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ESSAY

A social ecological model of education: Economic problems, citizenship solutions

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ABSTRACT

This article develops a model of education from Murray Bookchin's social ecology by demonstrating how "the economy," specifically growth and employment, intervenes between the environment and education, impeding the goal of environmental education. By reformulating Bookchin's central claim in terms of power, rather than domination, the argument for limits to growth is strengthened and gives rise to a necessary feature of ecological sustainability; namely, the collective imposition of limits on throughput, the technical term for resource use. To make such collective action effective, the model proposes that active citizenship become a more common aim of education, especially in relation to the increasingly narrow goal of education for employment.

KEYWORDS

citizenship education; ecological sustainability; economic growth; employment; power; social ecology

Introduction

The economy has grown to dominate all of modern life. In Polanyi's (2001) classic terms, it has become "disembedded" from society and the environment, subordinating them to its needs. As a key slogan of Bill Clinton's successful presidential campaign, "it's the economy stupid" was effective in communicating this dominance to the American public (Moore, 2022); and as John Maynard Keynes, arguably the most influential economist of the twentieth century, famously opined: "[p]ractical men who believe themselves to be quite exempt from any intellectual influence, are usually the slaves of some defunct economist" (Keynes, 2009, p. 331). Environmental education was designed to account for this economic impact. Number 1 of its guiding principles is that it should consider the environment in its totality, including, amongst others, economic factors; and number 5 of its objectives is to help people evaluate environmental measures and educational programs in terms of, again amongst others, economic factors (UNESCO & UNEP, 1975, p. 4). Yet mounting evidence (e.g., IPBES, 2019; IPCC, 2021; Steffen et al., 2015) strongly suggests that the goal of environmental education is not being achieved: "[t]o develop a world population that is aware of…the environment *and its associated problems*, and which…work[s] individually and collectively toward solutions" (UNESCO & UNEP, 1975, p. 3, emphasis added).

In this article I address this problem in two interrelated ways. First, I demonstrate how the economy intervenes between the environment and education in a way that specifically detracts from environmental education's goal. And second, as a vehicle for this endeavor, I develop a novel, social ecological model of education, which not only diagnoses the problem, but suggests a solution.

Social ecology is a field broadly concerned with humans' impact on the environment. There are many who have used the term social ecology, including Julian Huxley, Erwin Gutkind, and Mattei Dogan, amongst others, but Murray Bookchin is arguably the most influential of them (Wright & Hill, 2011, p. 2), and thus it is his work that I focus on here. Beginning in the 1960s, Bookchin developed his use of social ecology based on a concise, controversial principle: that ecological problems stem from social problems, and more specifically that humans' domination of nature stems from humans' domination of

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one another (Bookchin, 1982, p. 6, 1986, p. 85, 1987, pp. 49–50, 1994a, pp. 25, 56n22, 65–66, 1994b, pp. 17, 23, 2006, pp. 19–20). For reasons described in Appendix A and elaborated below, I replace the term "domination" in Bookchin's formulation with "power." The principle applied to advance the model of education developed in this article is thus: humans' power over nature stems from humans' power over one another.

According to this principle the means to resolving our mounting ecological problems, from biodiversity loss to climate change, is to implement a much more democratic society, with popular control over resource use. For Bookchin, the empowerment of active citizens needed for such popular control was to be effected through localized, participatory, democratic assemblies (Bookchin, 1987, p. 144), a political model he referred to as libertarian municipalism (Bookchin, 2015).

But how is the citizenry to be prepared for such active participation? In terms of education, Bookchin did not write much on the subject, with no critical analysis of schooling, which is odd given his repeated argument that gerontocracy was the first form of domination (Bookchin, 1982, p. 13, 1994a, p. 56n2, 2006, p. 34). He did however make a passing criticism of the culture of rote learning and testing (Bookchin, 1994a, p. 13) and advised that communal life itself should act as a vehicle for the education of the young, and the local people's assemblies mentioned above for that of the people in general (2006, p. 104). Yet in other places he argued in support of conventional social institutions, especially citizenship (Bookchin, 1974, 1982, 1986, 2006), a matter to which I will return.

Now consider education as a social institution. Globally, from pre-primary school through to tertiary education, there are about 1.8 billion students in the world and about 94 million teachers, which together amount to almost a quarter of the human population (see Appendix B). In addition to this are all those people working in administrative roles, principals, support staff, and so on. Given the sheer scale of this institution and an appreciation that current circumstances are not inevitabilities, but the result of historical contingencies, education clearly has a role to play in causing our social ecological problems, but equally in providing possible solutions to them. Not an exclusive role of course, but an important one nonetheless. How then has education been theorized in terms of social ecology?

