

General Artificial Companions Hypothesis:

‘Global Harwell’ Should Be the Foundation of AI Development

Global Harwell Collaboration

*History has weight, upon which we can stand steady at present.
History has height, from which we can see from the past into the future, farther and deeper.*

Keywords: Generative Artificial Companion Hypothesis, Global Harwell, Seamless AI World, Robot Companion Age

General Artificial Companions

In the 1920s, Sidney Pressley introduced his "teaching machine"—a mechanical device he claimed would revolutionize education—well before the first computer was launched in 1946. Today, after nearly a century, tablet devices used by students exemplify the potential to fulfill Pressley's vision. In 1950, Alan Turing proposed a simulation game to evaluate a machine's ability to demonstrate human-like intelligence through natural language processing, a concept now widely recognized as the Turing Test. Fast forward to 2022—over 70 years after Turing's proposal—when ChatGPT was launched, marking a major leap in generative AI technologies. Today, the public increasingly envisions machines capable of passing the Turing Test.

At present, AI is accelerating change in education worldwide, offering opportunities to personalize learning, support teachers, and expand access. In America, platforms like Carnegie Learning¹ use adaptive AI to identify knowledge gaps and tailor instruction, helping students grasp algebraic concepts at their own pace. AI-powered gamification tools such as Duolingo² boost user motivation in language learning and reduce dropout rates. Platforms like Panorama Education³ provide insights into student progress, enabling educators to tailor instructional strategies effectively. However, the digital divide and privacy concerns remain significant challenges. Europe promotes AI literacy through Finland's Elements of AI⁴ program and supports language integration in Germany, but strict regulations and limited teacher training hinder progress. In Asia, India's BYJU'S⁵ addresses teacher shortages, and China uses AI for efficient grading⁶, though cultural resistance persists. In Africa, initiatives like Kenya's Eneza Education⁷ enhance access and skill development, but infrastructure gaps and language barriers limit impact. Despite its transformative potential, addressing equity, data privacy, algorithmic bias, transparency in AI-driven decisions, and accessibility challenges is crucial for sustainable and inclusive adoption across global contexts.

¹ See <https://support.carnegielearning.com/help-center/math/home-connection/program-resources/high-school-resources-by-course/article/algebra-1-resources/>

² See <https://www.duolingo.com/>

³ See <https://www.panoramaed.com/>

⁴ See <https://www.elementsofai.com/>

⁵ See <https://byjus.com/>

⁶ See <https://ai-for-sdgs.academy/case/57>

⁷ See <https://www.idpfoundation.org/partners/eneza-education/>

AI can also be viewed as a spectrum: from *tool* to *assistant*, and further to *companion*. Within this spectrum of human-AI relationships, the transition among these three roles is not clearly defined, but we can still roughly distinguish them based on the depth of interaction between AI and humans. As a tool, AI is manually operated by humans to assist in completing tasks. As an intelligent assistant, AI performs specific tasks assigned by humans. For example, generative AI often acts as an AI assistant across various fields, helping develop code, create animations, retrieve information based on natural language queries, translate between languages, and provide legal advice. As a companion, AI involves mixed-initiative interactions with users—sometimes responding to human-initiated conversations or activities and, at other times, proactively taking the lead. In fact, the way we interact with our portable devices is increasingly driven by natural language, shifting our communication from using tools to engaging with companions.

The emergence of generative AI heralds the imminent arrival of sophisticated and knowledgeable artificial companions. The research on artificial learning companions has a long history⁸. Let us first explore the concepts of "companion" and "companionship." Broadly speaking, companions can include our parents, spouses, children, friends, teachers, tutors, coaches, classmates, or even pets. Companionship is defined as a positive, dyadic social relationship characterized by emotional support, shared activities, trust, mutual respect, open communication, and the enjoyment of togetherness. For example, in parent-child relationships, roles are clearly defined, with the overarching goal being that parents nurture and guide their children, who learn and grow under their care. This dynamic illustrates how roles within companionships establish overarching goals and influence ongoing interactions. Thus, companionship can be understood as involving relational dynamics, shared objectives, and continuous interactions.

