


# Artificial Intelligence (AI), De-Growth Philosophy and Education for Sustainability

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## Abstract

Recent advances in artificial intelligence applications – especially the general public availability of tools produced by Open AI, Google, Anthropic and Meta – have sparked widespread interest and controversy in both academic and popular discourse. Opinion is divided between optimists and pessimists – boomers and doomers – on the potential benefits and harms of the new technology, but there is general agreement that AI tools will have a substantial impact on work, education, science, medicine, entertainment, and general society and culture. In relation to the climate crisis and the need for responses in terms of sustainability changes, AI clearly has the potential to revolutionize efforts in this field, enhancing efficiency and optimizing resource use. However, on the debit side, the huge energy demand of AI development may exacerbate the current state of affairs and result in a disastrous downward spiral of energy overload and environmental degradation. Given these potential dangers, there is a need to locate AI developments within a framework of measures informed by de-growth philosophy which posits that sustainable futures require a re-evaluation of growth metrics, advocating for systems that support ecological balance and social equity. Education at all levels can play a crucial role in integrating AI with a robust and viable sustainability agenda through the fostering of critical thinking and awareness of the sustainability challenges. This article will explore the threats and promises of the new AI developments against the background of sustainability requirements and informed by de-growth strategies before examining ways in which teaching, learning and curriculum may support efforts in this domain.

**Keywords:** Artificial Intelligence (AI); Climate Change; Education for Sustainability; De-growth philosophy; Ethics.

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## 1. INTRODUCTION

Given the current state of the world – the climate crisis, the rise of populist autocratic politics globally, the proliferation of disinformation and fake news, and the encroachment of artificial intelligence (AI) tools in all aspects of public and private life – there has never been a more urgent need for educational programmes at all levels to incorporate elements of philosophical analysis and moral evaluation to foster rationality and critical thinking in all disciplines. Amongst the many urgent challenges facing humanity at the present time, the climate crisis must, arguably, be accorded pride of place since it threatens just about every aspect of our existence in this increasingly fragile and fragmented world. As Akinsemolu & Onyeaka [1], researching the role of green education, have observed, ‘sustainable development has become a core part of all day-to-day activities and considerations because of the

critical role it plays in determining the future’, and they go on to elaborate in commenting that:

The future of the planet will be determined by the ability of humankind to ensure that Sustainable Development Goals (SDGs) are achieved successfully. Cleaner production, nature-based learning, environment and green education have increasingly emerged as some of the aspects that should be considered in order to achieve SDGs. There is a general consensus that green education plays a pivotal role in disrupting the intergenerational poverty cycle, improving health outcomes, and protecting the environment to ensure that it continues to sustain present and future generations (p.3).

In order to determine the role of education in sustainable development, it would be useful to analyse SDGs and related elements – including the increasing role of artificial intelligence (AI) tools in this expanding

domain – in greater depth before examining strategies drawn from de-growth theories which can inform learning strategies in general green education programmes [2].

## 2. Sustainable Development: Goals and Challenges

The 1987, United Nations (UN) *Brundtland Commission* defined sustainability as ‘meeting the needs of the present without compromising the ability of future generations to meet their own needs’ [3] and, with some modifications, this perspective still informs the world of the 21<sup>st</sup> century, though the challenges and urgent responses required to face these are both more serious and wide-ranging than they were in the 1980s. In the recent UN assessment of progress in relation to the key goals - though some optimism was noted in relation to the decline of malaria and HIV infections, the growth of women’s suffrage, and the increased global access to electricity and the internet – on the debit side the report noted that progress was far too slow [4]. Key problem areas were listed as (pp.4-6):

- Only 35% of SDG targets are on track or making modest gains. Nearly half are progressing too slowly, and 18% are actually regressing.
- Over 800 million people still live in extreme poverty and hunger. One in 11 people still face hunger. Billions live without safe drinking water and sanitation.
- Women continue to shoulder 2.5 times more unpaid care work than men.
- Persons with disabilities remain underserved across sectors.
- Climate records are being shattered, with 2024 the hottest year in history.
- CO<sub>2</sub> levels are the highest in over two million years.
- Over 120 million people are displaced—more than double the number in 2015.
- Debt service costs for low- and middle-income countries hit \$1.4 trillion, draining resources from critical development

This bleak picture is echoed in recent studies of climate change and its impact on the environment. As Schaeffer, *et al.*, [5] reported recently in a wide-ranging and important piece of research on climate change:

The years 2023 and 2024 were characterized by unprecedented warming across the globe, underscoring the urgency of climate action. Robust science advice for decision makers on