There is surprisingly little literature on the social ecology of education in Bookchin's sense, but from it I draw two conclusions. First, social ecology is usually used in a vague way to mean that society and nature are related, which is a truism, and not very useful (Cutter-Mackenzie-Knowles et al., 2020; Doherty et al., 2012; Frank, 2017; Henderson et al., 2023; Niemann, 2016; Payne, 2010; Wattchow, Jeanes, et al., 2014). And second, the concept of power is not placed at the center of analysis, but listed amongst other aspects of humans' relationship to nature and to each other (Cutter-Mackenzie-Knowles et al., 2020; Payne, 2010; Wattchow, Jeanes, et al., 2014); sometimes it is used only in a social context to describe humans' relationships to each other (Brown et al., 2014; Henare-Solomona, 2021; Henderson et al., 2023; Niemann, 2016; O'Connor et al., 2014, pp. 63–64); and sometimes it is barely mentioned at all (Doherty et al., 2012; Frank, 2017; Payne, 2010).

In addition to the foregoing, and the most pertinent to this paper, is the important work by Holohan (2018, 2023), who explores the concept of power among the relationships between education, ecological sustainability, and citizenship. Although the ecological half of Bookchin's principle, humans' power over nature, is not emphasized in Holohan's work, his ample recourse to citizenship aligns with the model developed below. Also noteworthy is the work of Stuart Hill, the Foundation Chair of Social Ecology at Western Sydney University, who has, amongst much else, written about issues of power (Hill, 2011, 2021). Under his leadership, social ecology integrates four domains: the personal, social, environmental, and spiritual/unknown (Hill, 2011). In that sense this paper will be seen to focus on the social and environmental, but I include some of the personal domain in the Discussion to follow, as for Hill the personal is the "most important point" (2011, p. 20), and will allow me to provide some local examples of what will otherwise appear as an impersonal, global exposition.

None of the foregoing literature clearly conforms to Bookchin's principle, but it does contain two important references to the economy.[1] The first is from Wattchow, Brown, et al. (2014, pp. 221–222), who observe that the most challenging aspect of transforming power-sharing arrangements in the context of a school-to-work program arises when attendees are there, not because they want to be, but because they must be to receive government payments, part of which is aimed at the development of employment

skills. This concept of education for employment is a key element of the model developed below. The second is by McNeill (2020, pp. 276–278), who briefly discusses the impact that economic growth has on the environment.

I deploy these two economic concepts, employment and growth, to interpret Bookchin's power-based principle, and demonstrate how the economy intervenes between the environment and education, impairing the goal of environmental education. The under-theorization of education from the perspective of Bookchin's social ecology is a gap in the literature that the model developed in this article seeks to fill. I begin by interpreting the ecological half of Bookchin's thesis (humans' power over nature) through the lens of ecological economics, for which criticism of economic growth and its impact on the goal of ecological sustainability is central (Daly & Farley, 2011). Next I interpret the social, specifically educational, half of Bookchin's thesis (humans' power over one another) through the impact that neoliberal policies have had on education, resulting in the increasing tendency for education to be aimed at preparation for employment. Following this I demonstrate how these two halves are related that conforms to Bookchin's principle of social ecology, both in theory and practice, to develop a novel, social ecological model of education. I end with a discussion of the model and suggestions for implementing the proposed solution.

Humans' power over nature

To begin interpreting the ecological half of Bookchin's principle, the concept of power needs to be defined. In this biophysical context, power is a natural scientific concept used to describe the flow rate of energy. Its standard unit is the watt (W), which is equal to one joule[2] (J) per second (s). The more energy one uses in less time, the greater the power generated. Two points need to be appreciated here: first, energy is *the* fundamental resource required to do anything (Smil, 2017), and second, like any resource, it is finite, both as a stock of potential energy, whether in the form of nonrenewables like fossil fuels or renewables such as wood; and as a flow of kinetic energy, most fundamentally in the form of solar, but which gives rise to other renewables such as biomass, wind, and hydroelectricity.

Humans increased their use of bioenergy (i.e., that derived from biomass) dramatically in the twentieth century (Krausmann et al., 2013). Since the industrial revolution we have vastly increased our use of fossil energy too: global production of coal has grown almost a thousand fold since 1800, and both oil and natural gas production have grown close to one and a half thousand times since about 1870 (Smil, 2017, p. 298). While the proportion of these various energy sources is slowly changing, humans' global energy consumption is still growing (International Energy Agency, 2021). Yet as just noted, energy is a finite resource, and such growth is thus inherently unsustainable, with peak production for oil occurring at latest by 2040 (Laherrère et al., 2022).

