

**Example of using comments in Word or Power Point to challenge learners, through instant dialogue that supports learners and their thinking. The learners had to answer the exam question in pairs. They then highlighted the processes and stores that can change over different timescales, identifying reasons for those changes.**

WALT: Be able to describe how the drainage basin acts as a system

Working as a group, write an answer the question, using the diagram above and the work from last lesson to inform your work.

**Describe the drainage basin as a system (10)**

The **drainage basin** is a catchment area through which all precipitation flows through a single stream or set of streams. The boundary between drainage basins is the drainage divide, which allows drainage basins to be open systems as the water can enter and leave different systems through processes such as **evaporation** and precipitation.

**Precipitation** comes in many forms and can include, but is not limited to, mist, rain, fog and snow. This releases water from the atmosphere which was stored as water vapour. Precipitation is the main input of water into the drainage system, but precipitation does not necessarily feed into the same drainage basin every time.

**Precipitated water** will enter stores, such as the ocean, and its time stored there can vary greatly between a matter of days, to a residence time of 4000 years in the ocean. However, it can alternatively be intercepted before then.

**Forested areas** intercept water from the atmosphere in their leaves and stems, which then engage in stemflow and throughfall. This results in water entering the earth's surface, and soil moisture holds 0.01% of all water and 0.05% of fresh water. Some water will infiltrate the ground after precipitation and enter underground stores known as aquifers or can go into an underground river system. Some water will remain on the surface and travel in flows such as rivers, or overland flow – which is most visible during times of flooding.

Any surface water can re-enter the atmosphere through the process of evaporation. 90% of atmospheric moisture is transferred into this store through evaporation, with the other 10% being through transpiration. These processes repeat cyclically, and water can hence move across the world by doing so. At any one given time, the Earth's oceans hold 96-97% of all water which highlights that the majority of water remains in stores.

Overall, the drainage basin is a very dynamic system which sees water being found in a variety of stores, inputs, outputs, and flows/transfers. Each drainage basin can vary dramatically in size, and this means that each one is different. Because of this, water easily enters and leaves various basins.

Learner 1: The catchment of any one drainage basin is changeable in the event of extreme weather conditions, as floodwaters could override a traditional boundary. Also, factors which influence the transfer of water (such as deforestation) can gradually shift the catchment area of a basin over time.

Teacher: Why is the management of a drainage basin so important if used for agriculture?

Learner 1 response: Agriculture relies on consistent conditions, so areas which are used for cultivation require the correct management. For example, the levels of surface runoff need to be carefully managed as to not 'drown' agriculture which only needs a managed level of water.

Teacher response: Absolutely - what about links to overfarming and erosion (linking to water)

Learner 1 response 2: Overfarming results in the reduction of nutrients in the earth, so different land areas must be used during different seasonal patterns. As such, it's important that large areas of land are correctly managed and not overwhelmed with surface water.

Learner 2: Evaporation can be increased or decreased depending on a number of factors, such as the impacts of climate change. The warmer or cooler climate which results could resultantly increase or decrease evaporation. Volcanic eruptions can also have an effect when ash and other material enters the atmosphere and refracts sunlight back into space and reducing Earth's temperature. Deforestation can play a role as the more surface water there is, the easier it is to be evaporated into...

Learner 2: Temperature impacts rates of precipitation as the stronger the temperature decrease with...

Teacher: What about in dry, arid environments?

Learner 2 response: In dry arid environments the weather can become more unpredictable with the majority...

Learner 1: The amount of snow that falls will decrease as the climate continues to warm leading to more amounts of rain

Teacher: What impact could this have on overland flow? how could this be managed by local populations?

Learner 1 response: there will be more surface water which can have adverse effects on vegetation in some cases this is useful however can be negative to some agriculture...

Learner 2: Stores of water could be changed by climate change as more evaporation would take place

Teacher: How would climate change impact cryospheric stores? What would be the long lasting impact of this?

Learner 2 response: if climate change continues to happen, cryospheric stores will decrease due to a rise in...

Teacher Q2: Excellent - what about positive feedback?

Learner 2 response 2: Positive feedback moves a system further away from its original state.

Learner 1: Deforestation, as well as afforestation, will impact the ability of vegetation to intercept precipitation, for better or worse. Deforestation...