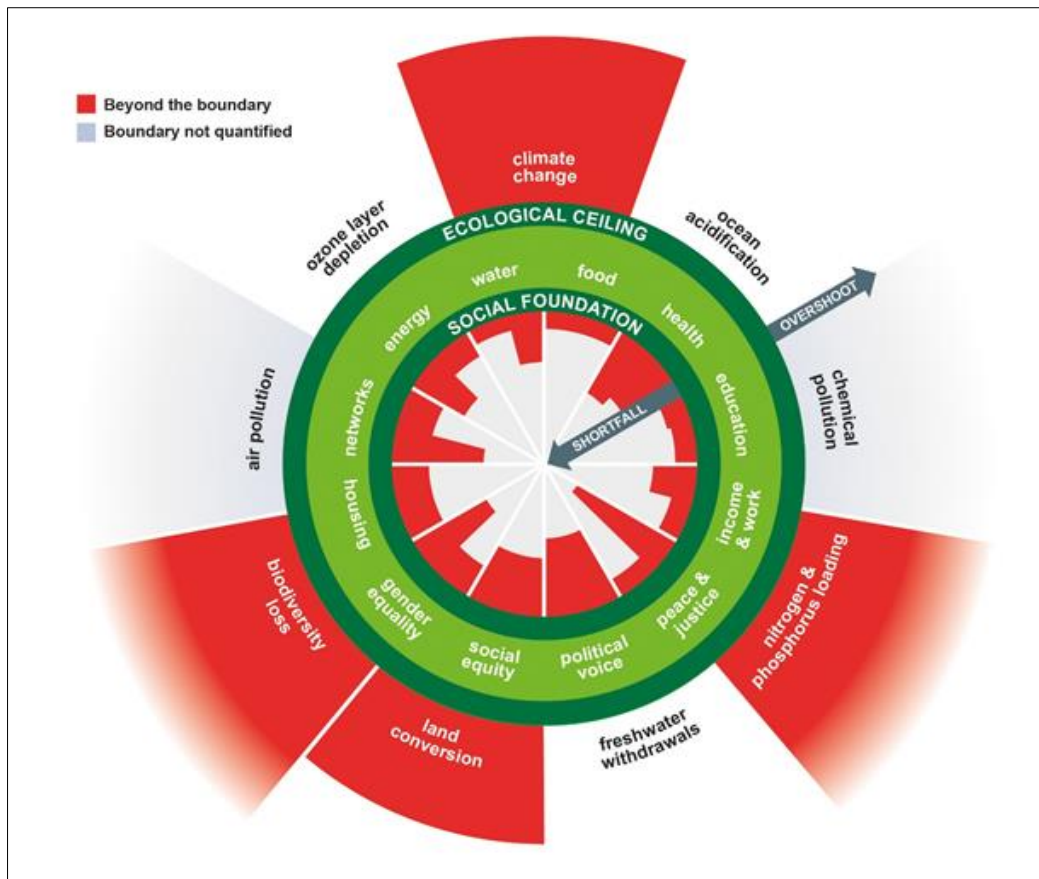
subjects as complex as climate change requires deep cross- and interdisciplinary understanding. However, navigating the ever-expanding and diverse peer-reviewed literature on climate change is enormously challenging for individual researchers. We elicited expert input through an online questionnaire (188 respondents from 45 countries) and prioritized 10 key advances in climate-change research with high policy relevance. The insights span a wide range of areas, from changes in methane and aerosol emissions to the factors shaping citizens’ acceptance of climate policies. This synthesis and communications effort forms the basis for a science-policy report distributed to party delegations ahead of the 29th session of the Conference of the Parties (COP29) to inform their positions and arguments on critical issues, including heat-adaptation planning, comprehensive mitigation strategies, and strengthened governance in energy-transition minerals value chains (p.2).

In responding to this urgent challenge – and the failure of nation states and corporations to meet this challenge – the research scientists called for more regular monitoring of climate change and greater attention to the factors which support resistance to climate change and sustainability measures. In this area, ethical principles of fairness and equity within and between nations and citizens needs to be foregrounded in terms of, for example, ‘just transition’ programmes regulating the move from fossil fuel to renewable energy sources in industrial societies [6].

In order to make sense of all such proposals, it would be useful to locate them within the increasing influential field of doughnut economics and de-growth philosophy.

## 3. Sustainability, De-Growth and Doughnut Economics

Doughnut Economics popularized by Kate Raworth [7] presents a framework for economic activity that aims to meet the needs of all whilst taking account of the planet’s finite means and resources, both in the present and, as far as possible, for future generations. Acknowledging the rapid development of technological, social and environmental factors in recent years, Raworth’s model integrates social and environmental dimensions much more explicitly than orthodox economic models. As illustrated in the diagram below:



The essence of the Doughnut: a social foundation of well-being that no one should fall below, and an ecological ceiling of planetary pressure that we should not go beyond. Between the two lies a safe and just space for all.

The first of the seven changes Raworth proposes to make economic theory and practice relevant to 21st century conditions is to change its main goal. As she puts it:

For over 70 years economics has been fixated on GDP, or national output, as its primary measure of progress. That fixation has been used to justify extreme inequalities of income and wealth coupled with unprecedented destruction of the living world. For the twenty-first century a far bigger goal is needed: meeting the human rights of every person within the means of our life-giving planet. And that goal is encapsulated in the concept of the Doughnut. The challenge now is to create economies – local to global – that help to bring all of humanity into the Doughnut’s safe and just space. Instead of pursuing ever-increasing GDP, it is time to discover how to thrive in balance (p.27).

The other six changes proposed by Raworth – seeing the big picture, nurturing human nature, employing systems thinking, designing to distribute,

creating to regenerate, and being agnostic about growth – are all directly relevant to sustainability goals and also feature in de-growth philosophy.

Raworth’s economic model has been influential in debates about sustainability and the climate crisis, and is on all fours with the emerging field of de-growth theory and practice. Doughnut economics directly confronts the idea of the threats caused by unregulated and headlong economic activity by arguing for new conceptions of how growth is defined and applied. Proponents of de-growth philosophy ask legitimate questions such as why do developed states interpret growth in purely economic terms of GDP when it can be applied to, for instance, the progress made in public health and social welfare, the inclusivity of schools and colleges to foster greater equality of opportunity, or the reduction of numbers of people in prisons or those suffering from mental ill health? The extension of the concept of growth to encompass a wider remit than GDP or the economy serves to provide a positive connotation for the concept of de-growth which may, in some contexts, seem negative. As the official *Degrowth* [8] organisation explains, the origin of the term:

Is to be found in Latin languages, where “la décroissance” in French or “la decrescita” in Italian refer to a river going back to its normal flow after a disastrous flood. The English word “de-growth” became prominent after the first international de-growth conference in Paris in

2008. It has since then been established in academic writing as well as in the media and is used by social movements and practitioners. The essential elements of de-growth strategies are outlined as:

- Striving for a self-determined life in dignity for all. This includes deceleration, time welfare and conviviality.
- An economy and a society that sustains the natural basis of life.
- A reduction of production and consumption in the global North and liberation from the one-sided Western paradigm of development. This could allow for a self-determined path of social organization in the global South.
- An extension of democratic decision-making to allow for real political participation.
- Social changes and an orientation towards sufficiency instead of purely technological changes and improvements in efficiency in order to solve ecological problems. We believe that it has historically been proven that decoupling economic growth from resource use is not possible (pp.2-3).

Moreover, advocates of such policies such as Katharina Richter [9] are keen to stress that de-growth should not be equated with a shrinking GDP or a recession. As she explains, 'de-growth proposes an equitable, voluntary reduction of over-consumption in affluent societies' (p.2). However, critics of the currently dominant neoliberal stage of economic activity such as Paul Mason [10] and George Monbiot [11] - though broadly agreeing with de-growth objectives - tend to locate them within a more radical socialist framework in order to advocate ways of repairing the damage to humanity and the planet caused by late capitalism.

