The Anthropocene and Academia: Reflection and New Approach

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Many friends and colleagues asked why we were so motivated to introduce a new interdisciplinary framework like Big History to our core course on sustainability / climate change at the Hong Kong University of Science and Technology. The reason is a mixture of intuition, observation and teaching experience. Often, our students, as our future leaders, do not see themselves as agents of change and they feel great despair by the complexity of problems we face.[1] So, we recognized the desperate need to introduce a new macroscopic perspective for our students to step back and see better opportunities and ways to approach the challenges.

We are Toddlers

Looking back to the Big Bang and the evolution of life on Earth, Big History shows that *Homo sapiens* are different. Collective learning has allowed us to leap from the middle of the food chain to its top in only a few geological nanoseconds. On that geological timescale though, we are still toddlers. This concept of infancy was introduced by economist / planner Bill Barron (2009) to examine the term 'development' and 'growth' in an environmental context. (Fig. 1).

The path of physiological development proceeds from baby to teenager and then to adult. But when we focus on technological growth, our social abilities have developed into those of just a toddler. We do not have the capacity or time to adapt to the changes that we have created. And, as toddlers, we love to play with 'toys,' from genetic and nano technology to artificial intelligence and rocketry.

We have a lot of toys. (Fig. 1). Some, like the COVID-19 vaccine, are put to global good, but others, like autonomous drones, could easily become weapons of mass destruction. Often, we do not really understand the impact of these techno-toys and we overestimate our ability to manage them and their unexpected consequences.

Specialization and the Great Acceleration

Social and human systems used to take millennia to develop, from hunter-gatherer systems to villages and agrarian societies. Now the time for such restructuring has shortened from millennia to centuries and then to even

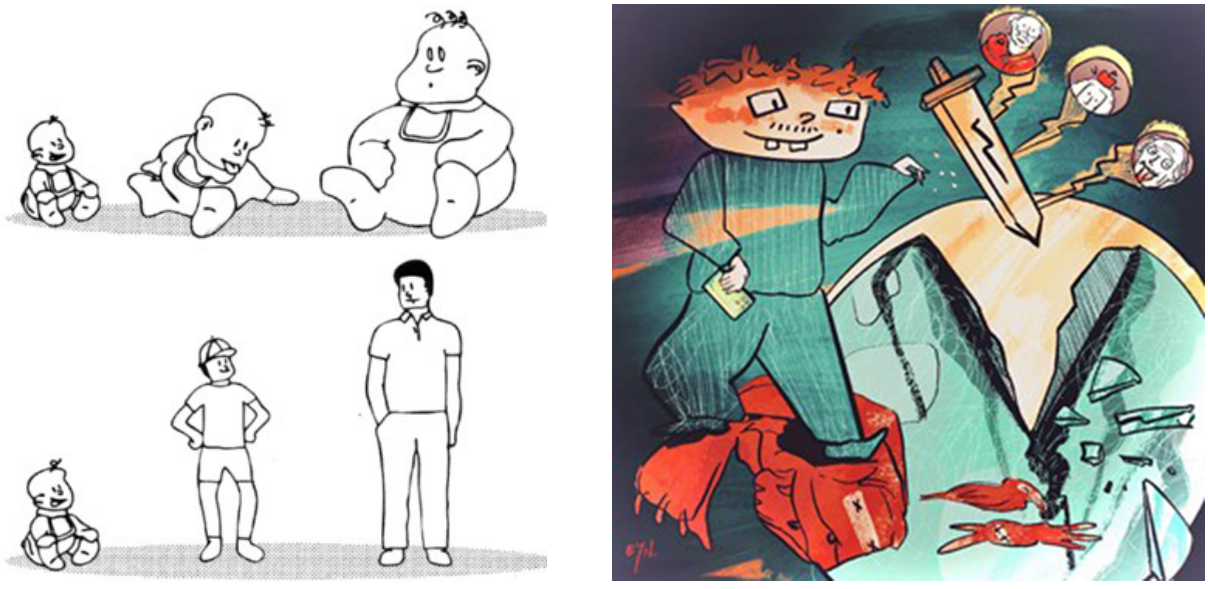
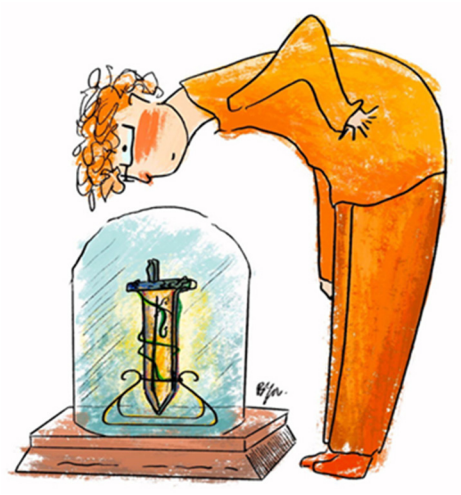


