered here for treatment.

Girl: How many treatment works are there in Hong Kong?

Super:
20 Water treatment works
2124
Largest
One quarter

Water Save Dave: There are now 20 water treatment works with a total capacity of 5.31 million cubic metres per day, which is equivalent to the volume of 2124 standard swimming pools of water! I came from Sha Tin Water Treatment Works, its capacity is 1.23 million cubic metres every day, which is the largest treatment works in Hong Kong, handling one quarter of our total treatment capacity every day.

Boy: Sounds impressive. So, Dave, what happens to you after entering here?

Super:
Chemicals
Alum

Water Save Dave: Every time I arrive here, I will be pre-treated by being dosed with various chemicals such as alum and then being stirred, forming larger particles to assist in the coagulation of the suspended solids which can facilitate precipitation.

Girl: Then?

Water Save Dave: Then I will be passed to the clarifier for precipitation. The sludge which settles to the bottom of the clarifiers is collected and compressed into sludge cakes before being disposed of at landfill sites. After taking a good bath in the clarifier, I will be drained through a fine filter to filtration pool.

Boy: What! Are you still not ready to go?

Water Save Dave: Not yet! The filtering processes require me to go through the

filtration pool to remove the more finely divided suspensions. A filter bed is used here.

Girl: A bed? How can a bed filter?

Super:
Anthracite
Sand
Other granular media

Water Save Dave: A filter bed comprises of three elements: anthracite, sand and other granular media, which can remove the more finely divided suspensions. After passing through the filter bed, I am cleansed.

Girl: Can I ask a question?

Water Save Dave: Go ahead.

Girl: Since the more finely divided suspensions accumulate in the interspace between the anthracite and sand, will the filter bed become dirty over the years?

Water Save Dave: You are so smart to come to this conclusion! In fact, the filter bed will accumulate lots of dirt if left unattended, just like how your bed sheets would become dirty over time if not washed. But it can be assured that the filter bed is cleansed by backwashing from time to time.

Boy: What do you mean by backwashing?

Water Save Dave: When compressed air is being pumped to the filter bed, residues depositing on the bed will be extracted. Given that the residues are lighter, they float on the surface of the pool. The mud-like residue is the substance filtered off by the filter bed.

Super:
Light
Heavy

Water Save Dave: After a while, as water level rises, the mud-like residues on the

surface are being washed off. All materials will slowly return to the original states according to their respective weights. This process repeats itself until the filter bed becomes clean and ready for the next filtering session.

Girl: I see. This process is quite amazing, and the water becomes clean.

Water Save Dave: Despite water being cleansed and filtered through the clarifier and filter, it is still not quite ready for consumption, not until the Three-treasures are added.

Super: Three stuffed treasures?

Boy: What treasures? Is it something on the menu?

Super:
Hydrated lime
Chlorine
Fluoride

Water Save Dave: Don’t be silly. The Three-treasures refer to hydrated lime, chlorine and fluoride.

Boy: I am sure filtered water is clean enough. How come we still need to add the Three-treasures?

Super:
Old water mains
Water storage tanks
Iron
Rust
Hydrated lime

Water Save Dave: Well there are reasons for it. As some old water mains and fittings are made of iron, and water storage tanks may also contain iron, hydrated lime is added to reduce corrosion of water mains and fittings.

Girl: What about chlorine?

Super:
Water treatment works → Water storage tanks → Houses

Water Save Dave: Given that most water storage tanks are on top of high-rises, water needs to travel for quite a while, during which bacteria may easily grow. As a result, chlorine is needed to keep water free of bacteria as the water flows through the distribution system.

Super:
Oral Health
Fluoride

Water Save Dave: Last but not least, in order to safeguard our oral health, water is also being added with an appropriate amount of fluoride. Upon adding the Three-treasures, water is finally clean and ready for use.

Girl: What a complicated treatment process!

Water Save Dave: Water treatment is a science that has recently been undergoing tremendous research and development, with many new technologies enhancing the treatment process.

Boy: Really! Can you name some examples?

Super:
Membrane technology
Water molecules
Save spaces
Reduce chemicals

Water Save Dave: For example, there is membrane technology. Membrane technologies refer to the use of membrane in the filtration process to separate substances from water. The principle is quite simple: the membrane acts as a filter that lets water molecules to go through, while it catches suspended solids and other substances. These technologies using a semi-permeable membrane are efficient in terms of the economy of the space they take up. Another advantage of such technologies is that they can work without or with only a few chemicals.