All such issues will form the contextual basis for an education for sustainability curriculum but - since curriculum development requires learning and teaching elements as well as aims and content - much more needs to be said about strategies for green education.

#### 4. Green Education: Principles and Methods

Given the vast range of complex, multi-faceted and multi-disciplinary issues which inform the discourse and often controversial debate on climate change and sustainability, it is suggested here that an overarching philosophical approach - foregrounding rationality, critical thinking and practical ethical reasoning - would provide the most suitable general guiding principle for approaches to teaching and learning in green education programmes [2]. Philosophers of education have considered these matters at length.

R.S Peters [12] offers a conception of rational thought in taking as his starting-point Aristotle's

contention that humans are rational in the sense that they impose plans and rules on their behaviour and have a capacity for theorizing. He goes on to explain this characteristic in terms of the 'transcendence of the this, the here and the now' which has its origin in the 'primitive tendency manifest in intelligence to accommodate or to change assumptions because the differences encountered in a novel situation do not permit assimilation'. This conception is elaborated by the suggestion that 'conscious, explicit attempts must be made to falsify assumptions, to find exceptions to rules...There must also be some form of public test to decide between competing assumptions' (pp.210-2011).

However, for our present more practical purposes there is a need for greater specification and refinement, and the account of rationality offered by W.D. Hudson [13] seems to satisfy all the requirements in this respect. Hudson is concerned to discover the dynamics of rational activity and his inquiry takes him right to the heart of the process. Rationality, he explains, is composite in nature, being made up of the elements of conformity and criticism. Conformity consists in operating within certain standards which determine in their respective fields what counts as a reason and what does not. The other constituent of the process, criticism, subjects these standards of explanation or decision to tests of effectiveness and, where they fail, rejects them in favour of more effective ones. Hudson suggests that all serious educational endeavour requires a 'matrix of tension' between these elements of conformity and criticism, and there is an insistence that rationality requires both these elements, not the operation of one to the exclusion of the other' (pp.52ff.).

It is important to embrace such a conception of rationality which incorporates elements of critical thinking since such an approach will be indispensable in considering the controversial issues surrounding sustainability. In this respect, the definition of critical thinking offered to students in the *University of Edinburgh Institute for Academic Development* [14] guidance document is directly relevant here; the document advises learners that:

Being critical does not just mean finding fault. It means assessing evidence from a variety of sources and making reasoned conclusions. As a result of your analysis you may decide that a particular piece of evidence is not robust, or that you disagree with the conclusion, but you should be able to state why you have come to this view and incorporate this into a bigger picture of the literature (p.2).

One more element is required to complete the methodological approach in this domain and that is sense of the nature of morality and the process of moral reasoning. A pragmatic and secular ethical perspective is recommended here to connect with critical rationality. The autonomy of ethics was firmly established by Kant

and contemporary moral philosophy has flourished without the need to ground values in anything beyond the empirical world of humans and their needs, capacities and interests. Daniel Dennett [15] illustrates clearly how fundamental moral principles such as benevolence, trust, respect for others and truth-telling emerged as part of human evolution and progress, and require no further explanation and justification beyond those which can be supplied by science. This is the point at which Sam Harris' [16] robust secularism comes into its own in terms of the enterprise of conceptualising and justifying morality by addressing the challenge of reconciling human values with scientific endeavour. The central thesis is that:

Questions about values - about meaning, morality, and life's larger purpose – are really questions about the well-being of conscious creatures. Values, therefore, translate into facts about what can be scientifically understood: regarding positive and negative social emotions, retributive impulses, the effects of specific laws and social institutions on human relationships, the neurophysiology of happiness and suffering, etc....The more we understand ourselves at the level of the brain, the more we will see that there are right and wrong answers to questions of human values (pp.2-3).

This framework of critical morality will provide the necessary principles of learning/teaching in a comprehensive education for sustainability programme. However, one more vital factor needs to be inserted into the discourse at this stage, and that is the widespread and monumentally far-reaching impact that artificial intelligence (AI) applications have had on just about every feature of human activity in recent times.

## 5. Artificial Intelligence (AI) and the Green Agenda

Although artificial intelligence (AI) systems have been with us for decades – in phones, cars, banking, medicine, and the like – it was the appearance of the publicly accessible Chat GPT and similar applications and tools in November 2022 that has stimulated such intense and unrelenting academic and popular interest. In the last three years – as Open AI has developed Chat GPT- 4 and 5 with similar advanced tools emerging from Google, Meta, and Amazon – the breadth and range of such tools has impacted almost every public and private sphere including health, education, entertainment, working life, the economy and general culture. Hundreds of articles, both academic and popular (57,000 publications by 2024 [17]) have been produced on AI implications since 2022 and – as a convenient way of organising this vast range of literature – it would be useful to examine issues under the headings outlined by Emily Bender and Alex Hanna of AI 'boomers' and 'doomers' [18].

### 5.1 Boomers

On the positive side benefits of using AI tools have been outlined a vast range of areas such as business, education, health, science, transport, defence, work and just about every aspect of social life [19]. Many of such alleged AI gains tend to be located within business and work environments within which there are claims about increases in productivity through the automation of repetitive tasks and processes, more efficient management and team working, and the acceleration of data collection and analysis. As will be argued below, all of these putative benefits have serious negative downsides linked to job losses, discrimination, misinformation and general social harm. However, on the boomer side it is worth mentioning some clear AI gains and achievements.

**In medicine and health care, research undertaken by the *World Economic Forum* [20] has reported a wide range of AI benefits including the following (p.2):**

- new AI software is "twice as accurate" as professionals at examining the brain scans of stroke patients
- AI can spot more bone fractures than humans can
- A new AI machine learning model can detect the presence of certain diseases before the patient is even aware of any symptoms
- A new brief from the World Health Organization (WHO) and partners, 'Mapping the application of artificial intelligence in traditional medicine', shows how AI can enhance traditional, complementary and integrative medicine (TCIM) while protecting cultural heritage.

The impact of Ai on education and academia in general has been far-reaching [21]. On the optimistic interpretations, there are claims that machine learning better facilitates personalized learning, and generally supports 'the promotion of learning and wellbeing of students, teachers, and other educational stakeholders' [22]. In a similar vein, in relation to the central topic of sustainable development, there are optimistic claims about the potential of AI in alleviating global warming, pollution and the degradation of the planet.