Throughout most of history humans have not accounted for their energy use and its limits when managing their environments; these are modern scientific concepts that arose only in the nineteenth century (Smil, 2017, p. 3). Yet they are fundamental to ecology and environmental science, and indeed science generally. As such, to make the sort of eco-citizenship aims endorsed in this paper effective, they ought to be a core part of high school science education. However, as the world moves toward electrification of everything and away from fossil fuels and the combustion engine, the thermodynamic principles of energy limits (especially the first and second laws; see Appendix C) may be in danger of being neglected in high school science education, and thereby the common knowledge needed to press for the imposition of limits on throughput proposed in this paper (see below). Thus, they ought to be emphasized, a matter to which I return in the Discussion below.

While the emphasis in this section is on the growth of human energy use in its relation to power, worth noting is that humans' use of matter—our material footprint—is also growing (Wiedmann et al., 2015). Between 1970 and 2019, global material extraction increased from 32 to 95 gigatonnes (Gt) per year (Lenzen et al., 2021, p. 158), which includes biomass, fossil fuels, metal ores, and nonmetallic minerals. If recycled materials are included in this material flow, humans' annual material usage eclipses 100 Gt (Circle Economy, 2020, p. 18).

In summary, since the industrial revolution humans have vastly increased, and are still increasing, their use of both of types of energy resources (i.e., renewable and non-) to generate power. Because these

both come from the environment and are finite, whatever energy is directed toward human uses is unavailable for other species. It is thus entirely accurate to say that humans have been increasing, and are continuing to increase, their power over nature. It is not a "mere anthropomorphism" as in Bookchin's analysis (see Appendix A). Furthermore, increases in humans' power over nature, that is growth in the rate of humans' energy use is, due to its finitude, inherently unsustainable.[3] As such, the imposition of limits on energy, and matter, is a fundamental necessity for ecological sustainability. But what is driving humans' power over nature?

Economic growth

For over half a century ecological economists have been arguing that humans' commitment to economic growth is inherently unsustainable and the fundamental cause of our mounting ecological problems (e.g., Daly, 1993b; Georgescu-Roegen, 1971; Hall, 2022; Meadows et al., 1972), leading to a recent *Nature* editorial demanding a resolution to the debate ("Limits to growth? It's time to end a 50-year argument," 2022). I make no attempt to review this vast debate; interested readers might consult Higgs (2021), amongst much other literature. As with many entrenched disagreements, different definitions of the terms of reference are part of the problem; thus I contrast two distinct, but related concepts at its core.

For mainstream economists, the most common measurement of economic growth is an increase in Gross Domestic Product (GDP), which is the total market value of the final goods and services produced in a country in one year (Samuelson & Nordhaus, 2010, pp. 386–394). Because GDP is a measure of value, denominated in dollars (or euros, pounds etc.), economists consider increases in GDP to be unlimited. However, as Daly (2014, p. 63) has argued, GDP is only a nominal measurement of value (in terms of dollars, etc.) because those dollar prices represent real goods and services.

In contrast, for ecological economists, the most important concept when judging the size of the economy and its growth is throughput, which is defined as all the matter and energy flowing through the economy over a given period of time (Daly, 1993a, p. 326). While GDP may appear to be based on value, the throughput is clearly a biophysical metric, and thus amenable to natural laws and limitations, most importantly the first and second laws of thermodynamics (Daly & Farley, 2011, pp. 64–70; Hall & Klitgaard, 2018, pp. 308–309).[4] Notice that while the argument for humans' power over nature began with an interpretation of limits on energy flows, here the argument is extended to limits on material flows too; in practice matter and energy are intimately related, as expressed by Einstein's $E = mc^2$ (see Appendix C).

These two measurements of economic growth, GDP and throughput, are distinct but related, leading to the great "decoupling debate" (Ward et al., 2016): the question of whether or not the economy can grow forever hinges entirely on whether increases in GDP's nominal measurements of value in terms of prices can be "decoupled" from throughput. In other words, at issue is whether economic growth can be "de-energized" (Smil, 2019, p. 492), and "dematerialized." Daly and Farley (2011, pp. 364–365n5) stress that although the correlation between changes in throughput and GDP is not 1:1, it is close nonetheless. Commenting on this issue, Ward et al. (2016, p. 10) conclude: "[o]ur model demonstrates that growth in GDP ultimately cannot plausibly be decoupled from growth in material and energy use, demonstrating categorically that GDP growth cannot be sustained indefinitely." Similarly, Parrique et al. (2019) (see also Parrique (2019)) made an exhaustive empirical investigation of the conflict between economic growth and ecological sustainability and found that there is no evidence that economic growth is being decoupled from environmental impact on a scale even close to what is needed to achieve ecological sustainability, and furthermore such decoupling is unlikely to occur in the future. Whatever the outcome of this debate, throughput is clearly increasing, compromising the goal of ecological sustainability. This expression of humans' power over nature is illustrated in Figure 1.

