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Ocean Literacy from kindergarten to secondary school: a vertically articulated curriculum on marine micro-plastics

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Marine micro-plastics are a relatively recent issue in research (Thompson et al. 2004), in the media and in education and, due to novelty and relevance, they are a suitable topic for addressing Ocean Literacy within science teaching to different age groups.
In fact marine micro-plastics can be used to introduce Ocean Literacy and environmental science, but also traditional science subjects like biology, chemistry and Earth science, with a system approach focused on "understanding the Ocean's influence on humans and human influence on the Ocean".

Inspired by the growing public interest for marine micro-plastics and by the lack of specific teaching activities in our country (Italy), we developed a vertically articulated curriculum on micro-plastics for students aged 5-15 years.
Our proposal is based on a number of practical activities realized with different language and communication styles to be suitable for different age groups.
For younger students (age 5-7) we use drama to address micro-plastics bioaccumulation in marine food chains: children act as fish of different trophic levels who pretend to "eat" micro-plastics models (built from plastic bottles) until the biggest fish is captured and ends up as a "meal" shared by other pupils. Teachers guide the performance and stimulate observations and remarks about the origin of micro-plastics and the correct management of plastic objects.
The performance has been documented in a video and presented in a national teacher workshop (3 Giorni per la Scuola, Napoli 2015).

For students aged 8-13 we propose observation and manipulation of common household plastic objects, followed by physical/chemical testing of different polymers to understand plastics characteristics that make these materials valuable but troublesome at the same time.
Students then observe sand samples, taken from a local beach, containing natural components and man-made fragments (including micro-plastics), so they can directly experience the fate of dumped plastic, discussing more sustainable management of plastic objects.

For older (14-16) students we introduce primary micro-plastics by means of personal care products containing micro-beads: students learn to recognize the presence of micro-beads by reading the product's composition, then measure micro-beads content of one of these products and calculate a possible annual dispersion of micro-beads from their town to the sea. Also this activity is followed by classroom discussion about possible solutions to micro-beads water pollution.

Micro-plastics activities have been presented to 39 students' groups since November 2014 and have been evaluated though questionnaires given to class teachers.
Lesson plans containing these activities have been published - and are freely accessible - in European and in Italian science teacher's journals (EIROforum Science in School, Pearson Italia Science Magazine).