There are claims, for example, that AI can be an invaluable tool in managing the transition from fossil fuel to net zero socio-economic conditions. As Stern, *et al.*, [23] argue:

The net-zero transition is not simply a mitigation strategy and should not be thought of as a "cost", but rather a great opportunity for innovation and sustainable, resilient and inclusive economic growth...Artificial intelligence (AI) is well-positioned to accelerate this transition and, as general-purpose technologies, AI can be applied to speed up this process of profound systems'

transformation by increasing the speed, efficiency, and effectiveness with which innovation processes are scaled and capital is deployed. AI is in a strong position to deliver use cases for the net-zero pathways of almost all economic systems and can help reimagine interconnected systems such as power, transport, cities and land use (pp.12-13).

Arguing along similar lines, Slimani, Omni & jabeur [24] report ‘findings which indicate that renewable energy transition mediates the link between AI and environmental performance. They also show that the digital economy enhances AI’s support for the renewable transition to cleaner sources’ (p.12).

However, as with most of the issues in this controversial field, there is a downside to all these claims about AI and climate which need to be addressed critically by learners and educators.

## 5.2. Doomers

In their recent critique of the wide range of discourse about AI, Bender & Hanna [18] point out the intriguing state of affairs in which – in what they describe as the topsy-turvy world of ‘AI hype and con’ – boomers and doomers are often in the same camp. As they put it: Scratch a doomer and find a booster...Doomerism and boomerism are supposedly diametrically opposed camps, but both see AI as inevitable and desirable (p.148).

The explanation for this surface irrationalism is to be found in the need for the big tech companies to maintain the hyperbolic publicity about the tremendous power of their AI tools. Thus, Sam Altman of Open AI [25] may freely admit that AI will cause substantial job losses, pose threats to national security and wreak general havoc on human communications, but he does so in a context in which AI development is said to be happily advancing from strength to strength.

Moreover, many of the more grandiose concerns expressed by doomsters about the potential for superintelligent AI robotics to destroy human civilisation are, for Bender & Hanna [18], pure science fantasy designed to distract us from the real harms that AI is inflicting on humanity right now not in some sci-fi future. As they comment:

The danger is not from some hypothetical extinction-level event. The danger emerges from rampant financial speculation, the degradation of informational trust and environments, the normalization of data theft and exploitation, and the data harmonization systems that punish people who have the least power in our society by tracking them through pervasive policing systems. But the Doomer/Boosters would have us looking the

other way from all these real harms bedazzled by their dystopian/utopian visions (pp.151-2).

However, when it comes to the current climate catastrophe, none of us can afford to look the other way, and the next section outlines what needs to be included in an education for sustainability programme which tackles, forcefully and fearlessly, AI, climate change, and related issues of justice and inequality.

## 6. Green Education for Sustainable Development

It would be useful to discuss a model curriculum in this domain in the educationally familiar terms of aims, content and methods.

### 6.1. Aims

The principal aim of an education for sustainability learning programme is necessarily derived from the nature, criteria and process of work in the field identified earlier. In the concise words of the 1987, United Nations (UN) *Brundtland Commission* sustainability means ‘meeting the needs of the present without compromising the ability of future generations to meet their own needs’ [3]. We can add to these further nuances derived from de-growth philosophy and Raworth’s economic vision but this concise definition essentially informs the whole programme.

### 6.2. Content

The main elements in this core part of the curriculum will be drawn from the earlier sections outlining the challenges, obstacles, route maps to progress, and the socio-economic and political climate – including the intrusion of AI into all spheres of discourse – which define the current state of affairs in the sustainability field. However, it will not be sufficient here to simply rehearse all the facts, opinions, false trails and fake news which continues to develop exponentially in this areas. Of course, the main evidence for the climate catastrophe facing us all – as reported in the major international studies referred to in Section 2 above – needs to be presented to learners. But this needs to be juxtaposed with critiques of the powerful anti-climate agenda channelled and funded by the fossil fuel lobby and the growing influence of right-wing populist politics dedicated to maintaining the status quo in the face of the direct evidence of global warming in the form of huge temperature increases, floods, wildfires, melting ice at the poles, and the worrying loss of biodiversity in the natural world. Of course, the AI revolution – and the power of the tech barons who own, drive and profit from this – needs to be tackled head on here, and recent work by Yanis Varoufakis on ‘techno feudalism’ [26] could be useful in helping to clarify issues concerning the political and economic background to the sustainability agenda. Also useful will be principles and approaches outlined in the next section on methods, in which ideas and strategies drawn from philosophical analysis and ethical evaluation can be brought to bear on the central topics.

### 6.3. Methods

The strategy of critical rationality advocated in Section 3 above will provide an overall guiding principle in this sphere, but there is also a wealth of material and resources to be mined in the disciplines of philosophy and ethics which be invaluable in learning and teaching. Rationality requires us to balance criticism with attention to facts, evidence and standards but, unless we are to remain in a state of suspended animation, there must be end to this balancing act when decisions to believe, judge and decide on the best available evidence results in action. The concept of ‘negative capability’ first advocated by the poet John Keats in 1817 refers to the quality of being able to tolerate doubt, uncertainty, and mystery without feeling a need to find immediate, rational explanations. This is, no doubt, useful in cases of aesthetic and creative endeavour where the outcomes – the making of a work of art – do not have any substantive, life-changing impact on the world. The question of climate change is not, however, such a case. There is now overwhelming evidence for climate change which is causing serious damage to planet earth: wildfires, floods, and the hottest months on record in recent times cannot be gainsaid. As a recent Royal Society Report [27] observed:

Rigorous analysis of all data and lines of evidence shows that most of the observed global warming over the past 50 years or so cannot be explained by natural causes and instead requires a significant role for the influence of human activities (p.3).

All discussion and analysis needs to foreground such foundational statements.

### 6.4. Green education: a sample component

After presenting all the latest evidence on climate change – naturally, tailored to suit the needs of particular age groups of learners – the debate and discussion is encouraged and facilitated by reference to counter-claims and alternative views. In this area, the role of AI, mainstream news, social media and political lobby groups need to be taken into account. As a starting point basic critical analysis can help us to expose and lay bare the monumental hype and con tricks perpetrated by techno barons and powerful anti-climate change lobbying organisations.