As argued above, a necessary feature of ecological sustainability is the imposition of limits on throughput. Made effective, this leads to the situation ecological economists refer to as the steady-state economy (Daly, 1993a, 2014), depicted in Figure 2. Notice that in the steady state, while throughput is held steady, economic development is still possible: in this context economic development refers to qualitative changes in production, as opposed to growth which refers to quantitative increases in throughput (Daly, 1997).

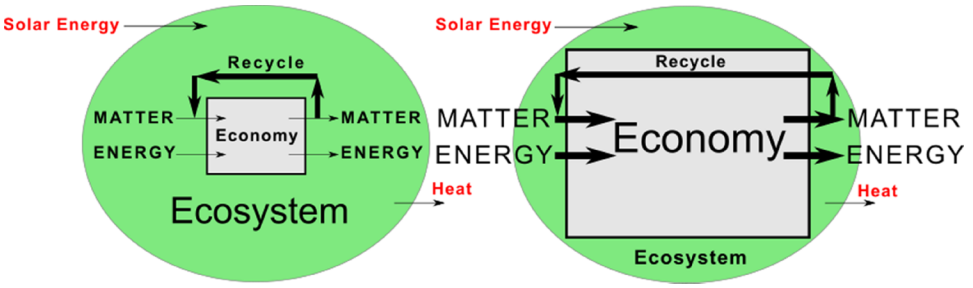

Figure 1. As economic growth proceeds, material and energy use (throughput) increases, expanding into ecosystems, degrading their functionality. Source: Author's own, adapted from Daly (2015).

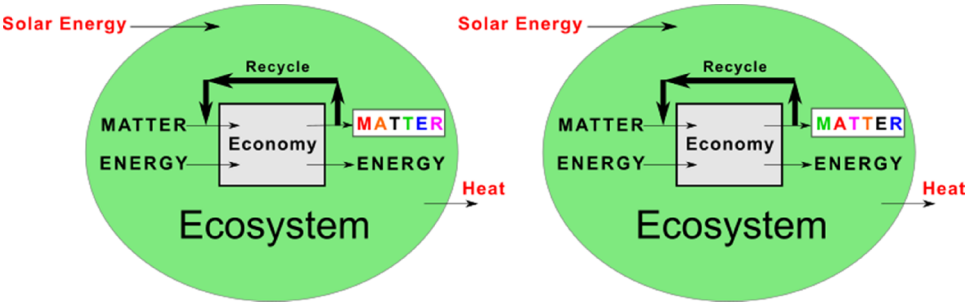

Figure 2. The steady-state economy: throughput is held steady, or allowed to fluctuate mildly. While here I define the steady-state economy in terms of limitations on throughput flow, Daly (1993a, 2014) usually defined it in terms of limitations on stocks of human artifacts and population, with throughput allowed to vary, but kept to sustainable levels. These are simply different emphases on the limitations needed for the same goal of ecological sustainability (H. Daly, personal communication, May 15, 2019). Note the qualitative material output changes represented by change of color of matter. This provides opportunities for economic development while throughput growth is halted. Source: Author's own.

Such qualitative changes can include changes in technology, information, fashion, and income and wealth distribution (Daly & Farley, 2011, pp. 6–7). A human body analogy can help make this distinction clear: a baby grows by consuming more matter and energy, but a fully grown adult can continue to develop through experience and education without any growth at all.

Having interpreted humans' power over nature through economic growth, and having described an essential characteristic of ecological sustainability as the imposition of limits on throughput, it is important to recognize that most countries maintain growth as a core principle of macroeconomic policy, including Australia (Australian Government Treasury, 2022, pp. 12, 24, et passim), the United States (Department of the Treasury, 2022, pp. ii, viii, et passim), Canada (Department of Finance Canada, 2022), the European Union (European Central Bank, 2023), the United Kingdom (HM Treasury, 2022), Japan (Bank of Japan, 2022, p. 7), and many others. The policy extends to the international arena too, with Goal 8 of the United Nations' Sustainable Development Goals (SDGs) being "decent work and economic growth" (United Nations, n.d.).

In summary, humans' deliberate expansion of energy and material use through the policy of economic growth is an expression of our power over nature. From this arises a conception of ecological sustainability, which requires the imposition of limits on throughput. According to Bookchin's social ecological maxim however, this ecological problem of humans' power over nature stems from the social problem of humans' power over one another, to which I now turn.

