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Adapting our diets for global climate change: Could eating bugs really be an answer?

"It is time to be terrified, enraged, heartbroken, grief-stricken, radical.

It is time to act."

So said Hannah Laga Abram, a student protesting over the government's inaction on climate change in February 2019 (Glenza *et al*., 2019).

As educators in geography, we are being called to action by the young people we work with. Fellow geographers, such as David Hicks (2018) and Hilary Whitehouse (2018), remind us that we should not dwell on the doom-and-gloom stories littering the headlines and get caught up in the negative processes that may seem uncontrollable. Instead, we should embrace positive pedagogies; supporting young people to (re)imagine futures and feel empowered to act as global citizens. In essence, we need to deliver what Hicks (2014) refers to as a *geography of hope*; one in which crises are not merely reported in our classrooms, but rather pedagogies are used that will support behaviour change at a local level in order to build global understandings and young people's agency for long term sustainable stewardship.

In a recent issue of *Teaching Geography*, Hicks (2019) outlines four critical stages that we, as educators, can use to frame effective engagement with global crises. We should support:

1. the acquisition of appropriate knowledge of the issues
2. an exploration of young people's feeling towards these issues
3. the identification of relevant choices for positive change
4. opportunities to engage in appropriate action for change

And so, in this article, I will use this four-staged approach and consider how teachers and young people can look at the global food crisis, considering how novel foods might be a potential catalyst for change and questioning whether a shift from eating vertebrate meat to eating insects is really a possibility.

1. Acquisition of knowledge: What's the problem, what are the issues?

Food is essential for life: it is a topic that young people can immediately engage with. Whether it's about what they love or hate on their plate, opinions on food are usually forthcoming in any class. Yet the UNFAO (2013) reports that by 2050 the planet's food requirements will far outweigh its resources. We will need 42% more crop land, 120% more water and 70% more food in order to feed the growing population – the equivalent resources found on not one, but five Earth–like planets. In part, this demand comes from the growing demand for red meat, which is predicted to at least double in the same timeframe (Ranganthan and Waite, 2016; van Huis *et al*., 2013). Increased red meat production required to fuel our predicted future demand comes hand-in-hand with the need

for intensification of crop and livestock farming. Such intensification is often linked to impacts on animal welfare (e.g. Stricklin and Swanson, 1993; Wood-Gush and Vestergaard, 1989) and the environment (e.g. Wall and Beynon, 2012). Ruminant livestock, such as cattle, produce large quantities of greenhouse gases (in cattle's case methane, which is 25 times more powerful at trapping atmospheric heat than carbon dioxide).

Concerns over people living with food poverty, or animals not being treated fairly, or water supplies being polluted with agricultural chemicals all build up. As educators we can support young people to explore these with reference to the food choices they make.

2. Exploration of feelings: I'm not sure I'd want to try that …

'Meat Free Monday', 'Veganuary' and the 'flexitarian diet' are all becoming common terms as we are encouraged to move away from a diet high in meat. While eating a plant-based diet may be one way of reducing the environmental and ethical issues associated with the intensification of livestock farming mentioned above, there is an alternative, or supplementary, approach to consider; swapping meat for insects.

Edible insects provide a high-protein, sustainable alternative to meat and are already eaten by millions of people each day (van Huis *et al*., 2013). The World Health Organisation (WHO, 2013) has recognised entomophagy (the practice of eating insects) as a potential answer to many of the problems relating to food production and consumption. However, the WHO also recognises that, if a shift towards eating insects is to become a common practice in Western Europe, more research is required to support it and consumer attitudes must change.

Many young people's only experience of eating insects will be through scenes from a popular television programme where 'celebrities' eat wriggling creepy crawlies as part of various challenges. Such images do nothing to encourage insects as a tasty, nutritious and sustainable food choice, but rather feed neophobia (a fear of trying something new). As educators, we need to think about how we can unpack possible preconceived feelings surrounding edible insects and consider how we can offer entomophagy as a realistic adaptation to behaviour that may have positive consequences.

3. Identifying choices: What questions need answering?

I have been involved in research with schools in Wales that have been testing a new food product from Bug Farm Foods Ltd called VEXo®: an insect- and plant-based meat alternative. This research has allowed issues surrounding the neophobia of entomophagy to be scrutinised and has clarified three questions that young people wish to explore before possible action for a sustainable future can begin to be enabled.