#### 6.4.1. Philosophical Issues

An important first point to make about the new AI large language models (LLMs) such as Open AI’s Chat GPT series, Google’s Gemini and Microsoft’s Llama models is that they are neither rationally intelligent nor capable of human-like thinking and reasoning. The IBM site [29] defines them as follows:

Large language models (LLMs) are a category of deep learning models trained on immense amounts of data, making them capable of understanding and generating natural language and other types of content to perform a wide

range of tasks. LLMs are built on a type of neural network architecture called a transformer which excels at handling sequences of words and capturing patterns in text (p.1).

Bender & Hanna [18] insist that they should be called by their true names as ‘text extruding machines’ which fool the unwary into thinking they have some human-like understanding because they can answer complex questions in human language. The philosopher, John Searle’s famous ‘Chinese Room’ experiment serves to warn us about making such potentially disastrous errors. The key thrust of the argument is explained clearly by John Horgan [30]:

[Searle] asks us to imagine a man who doesn’t understand Chinese sitting in a room. The room contains a manual that tells the man how to respond to a string of Chinese characters with another string of characters. Someone outside the room slips a sheet of paper with Chinese characters on it under the door. The man finds the right response in the manual, copies it onto a sheet of paper and slips it back under the door. Unknown to the man, he is replying to a question, like “What is your favourite colour?” with an appropriate answer, like “Blue.” In this way, he mimics someone who understands Chinese even though he doesn’t know a word. That’s what computers do, too, according to Searle. They process symbols in ways that simulate human thinking, but they are actually mindless automatons (p.2).

Searle [31] argues that the Chinese Room argument – claiming that mere computation or information-processing, no matter how complex or stunningly fast, equates to intelligent reasoning and understanding – ‘strikes at the heart of the strong AI project’ (p.43) and he has been able to defend his position against some key philosophical objections. Arguing along similar lines, Noam Chomsky [32] has commented on the ‘false promise of ChatGPT’ arguing that – although such applications are ‘marvels of machine learning’ – the science of linguistics and epistemology indicate that ‘they differ profoundly from how humans reason and use language’ (p.3). The philosopher Philip Goff [33] argues forcefully that ‘ChatGPT can’t think – consciousness is something entirely different to today’s AI’ (p.2).

All this does not gainsay the beneficial impact of AI tools in healthcare, education and work noted above but it certainly helps to put the claims of the technological billionaires like Elon Musk and Sam Altman into proper perspective. More importantly, when it comes to climate change, it is imperative to challenge the claims of AI beneficence with scientific evidence. There is now a wealth of evidence that the energy-hungry expansion of massive data centres required by AI development will cause an exponential increase in

greenhouse gas emissions. As *EuronewsGreen* [34] noted recently, ‘Data centre electricity demand is predicted to rise to around 945 terawatt hours by 2030, more than the entire electricity consumption of Japan’ (p.1). Bender & Hanna [18] fully endorse this position on AI energy demands, stating unequivocally that ‘AI is hastening the climate catastrophe’ (pp.156ff.). Moreover, adding insult to injury, the many errors and fantastically mistaken citations and judgments – quaintly labelled ‘hallucinations’ by the tech industry – will require even more energy in the attempt to remove them from LLMs. Wei Xing [35] explains that this is because the reduction of AI hallucinations requires substantially more ‘training’ – that is massive trawling of data sets, often infringing copyrights of all kinds – and this is extremely energy intensive.

It will be important to place all these issues before students in seeking to explore ways of challenging the apparently unrelenting doom spiral towards the destruction of the planet. As Arshin Adib-Moghaddam [36] urges, ‘the public needs to challenge the good AI myth pushed by tech companies’. He elaborates in commenting:

The public is at the receiving end of a distinctly hierarchical top-down system, from the big tech companies and their governmental enablers to users. In this way, we are made to consume, with little to no influence over how the technology is used. This positive AI ideology is therefore primarily about money and power. As it stands, there is no global movement with a unifying manifesto that would bring together societies to leverage AI for the benefit of communities of people, or to safeguard our right to privacy (p.2).

Such criticisms place AI developments – indeed, all trends which have an impact on sustainability – within the prevailing politico-economic power structures and, in this regard, the work of Varoufakis [26] is well worth referencing.

Varoufakis presents convincing evidence that the rise of tech company dominance over all aspects of social, political, economic and cultural life – and the overwhelming power of tech barons such as Elon Musk, Jeff Bezos and Mark Zuckerberg – has resulted in a post-capitalist state of affairs that he calls ‘technofeudalism’. As he explains:

Markets, the medium of capitalism, have been replaced by digital trading platforms which look like, but are not, markets, and are better understood as fiefdoms. And profit, the engine of capitalism, has been replaced with its feudal predecessor: rent. Specifically, it is a form of rent that must be paid for access to those platforms and to the cloud more broadly. I call it *cloud rent* (original italics; p.34).

Moreover, the cloud capitalists are able to extract more profit than their more orthodox predecessors because they have absolute control over all their platforms which traders have to use to sell products. In addition, all users, all of us who click on Amazon, Facebook or any other social media platform are working for these ‘cloudalists’ for free by providing them with our personal data as well as our business.

Discussing ways of escaping from this serfdom, Varoufakis recommends democratising the cloud through strategic ‘rent strikes’ and state regulation to control content and scale. And this is exactly what climate activists are calling for in the campaign to combat runaway greenhouse gas emissions and uncontrolled climate change. Europe now has a reasonably robust AI regulation system [37] – its effectiveness can be discerned by how much the big tech platforms object to it – and similar systems are worth implementing globally, along with the increasing number of legal challenges designed to bring the tech companies down to earth and under democratic control [38, 39].

Learners on an education for sustainability programme need to be acquainted with all this activity designed to slow down climate change, and there is a wealth of material supplied by the large activist organisations such as *Greenpeace* and the *Climate Action Network* [40] which will be invaluable in this process.

#### 6.4.2. Ethical Issues

Almost all the issues discussed above have a moral dimension since they concern potential harms or benefits to humans and the natural world. AI tools – though they might be accorded the provisional label of ‘non-human persons’ [41] – are not capable of human understanding and reasoning and, thus, are not ethical agents in themselves. However, the people designing and constructing them *are* moral agents and are subject to the constraints of the ethical universe within which we all dwell. Efforts concerned with ensuring that AI tools do not cause harm to human are referred to as ‘values alignment’ in the tech industry.