Humans' power over one another

Unlike humans' power over nature, which can be reduced to arguments related to energy and material use, humans' power over one another is more complex and can be expressed in numerous ways: in law,

media, family structure, and so on. As a political economic concept, power can be thought of as the ability to make people do things they would not otherwise do (McLean & McMillan, 2009, pp. 425–426). The purpose of this article is to develop a social ecological model of education, and thus I am interested in an expression of humans' power over one another at school. From the literature review above I highlighted a critical perspective on education for employment as an example of this. To bring such a perspective into focus, Appendix D provides a brief, critical history of employment.

While many employees have no doubt made significant gains over the last two centuries, the current definition of employment reflects its historical criticism. In Australia, an employee is one who "[p]erforms work, under the direction and control of their employer, on an ongoing basis" (Australian Government Fair Work Ombudsman, 2020, n.p.). Similarly, in the United States

> [u]nder common-law rules, anyone who performs services for you is your employee *if you can control what will be done and how it will be done.* This is so even when you give the employee freedom of action. What matters is that you have the right to control the details of how the services are performed. (Internal Revenue Service, 2020, n.p., emphasis in original)

With the foregoing history and current definitions of employment in view, some doubt arises as to the legitimacy of education for it. For why should education prepare young people to "perform work, under the direction and control of someone else, on an ongoing basis"? This certainly appears to be an expression of humans' power over one another. How is this related to education?

Education for employment

Education for employment has become an increasingly common purpose of education in the neoliberal era, especially since governments have chosen to use unemployment as a tool for combatting inflation (van Tol, in press). Education has then mistakenly been held responsible for the resultant rise in un- and underemployment,[5] as though unemployment were an educational problem, rather than a political economic one (van Tol, in press). As Sukarieh and Tannock (2015, p. 67) summarize:

> Overwhelmingly, the dominant response to rising youth unemployment world-wide has been to focus critical attention on the failures of the education system to meet the needs of corporate employers, and provide students with the particular skill set that employers wish to see when recruiting new employees.

Indeed, many national and subnational governments have educational policy objectives at the secondary school level aimed at employment. This includes Australia (Council of Australian Governments Education Council, 2019, pp. 6, 10, 14, et passim), Ontario (Ontario Ministry of Education, 2013, p. 23), British Columbia (British Columbia Government, 2020), New York (New York State Education Department, 2015), Texas (Texas Education Agency, 2020), the UK (UK Department for Education, 2017, pp. 23–25), and New Zealand (New Zealand Ministry of Education, 2020a, pp. 7, 9, et passim), amongst many others. This trend has spread to universities, too. For example, in the UK (Tomlinson, 2012; Tymon, 2013), Australia (Universities Australia, 2022), and the US (American Academy of Arts & Science, 2018), and extends throughout OECD countries (Gedye & Beaumont, 2018, p. 406).

In light of the foregoing criticism of employment, this prevalence of education for it is problematic. While so commonplace as to seem "normal," it is certainly at odds with the aim of education set by Wilhelm von Humboldt, the architect of the first mass compulsory school system in the world, in Prussia, and pioneer of the modern university system. As von Humboldt insisted: "Education as such…[is] henceforth to be decoupled from the idea of technical or vocational training. Its purpose [is] not to turn cobblers' boys into cobblers, but to turn 'children into people'" (Clark, 2007, pp. 331–332). Von Humboldt expected graduates from every level of Prussia's national system of education to exercise their then newly granted citizenship rights and responsibilities through active political participation (Clark, 2007, pp. 333–334). Unfortunately for von Humboldt, his Enlightenment ideals were co-opted by the Prussian government and the school system used, not for the development of free individuals amongst an active citizenry, but for the purposes of statecraft and maintaining class distinctions amongst the population (Alves, 2019, pp. 10–12).

By the end of the nineteenth century many European states had followed suit and adopted a national system of education: Hungary in 1868, Austria in 1869, Switzerland in 1874, Italy in 1877, Holland in 1878, Belgium in 1879, Britain in 1880, and France in 1882 (Yunkaporta, 2019, p. 142). In the United States compulsory education laws were passed in various states beginning with Massachusetts in 1852, followed by Vermont in 1867, Michigan and New Hampshire in 1871, Connecticut in 1872, New York in 1874, Maine in 1875, Ohio in 1877, Wisconsin in 1879, and the rest of the states in the North and West by the end of the nineteenth century with the exception of Iowa, which adopted it in 1902 (Neem, 2017, pp. 178, Table 173). Each of the six Australian colonies adopted a state-wide system of public education in the 1870s (Keating, 2011, p. 210). What so readily drove the implementation of these systems of mass compulsory education?

