Global Harmony and Wellbeing

——How to establish Global Harwell Education in the digital future?

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Should Global Harmony and Wellbeing be the goal most humans aspire to? If so, Global Harmony and Wellbeing (or 'Harwell' for short) should stand as our ultimate educational goal. Given this, we must ask: Can education achieve this goal? If it can, how to design Global Harwell Education (GHE) in the digital future?

In this talk, I will present some thoughts concerning the above questions based on ongoing discussions among a group of international researchers[1]. In fact, searching answers for these questions have evolved within our research community over the last several decades. Along the way, groups of researchers have come together to summarize our findings and develop conceptual notions and theories, propelling our research forward. The monumental changes anticipated in the digital future suggest that researchers, especially our community who are involved in the use of technology, bear an even greater responsibility than before to spearhead the change through global collaboration.

A more straightforward way for me to describe these thoughts might be to base them on what I've evidenced regarding their evolution within the community.

The global educational goal problem

In my keynote in AIED2007, I posed 4 grand challenge problems. The first three were informed by my observation of research in artificial intelligence in education (AIED), computer-supported collaborative learning, mobile learning, and game-based learning, as well as by the challenges of transforming

[1] Chee-Kit LOOI, Siu-Cheung KONG, Wenli CHEN, Lung-Hsiang WONG, Su Luan WONG, Ben CHANG, Ju-Ling SHIH, Ying-Tien WU, Fu-Yun YU

education at that time. The fourth problem, *the global educational goal problem*, was particularly pressing. I explained that this is because threats such as nuclear holocaust, earth resource exhaustion, climate change, societal polarization, and mass extinction of species pose grave dangers to humanity and the planet. We worry about whether our next generation can survive in the planet—Earth—let alone enjoy living on. I admitted that when I first posed the problem, I didn't have any idea about the answer. However, the problem is so fundamental that it underpins why we do what we do.

Today, in addition to the recent Covid-19 pandemic, the threats mentioned above are even more acute. The world truly stands on the brink of peril. Can we live in harmony with the environment around us? What is the future of humankind? What role does education play in this?

As Mandela once stated, "Education is the most powerful weapon you can use to change the world." Indeed, education serves as a beacon of hope for our future. The education we impart today will determine the destiny of all humans in the years to come. In two or three decades, today's school students will emerge as the mainstays of our society.

Designing future education is designing the future world. As researchers in this influential field, have we ever thought about our educational goal at a higher-level manner? If not, are we sure that we fully understand the position of our research's contribution to the future education, or do we just let the ever-progressing technological advancement guide our research?

In this talk, I will present some thoughts on building a theory known as *Seamless Interest-Driven Co-Creator Theory* (SIDC Theory). Through this process, I hope to shed insights on preliminary ideas for addressing the questions raised. In fact, involving a wide range of aspects, design of future education requires a theory to guide its development. A theory, based on various research, experimentation, and observation, consists of a set of hypotheses. These hypotheses demand continuous research to test, verify, revise, or even be denied. Yet, a theory provides direction for research and practice to move forward to the targeted goal.

SIDC Theory comprises a goal, a means, and an environment, with the goal set to be achieved by the means in a future environment. The goal is "Global Harwell", where the word 'Harwell' is a portmanteau of "harmony" and "wellbeing". Arguably, this is our global educational goal. The means is informed by research and practices from a design theory known as the Interest-Driven Co-Creator Theory (IDC Theory). The envisaged environment of the

digital future is termed the Seamless AI World. Thus,

SIDC Theory = (Global Harwell, IDC Theory, Seamless AI World).

In this formulation of the theory, Global Harwell represents *why* and *what* to learn; IDC Theory informs *how* to learn; and Seamless AI World deals with *where* and *who* to learn with, as well as *how technology boosts* learning in such an environment.

Global Harwell Goal[2]

The term “Global Harwell” merits a brief description here. “Global” is emphasized here because, as we move into the digital future, the world seems to be getting smaller and smaller when it comes to connecting with people across the globe. Furthermore, we desire that everyone in the world enjoys a life full of harmony and wellbeing. The concept of "harmony" can broadly be understood as encompassing both *humanity harmony* and *environmental harmony*. Humanity harmony includes *individual harmony*, *family harmony*, *societal harmony*, and *global harmony*. Environmental harmony pertains to the sustainability of our global living environment. The concept of "wellbeing" speaks of health, wealth (or financial security), positive emotions, engagement, purpose, achievement, and more.