Figure 1: Development versus growth (left). Toddlers and toys (right). By artist Betty Yuen, Hong Kong.



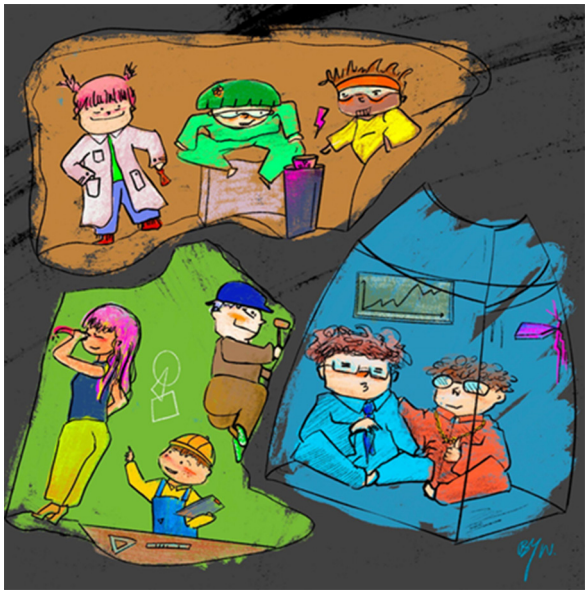


Figure 2: Ultimatum to humanity (left). Compartmentalized collective learning (right). By artist Betty Yuen, Hong Kong.

decades, years, and months. Humans used to be able to adapt, manage, control and utilize their innovations, but society cannot keep up with the rapid developments of science and technology, which turns out our new toys faster and faster in our age of the Great Acceleration. We are not able to comprehend the immense power of many of these toys.

With collective learning, we are able to make big progress in many areas, but we are still very much compartmentalized. (Fig. 2). Hyper-specialization in academia is 'silo-ing' our best minds, so our science and tech people don't talk much about the nonlinear impact of their work. Our financial experts don't think much about the disruptions they are funding, and our humanity and social science experts focus mainly on the problems of today but know little about the sweeping problems that are emerging, down the road, in the future.

While we were all enjoying these new toys in the last half of the 20th century, meteorologist Paul Crutzen and ecologist Eugene Stoermer sounded an alarm, in 2000, by popularizing the term 'Anthropocene' to highlight the dominant human influence on Planet Earth.[2] This was at the time we also began to talk more about multidisciplinary, interdisciplinary and transdisciplinary learning.

In order to give future generations a chance to prosper, we urgently need a new paradigm that highlights multidisciplinary understanding, one that acknowledges the Anthropocene and emphasizes the responsibility of all disciplines to help solve the sweeping problems of today and tomorrow. We understand that we are toddlers and that we have to equip ourselves with even more tools to prepare for the ever-accelerating changes of the Anthropocene.

Despite this awareness, many academics are not confident in transforming their curriculum for their students or they are bounded by a rigid institutional structure. So let us share some background of how we managed to innovate in our programs.

Indispensable for Sustainability Education

We understand that we are toddlers and that we have to help each other develop more tools in order to prepare for ever-accelerating changes during the Anthropocene, even though many academics are pessimistic about transforming their curriculum for students or are constrained by academic institutional structures. So here we share our experiences in adapting our pedagogy in 2016, our teaching experience and student feedback from 2018 to 2020, and our STEM program for both gifted and general secondary students in 2021.

John Lee Ka-Chiu, the Chief Executive for Hong Kong, expressed his ambition to advance STEAM education – Science, Technology, Engineering, Arts and Mathematics – in his 2022 Policy Address. He enunciated the incorporation of STEAM components into secondary-level curriculum and the designation of STEAM coordinators in schools, so as to holistically plan STEAM education, both inside and outside the classroom. We regard this as a hugely beneficial opportunity for us to introduce an interdisciplinary framework like Big History and embed it into our school system as an official school subject, not just as an interest-class elective.