The development of industrial capitalism in the nineteenth century precipitated the rise of employment and wage labor, the severance between work and home, and the concomitant parental daytime absence and disruption of family life (Sukarieh & Tannock, 2015, pp. 48–49; Yunkaporta, 2019, p. 139). These industrial capitalist-induced social and geographical dislocations led to the proliferation of idle, unsupervised, and unemployed urban youth, who frequently formed "roving street 'gangs'" (Sukarieh & Tannock, 2015, p. 50) and who middle-class reformers perceived as a threat to the social order. The development of mass, compulsory schooling was thus the foremost means of addressing this problem (Sukarieh & Tannock, 2015, pp. 49–51). But what, then, was, and should be, the purpose of education? Should it be to prepare young people for employment, to "perform work, under the direction and control of their employer, on an ongoing basis," or following von Humboldt, should it be to prepare young people for active citizenship and political participation?

The groundwork has been set to propose a social ecological model of education. So that the model includes a solution to our social ecological crisis that environmental and sustainability educators can utilize, I end this section with a brief overview of citizenship education.

Citizenship education

In parallel with the foregoing economic-induced educational developments, the concept of citizenship underwent radical transformation in the wake of the French Revolution (Wallerstein, 2011, ch. 4), and was then transmitted to the rest of Europe and eventually the world through the Napoleonic Wars (Woolf, 1989, p. 101, 1992, pp. 92–98). Then, for the first time in history, citizenship was extended to all people of France, converting them from royalist subjects to citizens of the new republic. This abrupt transition to universal citizenship would mean enfranchising the entire population and caused an immediate backlash to limit the scope of who would be included as part of "the people" of the new nation since "[t]oo many people were citizens. The results could be dangerous" (Wallerstein, 2011, p. 144). This was done by distinguishing between active and passive citizens: while passive citizens were to enjoy their civil rights, including their liberty and personal protection, only active citizens would participate in political decision-making, excluding workers, amongst other disenfranchized groups, from voting. The justification for this exclusion had to do with "independence of judgment" (Wallerstein, 2011, p. 145n2), whereby it was argued that passive citizens would be better represented in parliament by those upon whom they depended: meaning employers in the case of employees. The full rights of active citizenship were to be judged by the possession of property: only those who owned property could have the "independence of judgment" needed to make responsible political, and their closely affined economic decisions.

The property qualification for active citizenship and political participation became a central feature of nineteenth century liberalism (Clark, 2007, p. 334; Wallerstein, 2011, pp. 145, 154, 166). With regard to the liberals' views of citizenship education:

> they extolled the educated individual as the model citizen and the specialist as the only person who could wisely determine the details of social and political decisions. They argued that all others should slowly be admitted to full citizens' rights when their education had become sufficient to enable them to make balanced choices. (Wallerstein, 2006, p. 52)

School then became a conduit for distinguishing between those who would become a hard-working, money-saving, then property-owning, active citizen, and who would continue to languish as an employee and passive citizen. For this latter class

> obsession with the education of the poor is best understood as a concern about authority, about power, about the assertion…of control…. Expressed in an enormously ambitious attempt to determine, through the capture of educational means, the patterns of thought, sentiment and behaviour of the working class.… the school was to raise a new race of working people – respectful, cheerful, hard-working, loyal, patriotic, and religious. (as cited in Wallerstein, 2011, p. 138n183)

While the argument in this section has rested on policy and historical analyses, there is substantial empirical evidence from the field of psychology that suggests that these two purposes of education, for employment and for citizenship, are in tension (see Appendix E). This tension between education for employment and (active) citizenship education is a point to which I return below. What follows draws together everything hitherto, combining them to form a social ecological model of education.

A social ecological model of education

I have argued for two distinct interpretations of the two halves of Bookchin's social ecological principle: humans' power over nature expressed through our dedication to economic growth and its tension with ecological sustainability; while humans' power over one another is expressed through education's increasing tendency in the neoliberal era to prepare young people for employment. Bookchin used the phrase "stems from" to relate these social and ecological expressions of power: humans' power over nature stems from humans' power over one another. That is the theory, how is it expressed in practice?

Keynesian economics and the neoclassical synthesis

Macroeconomics—the study of the economy in the aggregate—began with Keynes' (2009) publication of *The General Theory of Employment, Interest and Money* (Samuelson & Nordhaus, 2010, p. 368), which he wrote during the great depression with the aim of alleviating the then high rates of unemployment. The principal importance of Keynes' work was the recommendation of government spending to increase economic growth, and as businesses expand, employment opportunities thereby (Keynes, 2009, p. 3). Following World War II governments followed Keynes' advice, with the third quarter of the twentieth century witnessing the highest rates of economic growth ever in human history (Piketty, 2017, p. 120). As a result of Keynesian pro-growth policies, very low unemployment rates, qualifying as full employment, extended throughout Western nations during this period (Hobsbawm, 1994, pp. 328, 329; Mitchell & Fazi, 2017, p. 17). Since the 1970s however, mainstream economics has abandoned a purist Keynesian approach and adopted instead the neoclassical school of economics. The emphasis on growth has remained nonetheless through the "neoclassical synthesis," referring to the hybridization of Keynes' emphasis on growth, with a more "free-market" approach to economic policy which permits high rates of unemployment (Mitchell et al., 2019, pp. 432–442).