It's worth noting that it not easy to identify a third concept that cannot be included in harmony and wellbeing in terms of what most people aspire in their whole lives. Also, while concepts of harmony and wellbeing overlap in some respects, they possess distinct differences. In fact, if there is no family harmony, there is no individual wellbeing; if no societal (or national) harmony, no family harmony; if no global harmony, no societal harmony. Because of these dependences, instead of seeking harmony progressively from *inside to outside*—from individual harmony to family harmony, to societal harmony, and then to global harmony—we should emphasize even more from *outside to inside*: from global to societal, to family, and to individual. Nevertheless, pursuing individual wellbeing is human instinct. If this goes to the extreme, one will become selfish. By the same logic, we could see family-selfishness and societal-selfishness. Conflicts, confrontations, or wars at different levels will then be inevitable. This is also another reason why the term 'global' should be

[2] More description of harmony is needed in this section.

especially emphasized.

There is a further aspect we need to consider. Apart from religious doctrines and ideological beliefs, if Global Harwell represents the primary aspiration of most humans, then science, technology (including AI), and even all human knowledge—whether developed in the past, at present, or in the future—should be directed towards realizing this goal. Indeed, this is the very reason for their existence.

Given all these deliberations, Global Harwell should stand as our ultimate educational goal. Now we ask: Can education achieve this goal? And how does digital technology assist in reaching it?

Interest-Driven Co-Creator Theory (IDC Theory)[3]

Considering that Asian education is largely examination-driven, a group of Asian researchers informally convened at ICCE2014 in Japan and began to build a theory that focuses on learning interest development while ensuring high performance. It's hoped that the theory could have a profound impact on future education in Asia and beyond. Since 2018, a series of articles on the Interest-Driven Creator Theory that captures various elements of wellbeing and harmony have been published. To put stronger emphasis on collaborative creation than individual creation, we shall slightly revise the name of the theory to Interest-Driven Co-Creator Theory (IDC Theory).

Seamless AI World

Now, what will our learning environment be in the digital future? What we envision is *Seamless AI World*, a notion related to three areas: *seamless learning*, *metaverse*, and *artificial learning companions*.

Seamless learning refers to an educational notion that we proposed with other researchers in 2006. This goes back to a rather long journey of our work. To extend our research in 1990s on networked learning and intelligent future classrooms, starting in 2000 we conducted a large project on future learning technology with the focus on learning inside and outside classrooms using mobile technologies as well as building a large online learning community called EduCity[4]. EduCity deserves some elaboration here because, to some extent, it conceptually aligns with the notion of the metaverse.

[3] This section will be expanded based on the thoughts and materials we have so far.

[4]

Under EduCity (representing Taiwan), there were EduTowns (representing schools), and under EduTowns, there were EduVillages (representing classes). The notion of city represents a pinnacle of human civilization outcome of human civilization. EduCity, representing Taiwan, is an intricate structure consisting of multiple layers. Within this EduCity, there are EduTowns, which stand as representations of individual schools. Just as towns have their own identity, character, and governance within a city, schools maintain their unique ethos and principles under the overarching umbrella of a city or system. Diving down, within these EduTowns are EduVillages. These can be thought of as individual classes. Analogous to villages in the real world, each EduVillage has its own sense of community, its own dynamics, and its own distinct flavor, yet all are interrelated and contribute to the functioning of the larger EduTown.

In this setup, the notion of a city, town, and village paints a vivid picture of how educational systems, schools, and classes can be structured and understood, with each layer playing its part in the larger framework of education. This metaphorical representation underscores the significance and complexity of the educational ecosystem, emphasizing the importance of each component in the grand scheme of education. The number of users (called EduCitizens) in EduCity reached 1.5 million in 2004 when the project ended. Unfortunately, EduCity could not continue to operate after transferring to the industry.

Recognizing mobile technologies and online learning communities that would become pervasive and bear the potential to bridge the gap between formal and informal learning experiences, I took initiation to invite 17 international researchers with similar view to write a paper introducing the notions of one-to-one technology enhanced learning and seamless learning in 2006. Since then, seamless learning has been further advocated by Wong and Looi and studied by numerous other researchers.

Seamless learning speaks of, with the support of technologies facilitating continuous and connected learning experiences across various locations, times, devices, and social settings. The term *seamless* captures the essence of the notion: breaking down barriers and transitioning smoothly between different learning contexts, be they formal or informal. Rooted in the ubiquity of mobile technologies and digital resources such as various online learning material and communities, seamless learning empowers learners to switch from personal learning to collaborative learning, from classroom environments to real-world settings, and from face-to-face to online interactions without disruption.