It is one thing to establish regulations to cover AI use and development, quite another to ensure that the necessary control mechanisms are built into the new technology. Bostrom’s work on *Superintelligence* [42] has established the definitive blueprint for progress in this crucial field. He initially outlines a range of ‘capability control methods’ which are designed to ‘prevent undesirable outcomes by limiting what the superintelligence can do’. This is further explained in terms of:

Placing the superintelligence in an environment in which it is unable to cause harm (boxing methods) or in which there are strongly convergent instrumental reasons not to engage

in harmful behaviour (incentive methods). It might involve limiting the internal capacities of the superintelligence (stunting). In addition, capability control methods might involve the use of mechanisms to automatically detect and react to various kinds of containment failure or attempted transgression (tripwires) (pp.157-168).

Bostrom recommends a ‘common good principle’ to ensure that the desired outcome of all such safeguards is in line with the ideal that ‘superintelligence should be developed only for the benefit of all of humanity and in the service of widely shared ethical ideals’ (p.312).

Such shared ethical ideals will apply – not just to AI – but also to all the processes discussed above in relation to education for sustainability. It was noted that de-growth philosophy incorporated aspects of social justice and equality. In this area, the work of the moral philosopher, Peter Singer, will be valuable in dealing with such issues.

Peter Singer’s famous “Shallow Pond” thought experiment was originally constructed in the context of an ethical argument for encouraging charity donations in the light of the 1971 refugee crisis in East Bengal and outlined in very brief form in *Famine, Affluence and Morality* [43]. It is worth reporting in full:

If I am walking past a shallow pond and I see a child drowning in it, I ought to wade in and pull the child out. This will mean getting my clothes muddy, but this is insignificant whereas the death of the child would presumably be a very bad thing (p.7).

Singer goes on to claim that it ‘makes no moral difference whether the person I can help is a neighbour’s child ten yards from me or a Bengali whose name I shall never know, ten thousand miles away’ (ibid.)

Over the years Singer has elaborated this thought experiment and defended its implications against a range of criticisms [44]. A key challenge turns on the fact that the child in the pond is near to you whereas the starving children may be far away in foreign countries. The response to this challenge is that – if we use our impartial reasoning capacities – it will be acknowledged that ‘there is no justification for having strong condemnation in one situation (i.e. in not saving the drowning child), and no such response in the other one’ (p.36) concerned with relieving poverty abroad.

In the fifty years since Singer outlined the original thought experiment, his advocacy of charitable giving has advanced by leaps and bounds. Moreover, the movement – now labelled “effective altruism” (<https://www.effectivealtruism.org/>) – has been boosted by the organisation *The Life You Can Save* [45]

established by Singer to provide just that body of empirical social research which critics have demanded. Common misconceptions about charitable donating – such as philanthropy causing dependency, corruption or harming economic growth – are systematically dismantled by Singer who demonstrates forcefully the unfairness of the global economic system and explains in fine detail how systematic research by organisations such as *Give Directly* and *Give Well* has fostered public ‘confidence that people in extreme poverty will benefit from your donation, and benefit in a manner that is highly cost-effective’ (p.103).

In a similar way, the Oxford philosopher, William MacAskill, offers powerful reasons in *Doing Good Better* [46] why all in the developed world should engage in effective altruism (EA). In reply to the common objection that anything we might do to try to relieve world poverty would amount to a futile drop in the ocean, he reminds us that:

We have the opportunity to provide a benefit for others that is one hundred times greater than the benefit we could provide for ourselves. That we can’t solve all the problems in the world doesn’t alter the fact that, if we choose, we can transform the lives of thousands of people (p.30).

Moreover, the challenge to global injustice and inequality is not just a moral imperative but a practical existential one as well. The research by Wilkinson & Pickett [47] over the years has indicated that countries with greater gaps between the rich and poor tend to have far more problems than those with greater income equality. As they note: populations with larger income differences tend to have worse health: lower life expectancy and higher rates of infant mortality, mental illness, illicit drug use and obesity. Greater inequality also damages social relationships:

More unequal societies experience more violence (as measured by homicide rates) and higher rates of imprisonment; people trust each other less and community life is weaker (p.xvii).

There are, of course, many more urgent problems facing us at the present time and, as Toby Ord [48] reminds us, many of these require urgent attention, not just for those living today, but for future generations. In order to apply Singer’s practical ethics to the rational reconstruction of society, it is worth incorporating Toby Ord’s future-oriented, inter-generational arguments into the discourse. In his seminal work on existential risks to humanity, Ord meticulously examines a wide range of threats, both natural and anthropogenic, that could potentially eradicate humanity or drastically curtail its future potential. He argues that:

Safeguarding humanity’s future is the defining challenge of our time. For we stand at a crucial moment in the history of our species. Fuelled

by technological progress, our power has grown so great that, for the first time in humanity's long history, we have the capacity to destroy ourselves – severing our entire future and everything we could become (pp.2-3).

Moreover, if some of this ethical philosophizing seems rather too abstract, there is a wealth of fictional material in the form of novels, poetry and film suitable for learners of all ages to supplement the science and philosophy [49]. The *Climate Change Resources* organisation has also produced a wide range of films for young people which explain clearly the dangers and threats of global warming [50].

## 7. Coda: Ethics, Sustainability and Secular Spirituality

As indicated above, in order to supplement to the model programme suggested here, there will be a need to draw on a wider range of material – from literature, art, and humanities in general – to support the, thus far, largely scientific/philosophical/pragmatic tone of the educational project. As the writer and climate activist, Rebecca Solnit [51] reminds us, 'every crisis is in part a storytelling crisis. This is as true of climate chaos as anything else'. She offers the following metaphorical story:

In a sense, we are all in a school bus on a slippery road in a thunderstorm. Climate activists are trying to take the wheel from the reckless drivers who are steering us all into trouble. We are trying to turn toward safety. We are trying to be good ancestors, to make a world in which the land that, in the past, fed many species, including ours, will feed them in the future, to take the fork in the road ahead that leads to well-being in the short term and the long. To build better roads in the future instead of sliding into the ditch (pp.139-140).