The "jobs and growth" mantra is still commonplace today. The goal is to use economic growth as a means to provide for employment opportunities (e.g., SDG 8: decent work and economic growth (United Nations, n.d.). In other words, the end is employment (humans' power over one another), and the means is economic growth (humans' power over nature), with education for employment becoming increasingly prominent due to the deliberate unemployment policies of the neoliberal era mentioned above. These relationships form a social ecological model of education, shown in Figure 3.

Citizenship education and ecological sustainability

While Figure 3 suggests education for employment is contributing to our social ecological problems, an alternative purpose of education may alleviate them. Recall von Humboldt's original aim for education:

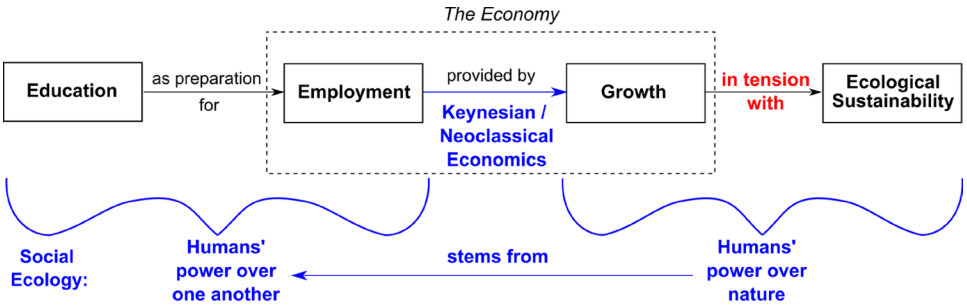

Figure 3. A social ecological model of education. Concepts and relations are shown in black. Theoretical framework is shown in blue. Tension is shown in red.

to prepare young people to become active citizens who participate in decision-making processes of society, often expressed in educational policy today as working for or contributing to the common, or public good (Council of Australian Governments Education Council, 2019, p. 8; Government of Ontario, 2023, section C1; New York State Education Department, 2023, Civic Skills & Action section, para. 8, et passim; New Zealand Ministry of Education, 2020b, pp. 42, 43, 44; UK Department for Education, 2013, p. 2). This mode of working freely for the common good is radically different from that of employment (i.e., working for a wage under the direction and control of someone else), and thus education in preparation for one will tend to occur at the expense of the other, producing a second tension in the model. Of special importance is the way citizenship education may democratize the decision-making power over growth, and thus act as the means for imposing the limitations on throughput required for the goal of ecological sustainability outlined above. This expanded social ecological model of education is shown in Figure 4.

Discussion

The model developed above is economical in two senses. First, in line with the introductory remarks about the economy's dominance, it places economic concepts, specifically growth and employment, at the center of analysis; these, along with inflation, are the core concepts of macroeconomics (Mitchell et al., 2019, p. 12). And second, the model is "efficient" in the sense that it aims for the greatest explanation with the fewest concepts; no doubt others could be introduced to expand the model's explanatory power, but I leave that for future research possibilities.

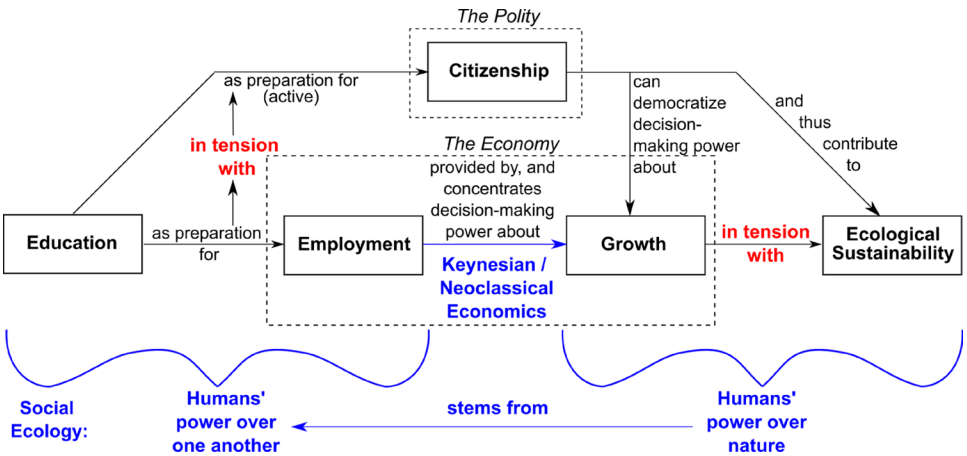

Figure 4. An expanded social ecological model of education, showing a tension between purposes of education, suggesting a means for alleviating the social ecological crisis, and contributing to ecological sustainability.