Underlying this notion is the belief that learning is a lifelong journey and

does not just happen in isolated episodes or environments. Through seamless learning, experiences can be linked, thereby maximizing the depth, breadth, and continuity of learning. This notion acknowledges the unique backgrounds and experiences of each learner and, by merging different learning settings, it leverages this diversity. As digital devices become more widespread, the significance of seamless learning grows, enabling learners to take greater control of their educational trajectories.

Metaverse, on the other hand, can be viewed as a forthcoming generation of online communities. It consists of collection of virtual worlds formed by merging augmented, virtual, and digital ecosystems. Powered by augmented reality (AR), virtual reality (VR), and other technologies, the metaverse offers immersive experiences and potentially reshapes our daily life by transforming how we work, learn, socialize, and entertain. Users interact with each other via avatars or with virtual companions that assume various roles.

Interestingly, in the Workshop of MetaACES in 2022, the keynote speaker put forward:

> *"Metaverse is an 'interconnected digital world' that seamlessly integrates physical and virtual spaces."*

Adopting the notion of seamless learning, I can also simply define:

> *"Seamless World is a 'real world' that seamlessly integrates physical and virtual spaces."*

They are almost the same except that the former addresses 'interconnected digital world' while the later emphasizes 'real world'. I put stress on 'real world' can be explained by the first paragraph of a paper I wrote on future classroom in 2010:

> *"Unless all parents one day work from home, unless the network communications bandwidth one day increases to the point where interface-to-interface interactions can supplant face-to-face interactions, schools will continue to exist. Even if these two 'unless' conditions become true, schools will continue; this is because with so many virtual worlds in which children engage or reside in the future, the school may be the most precious place for nurturing real-world, face-to-face socialization. Schools will not disappear but change.*

When and how schools will change, however, is not clear."

Note that the first sentence appears to describe the phenomenon we experienced during the pandemic, but, in fact, I didn't know Covid-19 would break out in 2020 when I wrote the paper in 2010. Anyhow, the global shift to remote work and online schooling during the pandemic provided a real-world test for my theoretical considerations. Many people came to realize the shortcomings of a purely virtual existence, missing the nuances of in-person interactions.

The emphasis on the 'real world' underlines the need to strike a balance between embracing digital advancements and preserving the tangible, human connections that are fundamental to our social fabric. As society integrates more virtual experiences, spaces that anchor us in the real world become increasingly vital. The depth and intricacy of face-to-face human interactions are immensely valuable. While we continue to engage students in virtual educational settings on certain occasions, such as the EduCity experiment in the early 2000s, the importance of real-world connections remains paramount.

Artificial learning companions[5], arguably, represent the most significant future development for transforming education, especially with the recent major advancements in AI technology. The emergence of generative AI technology, for instance, suggests that computers may one day pass the Turing Test right before our eyes. This implies that in certain situations, we might not be able to distinguish whether we are interacting with a human or a human-like artificial companion, whether it's virtual or robotic. Indeed, artificial companions will become pervasive in our surroundings. In our daily lives, AI offers a spectrum of support, ranging from serving as a mere tool to acting as a humanistic companion. The type of companionship an artificial companion provides depends on its domain of interaction with humans. Consequently, we can anticipate artificial learning companions, artificial job companions, artificial health companions, artificial exercise companions, and so forth.

In the realm of learning, artificial companions can assume roles such as peers (akin to fellow classmates or animal companions), teachers, tutors, or even delegates of the learner's human teacher or parent, among others. With the presence of these companions in the future learning scenarios, beyond merely supporting academic pursuits, learning companionship may enhance

[5] This part is mainly adopted from the description of a special issue of RPTEL on artificial learning companions.

the learner's sense of achievement, satisfaction, interest, social relationship, and so forth. In short, the design, research and practice of learning companions could foster students' learning and overall wellbeing. Numerous research issues beckon exploration. However, at this pivotal moment in the renaissance of artificial companion research, a historical context could lead us to see further into the future.

In 1988, my PhD advisor and I introduced the concept of an 'artificial learning companion' in a paper titled, "Studying with the Prince: The Computer as a Learning Companion." Within this AI-supported learning system, three entities interact: the human student, the computer learning companion, and the computer teacher. True to its name, the computer learning companion's role is to act as a study partner for the student. To this end, the companion is designed to learn the task roughly at the same level as the student. This allows both to exchange ideas and engage with the same material under the supervision of the computer teacher. There are two distinct approaches to designing the companion: simulating skill acquisition and actual machine learning. In the former, the performance of the companion is controlled by the system. In the latter, the companion is required to be able to learn as the student does by using the techniques of machine learning. Given the limitations of machine learning at the time, we opted for the skill acquisition simulation approach in our learning companion prototype, which we named 'Integration-Kid'.