In contemporary philosophy, there has been a concerted effort to challenge the dominant scientific paradigm of materialism [52]. The materialistic nature of the socio-economic system is directly linked to the physicalist materialism which drives much of contemporary science [53]. Jeremy Lent [54] describes how the idea of 'conquering nature' (pp.277ff.) derived from the scientific revolution emerging from the Renaissance – particularly from the writings of Bacon, Boyle and Leibniz – led to the exploitation of the earth's resources for material profit. Such a powerful metaphor later came to legitimize the development of capitalism, possessive individualism, colonial conquest and the 'untrammelled exploitation' of the natural world.

The new idealist philosophy of Bernardo Kastrup [55] similarly wishes to challenge the 'physicalist narrative' which 'enables a sense of direct egoic control over nature' (p.211). Such a perspective serves to 'turn the universe into a mechanical contraption

fuelled by mere chance [which] drains the meaning out of life' (ibid., p.216). Steve Taylor [56] is even more forceful in his attack on materialism. He asserts that:

The materialist worldview is bleak and barren; it tells us that life is fundamentally meaningless, that we're just here for a few decades and it doesn't really matter what we do...It seems inevitable that people should try to take refuge from the bleakness of materialism, treating themselves to as much fun and as many consumer products as they can afford, or trying to build up their wealth and status and power (pp.229-230).

As an alternative to this bleak vision, a perspective which places consciousness at the heart of existence allows for the fostering of a 'spiritual worldview [which] tells us that our lives are meaningful and purposeful' (p.232). In a similar vein, Philip Goff [57] espousing a panpsychist view based on the non-dualism of Eastern traditions, writes of such a perspective 're-enchanting the universe'. As he elaborates:

We need not live exclusively in the human realm, ever more diluted by globalization and consumerist capitalism. We can live in nature, in the universe. We can let go of nation and tribe, happy in the knowledge that there is a universe that welcomes us...At home in the cosmos, we might begin to dream about – and perhaps make real – a better world (p.217).

Along with the critical rationality and practical ethics outlined above, such a conception of secular spirituality can provide a valuable dimension – in support of the AI critiques and de-growth ideas outlined earlier – to ensure that the educational journey results in fully-formed, ethical and socially-engaged citizens, workers, and members of the global community. In terms of the increasingly urgent climate crisis and sustainability agenda, all our hopes for the future will rest squarely in the hands of such citizens.

## REFERENCES

1. Adenike A.A. & Onyeaka, H. The role of green education in achieving the sustainable development goals: A review. *Renewable and Sustainable Energy Reviews*. 2025. Volume 210, ISSN 1364-0321, <https://doi.org/10.1016/j.rser.2024.115239>.
2. Hyland, T. Green Idealism and the Educational Endeavour: Towards a Philosophical Critique of Materialism to Meet the Challenge of Climate Change. *International Journal of Arts, Humanities and Social Sciences Studies*, 2022, 7(5): 58-69
3. United Nations. *Sustainability*. 2007. <https://www.un.org/en/academic-impact/sustainability> accessed, 17/9/25
4. United Nations. *The Sustainable Development Goals*. 2025. <https://www.un.org/sustainabledevelopment/development-goals/> accessed 21/9/25

5. Schaeffer, R. Ten new insights in climate science 2024. *Science Direct*. 2025. <https://www.sciencedirect.com/science/article/pii/S2590332225001113> accessed 12/10/25
6. ETUC. *Spain guarantees a just transition for miners*. 2024 (European Trade Union Confederation). <https://www.etuc.org/en/spain-guarantees-just-transition-miners>
7. Raworth, K. *Doughnut Economics: Seven Ways to Think Like a 21st Century Economist*. 2017. London: RH Business Books.
8. Degrowth. *What is Degrowth?* 2021. <https://degrowth.info/degrowth>. accessed 23/9/25
9. Richter, K. Degrowth isn't the same as a recession – it's an alternative to growing the economy forever. *The Conversation*, 2023 May 23. <https://research-information.bris.ac.uk/en/publications/degrowth-isnt-the-same-as-a-recession-its-an-alternative-to-growi> . accessed 2/10/25
10. Mason, P. *Post-Capitalism: A Guide to Our Future*. 2015. London: Penguin
11. Monbiot, G. & Hutchison, P. *The Invisible Doctrine: The secret history of neoliberalism*. 2024. London: Penguin
12. Peters, R.S. Reason and Passion. In Dearden, R.F., Hirst, P.H. & Peters, R.S. (eds) *Education and the Development of Reason*. 1972. London: Routledge & Kegan Paul, 208-229
13. Hudson, W.D. Learning to be Rational. *Proceedings of the Philosophy of Education Society of Great Britain*. 1977. XI :39-56
14. University of Edinburgh. Critical Thinking. *Institute for Academic Development*. 2024. <https://institute-academic-development.ed.ac.uk/study-hub/learning-resources/critical>
15. Dennett, D. *Breaking the Spell: religion as a natural phenomenon*. 2006 London: Penguin Books
16. Harris, S. *The Moral Landscape: How Science Can Determine Human Values*. 2010. London: Free Press
17. Science. China tops the world in artificial intelligence publications, database analysis reveals. *Science*. 2025. <https://www.science.org/content/article/china-tops-world-artificial-intelligence-publications-database-analysis>. Accessed 20/9/25
18. Bender, E.M. & Hanna, A. *The AI Con: How to Fight Big Tech's Hype and Create the Future We Want*. 2025. London: Vintage
19. Oneadvanced. *The benefits of artificial intelligence (AI): A strategic overview*. 2025. <https://www.oneadvanced.com/resources/the-benefits-of-artificial-intelligence-ai-a-strategic-overview/> . accessed 12/10/25
20. World Economic Forum. *7 ways AI is transforming healthcare*. 2025. <https://www.weforum.org/stories/2025/08/ai-transforming-global-health/> accessed 15/10/25
21. Hyland, T. Artificial Intelligence (AI) Developments and their Implications for Humankind: A critical analysis of contemporary trends and perspectives. *Current Journal of Applied Science and Technology*. 2023, 42(21): 12-26
22. Bittencourt, I.I., Chalco, G., Santos, J. et al. Positive Artificial Intelligence in Education (P-AIED): A Roadmap. *International Journal of Artificial Intelligence in Education*. 2024, 34: 732–792. <https://doi.org/10.1007/s40593-023-00357-y>. accessed 21/9/25
23. Stern, N., Romani, M., Pierfederici, R. et al. Green and intelligent: the role of AI in the climate transition. *Climate Action* .2025 4, 56 <https://doi.org/10.1038/s44168-025-00252-3> accessed 3/10/15
24. Slimani, S., Omri, A. & Jabeur, S.B. When and how does artificial intelligence impact environmental performance? *Energy Economics*, 2025. 148, 108643, ISSN 0140-9883, <https://doi.org/10.1016/> accessed 15/10/25
25. Daws, R. Sam Altman: AI will cause job losses and national security threats. *AI News*. 2025. July 23. <https://www.artificialintelligence-news.com/news/sam-altman-ai-cause-job-losses-national-security-threats/> accessed 17/10/25
26. Varoufakis, Y. *Techno Feudalism: What Killed Capitalism*. 2025. London: Vintage
27. Royal Society. *The Basics of Climate Change*. 2025. <https://royalsociety.org/news-resources/projects/climate-change-evidence-causes/basics-of-climate-change/> accessed 25/9/25
28. IBM. *What are large language models (LLMs)?* 2025. <https://www.ibm.com/think/topics/large-language-models> accessed 17/10/25
29. Horgan, J. Quantum Mechanics, the Chinese Room Experiment and the Limits of Understanding. *Scientific American*, 2021, March 9, <https://www.scientificamerican.com/article/quantum-mechanics-the-chinese-room-experiment-and-the-limits-of-understanding/> accessed 28/9/25
30. Searle, J. R. *Mind*. 2004. Oxford: Oxford University Press
31. Chomsky, N. The False Promise of Chat GPT. *New York Times*, March 8, 2023
32. Goff, P. ChatGPT can't think – consciousness is something entirely different to today's AI. *The Conversation*. 2023 , May 17, <https://theconversation.com/chatgpt-cant-think-consciousness-is-something-entirely-different-to-todays-ai-204823> accessed 24/9/25
33. Bailey, J. Climate champion or catastrophe: Can AI 'offset' its own, growing emissions? *EuronewsGreen*. 2025. April 11, <https://www.euronews.com/green/2025/04/11/ai-climate-champion-catastrophe-carbon-emissions> accessed 26/9/25
34. Wei Xing. Why OpenAI's solution to AI hallucinations would kill ChatGPT tomorrow. *The Conversation*, 2025, Sep 12,