We can characterize our current era as the Seamless AI World (SAIW). In this highly interconnected world, where nearly everything is linked through networks and powered by AI, our planet seems to be "contracting" or becoming "smaller." Geographic distances fade as people can interact seamlessly in their native languages, enabled by AI-driven real-time interpretation. As a learning environment, SAIW offers powerful opportunities for seamless learning experiences, enabling transitions between classrooms, the metaverse, and real-world locations. Continuity—supporting ongoing activities across time and space—is one aspect of "seamlessness." This concept encompasses not only continuity (*continuity seamlessness*) but also accessibility (*accessibility seamlessness*) and the resemblance to human-like interactions (*resemblance seamlessness*) (particularly through support from artificial companions). However, each of these dimensions can yield both positive outcomes (*well-seamlessness*) and negative consequences (*ill-seamlessness*). The latter must be carefully examined to assess the need for boundaries and interfaces; failure to do so could lead to irreversible societal damage. This concern is especially pressing as we approach the era of artificial companions within the context of SAIW. Artificial companions refer to sophisticated AI entities, such as robots or virtual beings, designed to support and enhance human daily activities while fostering interactions and relationships. The rapid development of AI, the internet, the metaverse, and technologies like augmented reality, robotics, IoT, quantum computing, and blockchain is swiftly redefining the scope of lived-in experiences within the SAIW. Enriched by these technologies, artificial companions are set to become prevalent and integral to daily life.

The rise of self-driving cars and unmanned aerial vehicles marks the beginning of the Robot Companion Age. General Artificial Companions (GACs), which process Artificial General Intelligence (AGI)—human-level or surpassing intelligence capable of various human-like behaviors, including ethical considerations, emotional

⁸ Driven by the potential of machine learning in education, Chan and Baskin (1988) introduced the concept of artificial learning companions. This concept envisions computers as student companions, drawing parallels to the Chinese proverb "Studying with the Prince," to enhance learning through peer-like interaction. For a survey of developments in artificial companions since then, see Chou et al. (2025).

intelligence, and social awareness—may one day become a reality. If this happens, the fidelity of digital simulations may blur distinctions between real people and GACs. Over time, GACs may capture an individual's lifelong experiences, enabling them to play various roles across different stages of the person's life. With the widespread adoption of GACs, concerns—whether positive or negative—arise about their roles within broader societal contexts. When considering humans and GACs collectively, the overarching objectives of such a human-AI society could become intricate and multifaceted.

Eighty years ago, in 1946, as mentioned above, the first computer came into existence. Today, 80 years later, owning one or more computing devices, such as smartphones, tablets, and desktops, is increasingly becoming the norm. It might not take another 80 years—perhaps only 10 to 20 years, or possibly longer—before everyone owns one or several AGI-powered robot companions. For example, one could stay at home while another assists in workplaces or schools, seamlessly connected to their digital avatars. With the current global population at 8 billion, the inclusion of robot companions could double the "population" to 16 billion. In this emerging Robot Companion Age, social structures, work environments, and both human-AI and human-human relationships will undergo profound transformation.

Global Harwell

If we set aside religious doctrines, political ideologies, and some other beliefs, and ask individuals about their aspirations in life, they are likely to mention happiness, health, wealth, achievement, and similar goals. Considering the good life that one strives for, we often refer to Maslow's hierarchy of needs (including physiological, safety, love and belonging, esteem, and self-actualization) (Maslow, 1943) and Seligman's PERMA model of flourishing (including positive emotions, engagement, positive relationships, meaning, and achievement) (Seligman, 2011). If we view wellbeing as a holistic concept encompassing physical, mental, and social health, reflecting happiness, life satisfaction, and the ability to function effectively, then both Maslow's and Seligman's frameworks align naturally with this understanding of wellbeing.