Super:
Disinfection by Ozonation
Very strong oxidising agent
Control Taste / Odour
Disinfection

Water Save Dave: Another one is Disinfection by Ozonation. Ozone is a very strong oxidising agent. It has been widely used in water treatment to replace chlorine for oxidation of impurities, taste and odour control as well as disinfection. Compared with using chlorine, ozonation is much more expensive but odourless, at the same time, it is found to be effective for killing micro-organisms and controlling algae growth. However, it cannot produce a lasting disinfectant residue in water and therefore a small amount of residual chlorine is still dosed into the water before leaving the water treatment works to keep the water free from contamination and maintain purity during its journey in the distribution system.

Super:
Disinfection by Ultraviolet Radiation

Water Save Dave: Apart from the above two technologies, there is also Disinfection by Ultraviolet Radiation which is effective for killing micro-organisms. Disinfection using ultraviolet (UV) radiation has been more commonly used for wastewater treatment, but nowadays it is increasingly used for fresh water treatment as well. And here is the first water treatment works in Hong Kong using UV radiation for water disinfection.

Girl: With these new technologies, I believe water quality will get better in time.

Super:
Water treatment works

Water Save Dave: You are right. But there are still chances that clean water coming from treatment works can be contaminated. For example, improper commissioning of new plumbing systems, substandard plumbing materials, defective water main connections, or even vandalism may all result in water contamination within the supply system.

Boy: Oh dear, what can we do?

Super:
Design
Operation
Maintenance
Cleaned
Flushed
Sterilised

Water Save Dave: This involves the third step of the Water Safety Plan. In order to maintain water quality and avoid contamination during transportation of water, the design, operation and maintenance of the water network are very important. WSD has established procedures and practices to manage, reduce and control the hazards that may affect the safety of the drinking water supply in the distribution system. For example, a newly laid fresh water main has to be properly cleaned, flushed and sterilised according to established procedures before putting into use.

Girl: If a water main in a building bursts, should we first inform WSD for repair?

Water Save Dave: Well this is not entirely true.

Girl: Wrong again! How come?

Super:
Responsible by WSD
Land lot boundary
Responsible by building owners / property management offices

Water Save Dave: WSD is responsible for supplying water to connection points at the land boundaries of buildings. But the operation and maintenance of internal water mains and all associated supply facilities are the responsibility of building owners, their property management offices or registered service agents. They should properly maintain all internal plumbing within their premises such as engaging professionals in inspection and maintenance.

Boy: What kind of problems can occur with the water mains in a building?

Super:
Weaken the water flow

Water exposed to the air
Water seepages in ceilings or walls
High water bills

Water Save Dave: There's a lot! For example, water mains can be blocked by foreign objects and then the flow in the system may be weakened. The leaking points of water mains will expose the water, resulting in the depletion of the chlorine levels in water and also water seepages in ceilings or walls. They may also lead to high water bills. Therefore, it is important to maintain a good quality of water supply in the inside service systems.

Boy: Oh, then the residents must work diligently.

Super:
Quality Water Supply Scheme for Buildings – Fresh Water (Management System)
QMS

Water Save Dave: Indeed. To encourage building owners to fulfill their role in the provision of clean water at tap and to enable the public to have quality water, WSD launched the "Quality Water Supply Scheme for Buildings – Fresh Water (Management System)" (QMS).

Boy: What is QMS?

Super:
Voluntary
Property owners
Property management companies
Risk assessments
Measures
Feedback

Water Save Dave: QMS is a voluntary scheme for property owners and property management companies. Under this plan, stakeholders of the property have to perform risk assessments including identification of areas where potential contamination of the internal plumbing system may occur, such as impurities in the water storage tanks, and to introduce measures and strategic plans for inspection, maintenance and audits to receive positive feedback and ensure the effectiveness of

the scheme.

Water Save Dave: A certificate of compliance will be awarded to each property with acknowledged effort in water quality maintenance. Since the commencement of the scheme, public awareness on water quality has been improved, and it ensures healthy drinking water for residents.

Boy: Oh, let me find out whether my building has participated in the QMS.

Girl: I finally realise the amount of effort and processes involved in order to have clean drinking water.

Water Save Dave: Of course. Everybody has to contribute to enable water safety, including you and me!

Super:
2 mins
Hot water

Boy: I recall that my mother had once taught me to run the tap for at least two minutes for drinking or cooking in the morning if it had not been used overnight, and the over-ran water can be reused for planting or washing. Besides, we should not use hot water directly from the tap for cooking because the hot water may cause the impurities in the mains to be released, which can contaminate the water.

Super:
Plastic

Water Save Dave: Please also remember not to use plastic utensils for hot drinks, as carcinogenic substances can be released from heated plastic.

Boy & Girl: Yes Dave.

Water Save Dave: As the global population increases, urbanisation and industrial development lead to the increase in demand for water. It is estimated that by 2025, two thirds of the global population will experience moderate to severe water stress, while half of the population will face water shortage. Fresh water is a precious natural resource, so we must safeguard our water source and the environment.

Boy & Girl: Yes sir.