1. Where do edible insects come from?

Understandably, young people want to know where their food comes from. In Silveiras, Brazil, residents pluck the wings off ants and then either fry them or dip them in chocolate. In Thailand, crickets are gathered fresh in the morning and then fried. Different cultures prepare the insects they eat in all sorts of ways. Edible insects used in Bug Farm Foods' VEXo® are farmed in state-of-the-art farms following current best practice (IPIFF, 2019). Some countries have taken proactive steps to ensure good insect welfare standards (e.g. in 2013, Dutch legislation recognised that insect farming

should follow the 5 freedoms; the animal welfare rules by which the UK government works to but, at this time, do not recognise insects under). However, an insect farm looks different from the grassy fields and cow sheds with which we may be more familiar. At an insect farm, temperature, humidity and feeding are often controlled by computers and robots. Many species of insect are farmed in small spaces (and often farmed vertically) because these are the conditions in which they thrive. The species of insect that are farmed for human food breed quickly and require very little space or water: this makes farming them extremely efficient. For example, while approx. 22,000 litres of water is required to produce 1kg of beef, it takes just 1-10 litres of water to produce 1kg of edible insect protein - and insects release 99% fewer greenhouse gas emissions than cattle when converting their feed into edible protein for us. To produce the equivalent amount of protein, some insects require 12-25 times less feed when compared to cattle and half the feed compared to chickens. They also take up one tenth of the land area compared to cattle when turning that feed into edible protein (van Huis *et al.*, 2013).

2. Will I be able to see wings and antennae and little bug eyes in my food?

Megido *et al.* (2016) found that the acceptance of new foods lies in processing and, work with Welsh schools has echoed this: few young people wanted to see the parts of bugs in the food they were eating. In VEXo®, the insects are invisible to consumers.

3. Will eating insects make me ill?

Unless you have an allergy to dust mites or shellfish the answer to this is probably no! If you are allergic to either shellfish or to dust mites, then you may also be allergic to insects, as the allergens in them are similar. Some insects also contain traces of their feed, which may include gluten or soya, but this information will always be included on a product label. Insects farmed for human consumption in Europe must be farmed in accordance with EU food regulations, with a new draft hygiene criterion (IPIFF, 2019) published earlier this year. All edible insects come with the correct paperwork, which includes a full HACCP (Hazard Analysis Critical Control Points) analysis. Farmed insects are usually fed on GMO-free, GMP+ certified feed and do not contain hormones, synthetic chemicals or antibiotics. Microbiology testing is also required to show that insects are safe for humans to eat.

For those people who are nervous about eating insects, Gates (2017) points out that we are eating insects all of the time – although perhaps without our knowledge. He reports that:

In every 100g of chocolate there will be 30+ insect parts

Canned sweetcorn contains approximately 12mm of corn earworms or corn borers per 11kg

Citrus fruit juice will have 5+ fly eggs per 250ml (or at least one maggot per 250ml)

Ground thyme has 925+ insect fragments per 10g

Frozen broccoli has an average of 60+ aphids/thrips/mites per 100g

While these facts might put some people off chocolate, it might also reassure others and help normalise a shift in eating habits from vertebrate meat to insects.

4. What action can be taken?

For some, the consumption of vertebrate meat and animal derived products - with the various issues surrounding farm animal ethics and the environment - has led to vegetarianism and veganism. Interestingly, despite the fact that insects are officially classified as animals, many vegetarians and vegans are willing to eat them: they are welcoming insects as a protein alternative due to the environmentally sustainable and ethical methods of production (A. Holcroft, *pers. comm*., 2019).

We can see that the choices we have as consumers are increasing and offer interesting points for discussion in the classroom. New opportunities for change are there, but it is up to us to present these and allow young people time to explore and consider the consequences of change - not leaving our young people without routes to action, but providing them with real, up-to-date opportunities that enable engagement and a pathway to the future of their choosing.

Our classrooms and school canteens can provide a context for young people to rethink how our eating habits can be adapted to make a difference. While a shift to edible insects may not be a complete answer, as a single change to everyday practice, it could go some way towards making a larger positive difference. Could your school make the shift? What action could be taken to enable student voices to be heard in the school canteen? Who needs to be involved and through what channels? How could other departments embrace a shift? For example, could Food Technology lessons include insect-based recipes, or would a pop-up sustainable snack shop be a possible enterprise scheme?

There are many possible futures that we need to support young people in visualising and give them the tools to begin making the future of their choice.

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Bug Farm Foods is developing a teaching resource to help schools to embed edible insects into their teaching and is working to put VEXo® onto school lunch menus. If you would like to request the teaching resource, or are interested in including VEXo® on your school's lunch menu, please e-mail info@bugfarmfoods.com

For more information about Bug Farm Foods, recipe ideas, VEXo® and their other food products and cooking ingredients, visit www.bugfarmfoods.com

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