- <https://theconversation.com/why-openai-solution-to-ai-hallucinations-would-kill-chatgpt-tomorrow-265107> accessed 29/9/25
35. Arshin Adib-Moghaddam. Here's why the public needs to challenge the 'good AI' myth pushed by tech companies. *The Conversation*, 2025, June 23, <https://theconversation.com/heres-why-the-public-needs-to-challenge-the-good-ai-myth-pushed-by-tech-companies-259200> accessed 12/10/25
36. European Commission. Legal framework governing medicinal products for human use in the EU. *European Commission*. 2023. [https://health.ec.europa.eu/medicinal-products/legal-framework-governing-medicinal-products-human-use-eu\\_en](https://health.ec.europa.eu/medicinal-products/legal-framework-governing-medicinal-products-human-use-eu_en). accessed 19/10/25
37. Singh, S. & Dahlmann, F. Regulating AI use could stop its runaway energy expansion. *The Conversation*. 2025. September 12, <https://theconversation.com/regulating-ai-use-could-stop-its-runaway-energy-expansion-258425> accessed 10/9/25
38. Kokkoris, I. Despite Google's recent victory, a flurry of competition cases could still change how the tech giants do business. *The Conversation*. 2025. September 24. <https://theconversation.com/despite-googles-recent-victory-a-flurry-of-competition-cases-could-still-change-how-the-tech-giants-do-business-264890> accessed 4/10/25
39. Climate Action Network. Tackling the climate crisis. *Climate Action Network International*. 2025. <https://climatenetwork.org/> accessed 3/10/25
40. Hyland, T. AI Applications and Non-Human Persons. *Philosophy of Education Society of Great Britain*, 2023. June 13, <https://www.philosophy-of-education.org/ai-applications-and-non-human-persons/>
41. Bostrom, N. *Superintelligence*. 2014. Oxford: Oxford University Press; also Bostrom, N. *Ethical Issues in Advanced Artificial Intelligence*. 2023. <https://nickbostrom.com/ethics/ai> accessed. 7/10/25
42. Singer, P. *Famine, Affluence and Morality*. 2016. New York: Oxford University Press
43. Singer, P. *Ethics in the Real World*. 2023. Princeton: Princeton University Press
44. Singer, P. *The Life You Can Save*. 2019. <https://www.thelifeyoucansave.org/the-book/>
45. MacAskill, W. *Doing Good Better*. 2015. London: Faber & Faber
46. Wilkinson, R. & Pickett, K. *The Spirit Level: Why Equality is Better for Everyone* 2009. London: Penguin; also Wilkinson, R. & Pickett, K, *The Inner Level*. 2018. London: Allen Lane
47. Ord, T. *The Precipice: Existential Risk and the Future of Humanity*. 2020. London: Bloomsbury
48. Creamer, E. Look up: five hopeful novels about the climate crisis. *The Guardian*, 2025. August 16, <https://www.theguardian.com/books/2025/aug/16/look-up-five-hopeful-novels-about-the-climate-crisis> accessed 12/10/25
49. Climate Change Resources. *Films for Gen-Z*. 2024. <https://climatechangeresources.org/youth/youth-films/> accessed 2/10/25
50. Solnit, R. *No Straight Road Takes You There. Essays for Uneven Terrain*. 2025, London: Granta.
51. Hyland, T. *Philosophy, Science and Mindfulness*. 2018. Mauritius: Scholars' Press
52. Hyland, T. *Morality, Neo-Idealism and Conscious Realism*. 2024. London: Dodo Books
53. Lent, J. *The Patterning Instinct: A Cultural History of Humanity's Search for Meaning*. 2017. New York: Prometheus Books
54. Kastrup, B. *The Idea of the World*. 2019. Hampshire: iff Books
55. Taylor, S. *Spiritual Science: Why Science Needs Spirituality to Make Sense of the World*. 2018. London: Watkins Media
56. Goff, P. *Galileo's Error: Foundations for a New Science of Consciousness*. 2019 London: Rider