

S024

#### A. Basic Information of Video

- *Subject:* Biology
- *Grade level:* Secondary 4
- *Characteristics of students:* Mixed ability; generally motivated to learn
- *Topic addressed:* Digestive Process
- *Learning objective(s):*

After seeing the video, students should be able:

- To **describe** the digestive process, consisting of 5 major steps in different parts of the alimentary canal in correct **order**
  - To **locate** which food substances is being digested / absorbed in a certain organ
  - To **describe** the roles of different organs of the digestive system in the digestive process
  - To **illustrate** the adaptive features of the small intestine in facilitating the absorption process
- *Teaching materials to be used:*
    - Textbook (Chapter of Digestive System)
    - Model showing organs of the digestive system  
(Optional; for a more vivid and in-depth image so that students can get a better clear idea of the structure of the digestive system)

#### B. Rationales Underpinning the Video

Concept taught (in chronological order)	Brief description of the specific instructional strategy, representation, analogy or ... used	Underlying pedagogical reasoning (e.g. How do you think the strategy / picture / graph / ... helps students learn the concept? Why do you plan to teach in this way)
Brief introduction on 5 stages of digestive process	A lead-in of having students to reflect on what they know about usage of food in our body before the 5 stages were introduced	Common fallacies that digestion of food is only associated with the stomach and the ignorance of the other 4 stages of the digestive process are brought up, to grasp the attention of students. And the 5 stages were introduced briefly, acting as a introduction of the flow of the video.
Anatomy of the human digestive system	A labelled diagram is shown.	Organs were first gone through individually before illustrating the idea of an inter-connected tube is formed as the alimentary canal, so that students can have a clearer view on organs involved.
Ingestion process	A flow chart using diagrams and chewing motion is involved.	A whole pizza is shown before chewing, with only a piece left after chewing, giving students the idea that food is broken down into smaller pieces by chewing. The use of breaking food down is also mentioned, but since it is rather a common-sense that it's for easier swallowing, not much detail is further provided.
Digestion process	The misconception	Here, the misconception is mentioned again, as a

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(Mouth cavity)	that digestion involved only the stomach is brought up again before moving on the digestion process. Both motion diagrams and pictures are used for illustrating mechanical and chemical digestion.	lead-in that digestion actually starts in the mouth cavity. Mechanical and chemically digestions are illustrated separately to show that they are different ideas. A diagram of chain of starch being broken down to bi-molecule maltose is shown to show students that large chain of molecules is broken down, to a simpler form yet not the simplest (one single molecule).
Digestion process (Stomach)	A motion picture of bolus travelling down to the stomach with labels is shown. A word equation of proteins digestion is shown. A motion picture of churning action is shown.	As the words like bolus, oesophagus and its connection to the stomach is a rather new idea to students, a motion picture is shown so that students can have a vivid idea on how the bolus travels down the oesophagus. Word equation of proteins digestion is shown along side with the verbal description, so that students would less likely mix up words 'proteins', 'pepsin' and 'peptides'. The word churning might be new to students so that a motion picture is again shown to students.
Summary on substances digested in different parts of the alimentary canal	A checklist of substances digested in different digestive organs is provided, some key vocabularies are provided too.	As 3 different digestive organs are mentioned in a row, students receive so much information at once, like which substance is digested by certain enzyme to its simpler or simplest form, where is/are the substance digested. Nonetheless, some new vocabularies like 'bolus' and 'chyme' are mentioned very quickly so they are also mentioned here again.
Adaptive features of the small intestine facilitating absorption	2 features (the long and highly coiled small intestine and presence of villi) that increase the total surface area for absorption are mentioned first, with diagrams shown. Introduction of villi follows, illustrated with pictures and flows of substances. One question at the latest stage of the video is about villi.	Features are first shown, even though students might not already have the ideas on what 'villi' are, so that they can get an overview or general idea on how the structures facilitates absorption process in the small intestine. Features of villi are further introduced with the aid of diagrams, like the thin wall and the presence of capillary network. The flow of substances through the capillaries and the lacteal are mentioned respectively, the absorption of fatty acids is explained with more details to avoid possible misunderstandings. The question in the very last stage is to reinforce the idea of how villi aid absorption and another diagram was used instead of the one used in the first teaching part, so to ensure students understand the structure of villi (the presence of capillary network and lacteal) instead of just memorise the first diagram shown.

### C. Usage of Video

The video is meant for students to watch before learning the topic to grasp a basic idea on the digestive process, and for students who have finished the chapter at school as a quick summary to revisit the major concepts taught.