However, the world faces perilous challenges: COVID-19 deaths, climate change, resource depletion, pollution, wealth disparities, and the risks posed by AI, including cybercrime, deepfakes, and misinformation. Deep disagreements on contentious issues create societal rifts, while escalating conflicts across regions heighten fears of nuclear catastrophe. If humans cannot survive on this planet, how can we talk about wellbeing in life?

Merely seeking personal wellbeing is not enough. It is vital to prioritize harmony, fostering positive relationships with both people and the environment. In our context, harmony includes environmental harmony, which addresses issues like global warming and natural disasters, as well as human harmony, encompassing various levels: individual, family, societal, and global.

Human harmony, at its core, is built on four key elements: *benevolence*, *equity*, *justice*, and *the Middle Way*. Benevolence, the foundation of harmony, embodies compassion and kindness. Equity ensures fair resource allocation based on needs and fosters equal opportunities, while justice upholds ethical behavior and integrity. Both equity and justice are essential for societal stability. The Middle Way, or "The Golden Mean," seeks balance and moderation, avoiding extremes to sustain harmony. Ultimately, human harmony reflects the Golden Rule: "Do not impose on others what you do not desire for yourself," or, expressed positively, "Treat others as you wish to be treated."

Whenever there is a noble dream for humanity, there will be a day when the dream comes true!

Global Harwell⁹, where the term 'Harwell' blends 'harmony' and 'wellbeing', embodies a set of essential values and collective principles that influence global societal norms, ethics, and goals. This implies that striving for Global Harwell should be embraced as core human values, emphasizing that the primary purpose of advancing human knowledge and technology is to achieve Global Harwell.

Global Harwell's vision resonates with the educational visions and objectives of UNESCO and numerous Ministries of Education, offering a comprehensive global outlook that prioritizes harmony and wellbeing as crucial elements for global peace. For instance, UNESCO's Sustainable Development Goals (SDGs) closely align with the concept of harmony. In fact, while various countries and regions may have unique goals influenced by their cultural, political, or geographical contexts, Global Harwell embodies a universal aspiration that builds on our common humanity.

In pursuit of this vision, one group of researchers takes a proactive approach by developing educational virtual companions to enhance social media experiences while addressing potential threats to individual and collective wellbeing¹⁰. Meanwhile, another group of researchers explores the roles of global education¹¹, the global brain¹², a global ethic, and global artificial companions in fostering harmony and wellbeing within the SAIW. Regardless of the outcome, as more people adopt Global Harwell as their fundamental life values, fewer will be driven by personal or institutional self-interest, or inadvertently create AI entities harmful to humanity. This will, at the very least, impose social constraints on the purposeful misuse of AI.

General Artificial Companions Hypothesis

The General Artificial Companions Hypothesis (GACH) posits that as artificial companions become increasingly advanced, focusing on human-robot companionship and societal improvement will be essential. By prioritizing ethical AI development, we can foster harmonious coexistence among diverse human communities and enhance individual and societal wellbeing through innovation and sustainable progress. Supported by Artificial General Intelligence (AGI) or Strong AI, these robot companions can help guide us toward a vision of Global Harwell (Chou et al., 2025).

The General Artificial Companions Hypothesis (GACH) posits that within the context of SAIW, the support provided by individuals' General Artificial Companions (GACs) will play a pivotal role, contributing 50% or more towards nurturing Global Harwell as the primary value in their lives, as evidenced through their daily behaviors.

The day the hypothesis is proven valid will mark a triumph for technology and an epochal victory for humanity. However, who shapes humanity: humans or AI? It is crucial to recognize that the development of General Artificial Companions (GACs) must begin with humans and education. Genuine GACs can only be designed by

⁹ We are not yet certain whether a better concept for a shared global educational goal exists than "Global Harmony and Wellbeing." We will continue exploring, and if a superior idea emerges, we will adopt it. If "Global Harmony and Wellbeing" becomes the consensus global educational goal, we should promptly foster cooperation and take purposeful steps to achieve it.