Now, after 35 years of research into artificial learning companions, and with the empowerment of machine learning, generative AI showcases superior performance across various domains, though it occasionally produces incorrect or biased answers. Despite the ethical concerns raised, plenty of learning companions are set to be developed soon. In the not-too-distant future, learners will interact with multiple interconnected artificial companions. Artificial companions are almost there! What does the future hold? Ultimately, everyone will have lifelong learning companions, assuming different roles throughout their lives from childhood to adulthood.

In summary, considering the previous elaborations, Seamless AI World addresses *where* and with *whom* to learn, along with how technology can amplify these learning experiences. Furthermore, in a world where everything—people, devices, tangible objects, and hence physical and virtual spaces—are seamlessly interconnected, we may succinctly define Seamless AI World as follows:

“Seamless AI World is a ‘real world’ that seamlessly integrates all things, including physical and virtual spaces, empowered by AI.”

It's worth mentioning that Seamless AI World could also be a concise notion depicting our digital future, not just limited to education.

A path of establishing Global Harwell Education (GHE) across the globe

First, can education achieve the visionary goal of Global Harwell?

We may categorize our lifetime into three distinct phases. The first phase spans from birth to over 20 years old, during which the emphasis is predominantly on education. As individuals transition into their 30s and 40s, marking the second phase of their lives, the focus often shifts to family and career development. However, due to the quest for personal growth, learning remains an integral part of this period. The third phase encompasses retirement, which may be a lengthy duration, especially given that advances in medicine suggest the average lifespan of future generations might approach a hundred years. Even during retirement, the majority will remain committed to lifelong learning.

In the first phase—the formative years that mode an individual's character and values—if global education prioritizes Global Harwell as the paramount educational goal, it will instill universal values in these individuals. Such a value system and outlook towards the future will last as they grow up, shaping their interactions with others. They will not only embrace diverse cultures and coexist peacefully but will also gain deeper insights by embodying these values. Consequently, they contribute to realizing Global Harwell in the real world. Upon retirement, they may also intend to be role models for their descendants, ensuring them inherit and uphold these values.

Below I delineate a possible path to establish GHE across the globe.

1. Building global awareness

   Globally, members of academia, particularly international educational technology researchers, come together to learn from one another, deeply discuss and understand the goal, and further spread the vision within the global research community. On a local scale, they engage with policy makers to take action. Additionally, they convey this message to people from all walks of life and seek their support.

2. Building experimental sites in different countries and regions

Building GHE experimental sites guided by SIDC Theory is a practical and gradual, yet effective approach to transforming education, especially considering the challenges of restructuring current schools. Experimental sites can vary in scale, from a single subject in one class of a school to encompassing the entire school. Along the way, seasoned international researchers can assist countries or regions in developing their experimental sites. When an experimental site reaches a stage where it offers valuable insights for other teachers and schools, it evolves into a GHE Model Site. Note that, as depicted in IDC Theory, imitation is one of the most effective ways of learning adopted by our ancestors in the ancient times. However, most people would not imitate completely, but combine what they learn from the model with what they have learnt before, creating their own version.

3. Building Global Harwell Park

By intensively connecting GHE model sites from various countries and regions, we can construct the Global Harwell Parks. This park will exemplify how researchers and educators collaborate, facilitating shared learning for students, teachers, and parents with Global Harwell as their foremost educational goal. Essentially, the Global Harwell Park serves as an expansive GHE model site, accelerating educational transformation to establish a world of harmony and wellbeing.

4. Disseminating GHE and the Global Harwell Values across the globe

As time goes by, the number of GHE model sites will not only increase, but many of these sites will also expand to encompass their local communities, forming Global Harwell Communities. These communities will receive support from diverse segments of the local residential areas. Similarly, this expansion will occur within the Global Harwell Park. In essence, Global Harwell Values will permeate from the educational sector to all other social sectors and ripple out from one local community to another. The acceleration of this process will be facilitated by the integration of technology in the Seamless AI World.

Final remarks

However, establishing Global Harwell as the ultimate educational goal, designing education guided by SIDC Theory, harnessing technological advancements in the Seamless AI World—all these demand united, global endeavor. Furthermore, because of the potential far-reaching impact on education, its inherent intricacy, and the fast-moving of the digital world instituting GHE across the globe requires several generations to achieve.

There's an adage: "If you want to go fast, go alone; if you want to go far, go together." In fact, if you go alone, you go nowhere. However, given the pressing urgency of humanity and our planet teetering on the brink of peril, we need to go together, to go fast and to go far. We cordially invite you to join us in the on-going dialogue and find ways to act fast. (see globalharwellgoal.org).