This distinction is important. Although an elective allows for flexibility in planning and organizing, its influence on

society – students, teachers, parents, school administrators and officials – is much less. An official subject, however, is long-lasting and is engrained in an educational system, so that topics, classes, seminars and other forms of pedagogy are structured around it. As a result, the importance of Big History as an organizing system of awareness is brought about.

While faculty and our students are directly housed in the Hong Kong University of Science and Technology, we have developed a new program for secondary-level students (Form 1 to 3) and will involve our big-history undergraduates as student-teachers to instruct the younger students. In this way, we will be able to help all students better prepare for changes we will encounter in the 21st century. Below, is a description of this new program for secondary students.

We believe that the many problems we face today cannot be addressed or even well-articulated by a single discipline. One of the important skills in this century is an ability to integrate knowledge, and so there is a need for people with pluralistic expertise. In order to help students prosper in a 21st century environment, we hope to strengthen their ability to integrate and apply knowledge and skills across various disciplines and to foster their innovation. A critical challenge to our school curriculum is the absence of a systematic approach to nurture these skills.

In order to enhance the opportunity given by the latest Policy Address, we are proposing a new interdisciplinary framework called *Science, Environment and Society* (SES) – a chronological cosmic-evolution sequence, from the beginning of the universe and the development of the Earth's physical environment through the development of human society. We wish to utilize the power of narration, telling the story of everything to our junior secondary students, so as to arouse their interest in science and to equip science-process skills throughout the course of study.

The overarching goal of the SES program is to rejuvenate junior-science education with sustainability-education components via a curiosity-driven and evidence-based approach. Through examining the evolution of complexity as a common phenomenon, we aim to enrich junior-science and STEAM education. Secondly, we hope to address the importance and the role of scientific approach for information analysis. Lastly, we encourage proactive and a positive-thinking mindset for potential sustainability solutions. After implementation, we will then assess the impact of using the SES framework for student motivation in studying science and other disciplines.

We expect three major areas of deliverable products. The first is *knowledge* – students should be able to use evidence-based thinking to develop a macroscopic understanding and to be able to articulate key concepts in an interdisciplinary framework, including changing temporal and spatial scales, complexity, fragility and emergent properties. The second is *skills* – students should be able to develop science-process skills and readiness for multi- and interdisciplinary learning and information analysis skills. Finally, *values* – we hope that students can articulate the role of science and its relationship with other domains, including the environment and society. Furthermore, students should be able to build up a global citizenship and to think proactively about the outlook of sustainable development.

The SES program will follow a chorological order, but it will be divided by three themes. Secondary One – Science and the Universe, which will cover the big bang, the formation of stars and Earth's early environment. Secondary Two – Environment, which will include early life on Earth and its evolution to the appearance of *Homo sapiens*. Secondary Three – Society and Technology, which will engage with the cognitive revolution and collective learning to the agricultural and scientific revolutions. Then, students will have opportunity to discuss societies' responses to crisis, from which to foster a sustainability discussion beyond just the environmental.

We propose to implement the program in three phases. Phase I will be a demonstration period to local schools on the content of the SES framework. Phase II is expected to be a localization period that local schools can adapt and transit the teaching plans and materials for their students under our supervision. Phase III will be dissemination of program results and promotion to other schools.

We believe this interdisciplinary framework is indispensable for sustainability education, because it is not just showing the multiple layers of connections and non-linear effects, also important for highlighting how recent and changeable our social, economic and political systems are. We need to make students feel empowered, otherwise no matter how much knowledge we impressed upon them, they do not have the drive to solve our problems. It is also fundamental knowledge and way of thinking. The toddlers need to go to "preschool", where we learn to work with each other and also learn to understand what behaviour is dangerous and why.

We are at 'the best of times and the worst of times.' If we can do it right, we have a real potential to go for the moon

and even into the galaxy. However, dismay and disasters could be just around the corner, if we can't. Homo sapiens are smart and adaptable with both old and new institutions that encourage us to interact and learn, so as to adapt and prosper (Fig. 3). Last but not least, we believe even the sky is no limit and there are galactic potentials.

Figure 3: Aspire to Inspire. By artist Betty Yuen, Hong Kong.

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Endnotes

1. Wong, Lau and Gibson, 2020.
2. Crutzen and Stoermer 2000.

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