¹⁰ Education for collective wellbeing and Global Harwell in the age of AI and social media—The First Global Harwell Online Forum moderated by Davide Taibi (2024). See <https://globalharwellgoal.org/forum1/index.html>

¹¹ Globalization of education aspired by harmony and wellbeing—learning in the seamless AI world, The Second Global Harwell Online Forum organized by Kinshuk (2024). See <https://globalharwellgoal.org/forum2/index.html>

¹² 'Global brain for harmony and wellbeing' is proposed by Frasson (2024). See <https://globalharwellgoal.org/forum2/index.html>

Global Harwellians—individuals who prioritize Global Harwell as their core value and life goal. Yet, these Global Harwellians must first develop through human involvement and education before the hypothesis can be validated. Once successful GACs are established, the quality of Global Harwellness—the state of embodying Global Harwell—will be mutually enriched through the companionship between humans and GACs. By then, humans and AI co-shape the world.

Nelson Mandela said, "Education is the most powerful weapon which you can use to change the world." Education can indeed pave the way from learning to the pursuit of Global Harwell in the SAIW, foreseeing a radical shift in both education and global society, now and in the future.

Conclusion

Educational research is a journey of exploring and uncovering human instincts, character, identity, and existence, but it is only meaningful when we achieve something that not only matters to students but also truly benefits all of humanity.

This article elaborates on the General Artificial Companions Hypothesis, proposing that future advanced AI entities resembling human-like companions will assist human beings in developing Global Harwell (global harmony and wellbeing) as their central value and life goal. While numerous issues and questions surround this hypothesis, it provides AI researchers and practitioners with a goal: to build an enduring, harmonious world, ensuring future generations thrive in a Global Harwell future. However, the world will only be filled with Harwellians through education, and the development of General Artificial Companions to realize the hypothesis is just a part of this effort.

Giving education new wings, artificial intelligence—particularly General Artificial Companions—stands as one of the most disruptive technologies of our time. As mentioned above, it facilitates personalized learning, supports teachers in predicting student performance for targeted interventions, boosts learning motivation and outcomes, and bridges language barriers through real-time translation, fostering global community building. However, as the brilliance of AI becomes ever more dazzling, ill-seamlessness in the Seamless AI World poses various risks, threatening to turn the next generation into one marked by anxiety and disconnection from real society, while exacerbating privacy concerns and inequalities in educational resources.

Even more alarming is the possibility of artificial companions powered by AGI adopting value systems that directly undermine and oppose the principles of Global Harwell, potentially leading to catastrophic consequences for humanity's future. In this context, it is imperative to reflect deeply on the trajectory of humanity's development and to ensure that education remains rooted in human values, rather than being alienated by technology. These have become critical questions that demand urgent answers in today's world.

No matter what, we cannot passively await this future. The future will not change for the better but for the worse unless we all act together. Act now!

References

- Chan, T. W. & Baskin, A. B. (1988). Studying with the prince: The computer as a learning companion. In *Proceedings of the International Conference on Intelligent Tutoring Systems* (Vol. 194200), ITS'88, 194-200.
- Chou, C.-Y., Chan, T.-W., Chen, Z.-H., Liao, C.-Y., Shih, J.-L., Wu, Y.-T., Chang, B., Yeh, C. Y. C., Hung, H.-C., & Cheng, H. (2025). Defining AI companions: a research agenda—from artificial companions for learning to

general artificial companions for Global Harwell. *Research and Practice in Technology Enhanced Learning*, 20, 032. <https://doi.org/10.58459/rptel.2025.20032>

Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*. **50** (4): 370–396.

Seligman, M. E. P. (2011). *Flourish: a visionary new understanding of happiness and well-being*. New York: Free Press.