In the topic of digestive process, a lot of organs and concepts on the process itself are very new to students, like the 'churning of stomach', addition of different 'digestive juices' to the 'chyme' when it is being transported from the stomach to the small intestine, and many of them involve transportation of substances or movement of substances around organs. These concepts are rather hard to describe simply by words, and it's believed that the brain respond to visual information faster than words or other means (Bergwall, 2015). Thus, by showing these to students through a video, students' learning is guided through pictures and motion graphics together with keywords shown according to the narration, so that they don't have to scan through words and refer to the photos or diagrams as two different separated processes like when compared to learning through textbooks. Moving arrows are as well used to show the transport of different substances in the video which allows students to follow the flow of the entire process easily.

### References:

1. Education Bureau. (2015). *Biology Curriculum (S4-6) Supplementary Document for 2016 HKDSE*. Education Bureau. Retrieved from [http://cd1.edb.hkedcity.net/cd/science/biology/supplementary/bio\\_supplement\\_e\\_2016.pdf](http://cd1.edb.hkedcity.net/cd/science/biology/supplementary/bio_supplement_e_2016.pdf)
2. Travis Bergwall. (2015). *7 Reasons Students Learn Better with Video*. Retrieved from <https://www.linkedin.com/pulse/7-reasons-students-learn-better-video-travis-bergwall/>





## Thoughts on Video-teaching

Back when I just started working on the task, I believed there was no other way to make an educational video on biology concepts other than making animations. I recalled how I loved to watch TED-Ed videos about biological topics on Youtube (TED-Ed, 2017) instead of studying my textbooks. Thus, I went straight to an online animation-maker to start working on my video after drafting the storyboard (Appendix I), and was trying to mimic the video style of TED-Ed, aiming to grasp and arouse students interest in learning the digestive process through lively animation.

Two major problems then arose, with the first one as, me over-estimating my ability in making animation. The video ended up more like many presentation slides with narration, which is essentially just another typical class that students have at school, except that I, as the teacher, am not physically present as in a classroom setting. And the second problem is the fast pace of my video, both of the flow and the narration, when it was already proven that such sped up audio is not in the interest of majority of students (Galbraith, 2004), not to mention the target students are mostly non-native English speakers. I did not consider that TED-Ed videos provide information mostly for general public who might not have to understand full details about a certain concept, while I should be aiming to teach students about the digestive process in a clear and thorough manner, at the same time avoid leading students into any sorts of misconceptions. It was then I realised that blindly follows the style of video I used to love might not work for making my video for students with objectives I set. I then tried to add in more gif-format pictures and in-motion diagrams to illustrate different ideas so that it's less like a power-point presentation. Other than that, I also added in a summary after finishing the digestion stage, so to reinforce different major concepts mentioned and that students would less likely overlook certain new vocabularies mentioned. Yet, since I had mistaken the time limit of the video as 5 minutes, pace of my draft video was still very fast as I tried to rush through the entire digestive processes (the 5 key stages), and a lot of details on anatomy of the digestive system like the adaptive features of the small intestine were omitted for this reason.

I reviewed my own video and took a look at how a few of my peers were working on their videos. I realised how hard my video is to follow by audience, as I never really had a chance to watch my own video in an audience-perspective. I missed out the introduction of learning objectives in my video, which was kindly reminded by my peers, this is then added in my final video which I find makes things much clearer to both the audience and myself. Also, from the audience perspective, I realised much more keywords should have been highlighted and added into the summary sections, to avoid students overlooking or misunderstanding them.

I had the problem of how to monitor students' learning progress all along the process of making the video. Due to technical limitations, there is not much chances that I could do very interactive activities in the


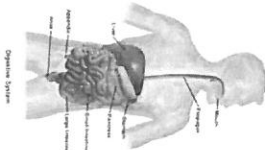



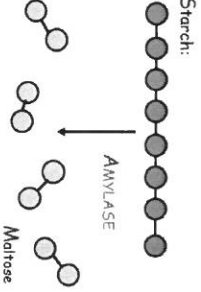


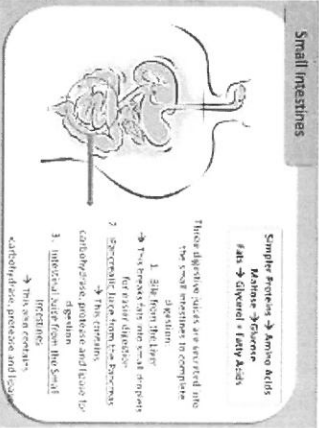
video. At last, I settle for a few questions as the final check-point for students, by highlighting one possible misconception about digestion of proteins. Villi structures and function are again highlighted too, as I believe this is a rather new concept to students and an important one as in the entire video.

