

STEM o6 - Microplastics Investigation

Supervisors: Dr. C.C. Cheang, Dr. W. C. Li
Community Partner: Heung To Middle School (Tin Shui Wai)

Mentor Teacher: Dr. Chan, Vice-Principal

Workshop Date: May 18, 24

Project introduction

Objectives

1. To identify the sources and influences of microplastics to the environment
2. To develop positive values and attitudes towards environmental protection through the dissection of fish (searching the microplastics inside the fish with the use of microscope) and students' presentations (regarding on innovative ways to reduce microplastic amount)

CUHK - Biology	EdUHK - Education	HKU - BEd&BSc
Li Ho Pan, Ben	Chung Man Fong, Mavis Tsang Cho Yee, Choco Wong Siu Yan	Lau Pui Ching, Christine (BIOL) Wong Yu Yeung, Gary (BIOL, ENVS)

STEM Workshop



Science
Develop the understanding of the basic concepts of ecology



Technology
Gain hands-on experience of the operation of microscope



Engineering
Design a ideal machine to solve microplastics problem



Mathematics
Handle statistical data



Workshop Design Rationale

Day 1- Microplastics and Fish Dissection

Delivered by Chung Man Fong; Li Ho Pan; Tsang Cho Yee
Assisted by Lau Pui Ching, Christine; Wong Siu Yan; Wong Yu Yeung, Gary

Knowledge

Students are expected to describe the sources and effects of microplastic on marine pollution and name the structures of the fish through dissection.

Skills

The lesson wishes to aid their skills in dissecting the Mullet and identifying microplastic with the use of microscope.

Values

Throughout the lesson, we hope to develop their awareness on the marine environment and to arouse their interest on microplastics investigation

Design

A 80-minute workshop with **1:1 ratio of hand-ons experience to lecturing**. The workshop scaffolds students' learning by

- lecturing the basics of microplastics, current global and local situation;
- watching videos on fish physiology, dissection and slide preparation;
- hands-on session of fish dissection and microscopy of microplastics

Day 2 - Beyond Microplastics

Delivered by Lau Pui Ching, Christine; Wong Siu Yan; Wong Yu Yeung, Gary

Knowledge

Students are expected to recognize the sources and impacts of microplastic on ecosystem, and acquire basic scientific knowledge on ways to reduce the microplastic amount.

Skills

This lesson hopes to facilitate their knowledge integration and application to solve real-life problems with peer collaboration. They are expected to present their ideas in a creative way.

Values

After this lesson, students would gain social, environmental and technological perceptions of science and develop positive and attitudes towards environmental protection. It is hoped that they are stimulated to act sensibly for sustainable development.

Design

A 80-minute workshop with **2:1 ratio of interactive and hand-ons experience to lecturing**. The workshop scaffolds students' learning by

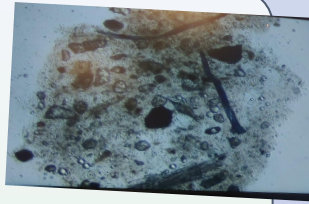
- a recap of previous experiences;
- lecturing Ecology Concepts (Bioaccumulation and Biomagnification);
- interactive video reviewing (HP Reveal) and facilitated group discussion;
- creative presentation (making videos, TV advertisement, singing...);
- encouraging to act sensibly for a sustainable environment;



For detailed lesson plans and teaching materials, please visit the following website



Project Highlights



- Led by very experienced environmental educators
 - 2 Supervisors, Mentor teacher
- Immediate follow-up of "Microplastic in Flathead mullet" publicize by Greenpeace HK

Greenpeace HK. (2018). 香港微塑膠含量高於國際平均值 市面6成野生烏頭中招. Retrieved from: <http://www.greenpeace.org/hk/press/releases/oceans/2018/04/plastic-mullet/>

- Guidance from the co-first author of the following journal article:

Cheung, L. T., Lui, C. Y., & Fok, L. (2018). Microplastic Contamination of Wild and Captive Flathead Grey Mullet (*Mugil cephalus*). *International journal of environmental research and public health*, 15(4), 597.

Conclusion and Recommendations



We have achieved our ultimate goals. Lots efforts were invested from planning to operating a STEM workshop, with the genuine support from the community partner, mentor teachers and supervisors.

It is suggested to have more specific teaching designs to fit with the project's operating constraints.

Limitation and Difficulties

- Students do not have much prior knowledge on fish structure and ecosystem, so we need to spend more time on lecturing.
- Packed schedule on Day 1, which also makes the fish dissection session a bit rush

Individual Reflections

We gained knowledge related to microplastics from this project. The impacts of microplastics are very far-reaching, not only damaging animals, but also ultimately affecting the entire ecological chain. We humans will suffer eventually.

We put emphasis on technology and scientific inquiry. Though our project lacks solid engineering elements, we incorporated the hands-on experiences as much as possible, that the students may have never tried before.

There was an orderly cooperation and division of labour between team members, which made the project go smoothly.



Acknowledgement

Firstly, we would like to thank **U-Stemist Scheme** for giving such golden opportunity to interact with supervisors and peers from different universities, and collaborate with a local school for a STEM project.

Secondly, we would like to express the deepest appreciation to **Dr. C.C. Cheang and Dr. W. C. Li (EdUHK)**, our supervisors, who are also experienced environmental educators and gave us aspiring guidance, invaluable constructive criticism and friendly advice during the project work. We have a hard time in finalizing the topic, and without their guidance and persistent help, *Microplastic Investigation* would not have been possible within a short time frame. We would also like to thank **Miss Lui Ching Yi, Research Assistant (EdUHK)** for the guidance on Dissection and Microscopy during Pre-Workshop Lab Session.

Thirdly, we would like to express our sincere gratitude to **Dr. Chan, Vice-Principal of Heung To Middle School (Tin Shui Wai)**, who kindly offered two precious teaching slots for our workshops and gave us practical advice for better workshop implementation. She also demonstrated a concern for environmental issues in her teaching (as reflected by her students), and we hope we can transcend such in our teaching philosophy in the future as she does. We are very grateful and thankful to have **Heung To's F.4 Biology students** who have creative mind and vibrant ideas.

Lastly, special mention has to be given to **Bella, Project Assistant (HKU)**, who provides us endless logistics support and assistance. We are grateful to have her in our project.