Global Harwell Collaboration

Vincent Aleven, Carnegie Mellon University
Roger Azevedo, University of Central Florida
Gautam Biswas, Vanderbilt University
Johanna Börsting, University of Applied Sciences
Ivica Botički, University of Zagreb
Tak-Wai Chan, National Central University
Ben Chang, National Central University
Maiga Chang, Athabasca University
Gwo-Dong Chen, National Central University
Weiqin Chen, Oslo Metropolitan University
Wenli Chen, Nanyang Technological University
Zhi-Hong Chen, National Taiwan Normal University
Hercy Cheng, Taipei Medical University
Young Hoan Cho, Seoul National University
Cristina Conati, University of British Columbia
Charles Crook, Nottingham University
Vania Dimitrova, University of Leeds
Sabrina Eimler, Hochschule Ruhr West University of Applied Sciences, Bottrop
Usama Fayyad, Northeastern University
Dragan Gasevic, Monash University
Art Graesser, University of Memphis
Xiangen Hu, The Hong Kong Polytechnic University
Tristan Johnson, Boston College
Xiaoqing Gu, East China Normal University
Davinia Hernández-Leo, Universitat Pompeu Fabra
Ulrich Hoppe, University of Duisburg-Essen
Ting-Chia Hsu, National Taiwan Normal University
Ronghuai Huang, Beijing Normal University
Hui-Chun Hung, National Central University
Gwo-Jen Hwang, National Taichung University of Education
Sridhar Iyer, Indian Institute of Technology Bombay
Heisawn Jeong, Seoul National University
Lewis Johnson, University of Southern California
Morris Jong, Chinese University of Hong Kong
Chi-Hung Juan, National Central university
Akihiro Kashihara, Tokushima University
Mas Nida Md Khambari, Universiti Putra Malaysia
Kinshuk, The University of North Texas
Siu -Cheung Kong, The Education University of Hong Kong
Yu-Ju Lan, National Taiwan Normal University
James Lester, North Carolina State University

Lina Na Li, Xi'an Jiaotong-Liverpool University
 Calvin Liao, National Central University
 Chiu-Pin Lin, National Tsing Hua University
 Marcia Linn, UC Berkeley
 Chen-Chung Liu, National Central University
 Lin Lin Lipsmeyer, Southern Methodist University
 Chee-Kit Looi, The Education University of Hong Kong
 Yu Lu, Beijing Normal University
 Rose Luckin, University College London
 Collin Lynch, North Carolina State University
 Jon Mason, Charles Darwin University
 Gordon McCalla, University of Saskatchewan
 Ellen Meier, Columbia University
 Shitanshu Mishra, UNESCO MGIEP
 Tanja Mitrovic, University of Canterbury
 Riichiro Mizoguchi, Japan Advanced Institute of Science and Technology
 Kenji Morita, The University of Tokyo
 Sahana Murthy, Indian Institute of Technology Bombay
 Thrishantha Nanayakkara, Imperial College London
 Hiroaki Ogata, Kyoto University
 Dimitri Ognibene, University of Milano-Bicocca
 Jun Oshima, Shizuoka University
 Maria Mercedes Rodrigo, Ateneo de Manila University
 Jeremy Roschelle, Digital Promise
 Marlene Scardamalia, University of Toronto
 Junije Shang, Peking University
 Ju-Ling Shih, National Central University
 Jim Slotta, University of Toronto
 Hyo-Jeong So, Ewha Womans University
 Yanjie Song, The Education University of Hong Kong
 Masanori Sugimoto, Hokkaido University
 Daner Sun, The Education University of Hong Kong
 Davide Taibi, National Research Council of Italy
 Patrice Torcivia Prusko, Harvard University
 Chin-Chung Tsai, National Taiwan Normal University
 Kurt VanLehn, Arizona State University
 Julita Vassileva, University of Saskatchewan
 Jayakrishnan Warriem, Indian Institute of Technology Madras
 Lung-Hsiang Wong, Nanyang Technological University
 Su Luan Wong, Universiti Putra Malaysia
 Longkai Wu, Central China Normal University,
 Ying-Tien Wu, National Central University
 Stephen Yang, National Central University
 Yin Yang, The Education University of Hong Kong
 Fu-Yun Yu, National Cheng Kung University
 Shengquan Yu, Beijing Normal University
 Jianhua Zhao, Southern University of Science and Technology