Also because of the above issue mentioned, I wondered if video teaching could eventually be the major teaching tool, or can only act as an assisting tool in teaching Science. I found it very hard to monitor students' learning, be it formatively or summatively. Taking my video as an example, it is only meant to be an introductory video to arouse students' interest in the digestive process and as a general overview. Teachers are still expected to go through different concepts with students slowly and thoroughly after showing the video, as all of the information present in this topic is rather rich and can hardly be gone through slowly but at the same time clearly in a 10-minute long video, not to mention spending much time in evaluating students' performance after the teaching session in the video.

To conclude, in the process of producing the teaching video, I learnt a lot more about how teaching a content-rich topic can be conducted in such short and limited time by eliciting the major points and concepts to go through with students, and to highlight certain easily mistaken concepts to avoid confusion. The way of teaching is certainly very different from that in a normal classroom-setting. As for now, I don't hold high hopes in relying on using videos as the major teaching tool due to time-constraints and technical limitations experienced in my production. Yet, I have certainly enjoyed the process of trying to produce such a video.

#### *References:*

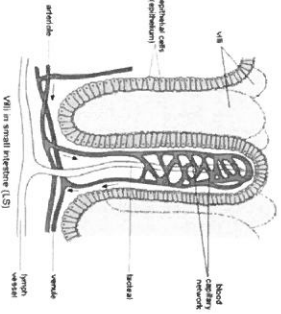
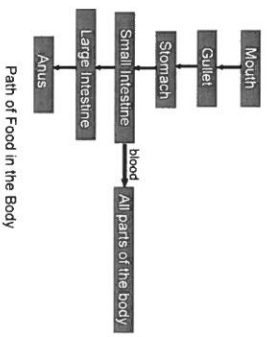

1. Galbraith, J.D. (2004). *Active Viewing: An Oxymoron in Video-Based Instruction?* Penn State University. Retrieved from [http://designer.50g.com/docs/Salt\\_2004.pdf](http://designer.50g.com/docs/Salt_2004.pdf)
2. TED-Ed. (2017, Mar 23). *How the food you eat affects your gut - Shilpa Ravella*. [Video file] Retrieved from <https://www.youtube.com/watch?v=1sISguPDlhY&t=83s>

1	2	3
	<p><u>Digestive System</u></p> <p><i>Alimentary Canal</i></p> <p>Food</p> <p>Mouth -----&gt; Anus</p> 	<p><b>INGESTION</b></p>  
<p>Brief description of the plot</p> <ul style="list-style-type: none"><li>- Briefly introduce how digestive process is consisted of 5 major steps and what are they</li></ul>	<ul style="list-style-type: none"><li>- Introduce the basic idea of a group of organs working together to form the digestive system</li><li>- Highlight that the organs are interconnected, forming the alimentary canal</li></ul>	<p>Ingestion</p> <ul style="list-style-type: none"><li>- The process of taking food to alimentary canal through the mouth</li><li>- Teeth: chew the food and break it into smaller pieces for easier swallowing</li></ul>
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<p><b>DIGESTION</b></p>  	<p><b>DIGESTION</b></p>  	<p><b>DIGESTION</b></p> 





<i>Brief description of the plot</i>	<b>Digestion – mouth cavity</b> <ul style="list-style-type: none"> <li>- Mechanical: chewing, breaks food down</li> <li>- Chemical: Presence of amylase which digest starch into maltose</li> </ul>	<b>Digestion – stomach</b> <ul style="list-style-type: none"> <li>- Gastric juice: containing enzyme (digesting proteins to peptides) and hydrochloric acid</li> </ul>	<b>Digestion – small intestine</b> <ul style="list-style-type: none"> <li>- Pancreatic juice (Pancreas): enzymes digesting carbohydrates, fats and proteins</li> <li>- Intestinal juice (Wall of small intestine): digesting carbohydrates and proteins</li> <li>- Bile (liver): emulsify fats into small oil droplets for easier digestion</li> </ul>
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7		8		9	
<b>Absorption</b>					
	<b>Egestion</b> 	<b>Conclusion</b> 	<b>Absorption</b> <ul style="list-style-type: none"> <li>- Highlight how structures of small intestine help in the absorption process</li> </ul>	<b>Assimilation</b> <ul style="list-style-type: none"> <li>- Introduce how the absorbed substance is transported to other parts of body</li> </ul>	<b>Conclusion</b> <ul style="list-style-type: none"> <li>- A quick round up on the 5 steps of digestive process learnt</li> </ul>
<i>Brief description of the plot</i>	<b>Egestion</b> <ul style="list-style-type: none"> <li>- Describe how will the body deal with the undigested / unwanted substances</li> </ul>				