Nothing in the model developed should be interpreted as an argument for economic determinism. The point is that employees, in their capacity as employees, do not have control over the scale of economic operations, or in other words over humans' power over nature. That decision is made by employers. Thus, education for employment tends to restrict economic decision-making power. Yet other forms of decision-making power, especially in the political sphere, provide spaces for individual and collective agency, a point long argued by Apple (1995, 2013). This anticipates the importance of citizenship education.

As argued, the tension between active citizenship education and education for employment is as old as modern systems of mass compulsory education themselves. To reduce this tension, elsewhere I have argued for a return to full employment through a Job Guarantee (van Tol, in press). That this might contribute to the goal of ecological sustainability as defined above seems plausible, with recent history supporting the supposition that full employment potentiates active citizenship (van Tol, in press). Resolving the social tension between these two opposing purposes of education by this method is politically pragmatic, has no need to propose revolutionary means (cf. Bowles & Gintis, 1976, ch. 11), and in light of contemporary history could even be considered conservative: as mentioned above, every Western government pursued full employment successfully following World War II until the onset of neoliberalism in the 1970s.

As for ensuring that active citizenship education is informed by the relevant scientific knowledge of energy limits, consider first a common example of sustainability in schools: recycling. While no doubt important, recycling, like any physical process, requires energy. And while the earth's biogeochemical cycles are driven by natural, renewable sources of energy, modern industrial recycling requires enormous amounts of labor and nonrenewable energy (Cullen, 2017, p. 483; Daly & Farley, 2011, pp. 39, 84; Smil, 2014, pp. 111–117), further expanding humans' energy use. To improve upon the micro-level interpretation of sustainability as recycling, to one based more on systems thinking (Meadows, 2008), I have outlined an approach to high school geography which joins the concerns for active citizenship education to the relevant knowledge of geography, physics, ecology, and economics that high school geography teachers and environmental and sustainability educators may find useful (van Tol, 2020).[6]

At a minimum, high school science and environmental and sustainability education should emphasize that: (1) energy underpins all real processes, and (2) the energy available is limited, and therefore humans' use of resources, howsoever conceived, is also limited (see Appendix C). Made effective, the citizenry may learn to question the commonplace policy of endless economic growth, which in turn will open up the question of how big the economy should be to achieve ecological sustainability, and the closely related question of how much of the economy's output each citizen should receive. These are big questions with no simple answers, but at the moment both are avoided by the relentless pursuit of economic growth (Daly & Farley, 2011, p. 301); no ecologically sustainable limit is being seriously and systematically discussed by politicians, and the question of distribution is thereby avoided: so long as the economy is growing, so the argument goes, there will be more for everyone, however disproportionately. Should these questions become prevalent, in education, culture, and politics, the decision-making processes for settling them would, at least in a democracy, involve an active citizenry. For details of policies that an active citizenry could pursue to achieve the goals of ecological sustainability and fair distribution, see Daly and Farley (2011, ch.s 22, 23).

The question of what exactly the sustainable limit to throughput is, and how it should be measured and put into practice, is complex and has no simple answer that can be applied to all spatial and temporal scales. However, one easily identifiable and policy-friendly metric depends on land use; proposals for limiting humans' land use to half, with the other half left to nature, has been proposed (https://natureneedshalf.org/), though admittedly, this raises the thorny question of which half humans will use: prime agricultural land and forests, or deserts and arctic tundra?

In the introduction I committed to providing local and personal examples of what has hitherto been mostly an impersonal, global account of the social ecology of education. How can teachers and students in their own, lived communities, contribute to ecological sustainability through active citizenship, as suggested by the social ecological model of education developed above? One way might begin by posing a simple question: Is our community sustainable? A skilled teacher might lead such a discussion and link it to some of the issues raised by the model: Is the community growing, quantitatively, either by

population, or by economic activity? If not, there may be a desire, or even need, to grow for the benefit of the community, and ecological economists roundly acknowledge this possibility; rather the concern is about growth *in the aggregate* (Daly & Farley, 2011). Here the relationship between the local and global becomes acute: a community may be sustained locally, but, for example, still rendered unsustainable by climate change. This could lead naturally to a discussion of the history of citizenship: what in the middle ages and early modern period was membership (for those who were citizens at all) in a local, urban community, became expanded and centralized with and through the growth of the modern state (Prak, 2018). Whether this radical change in the nature of citizenship might be considered good because it has been expanded, or bad because it has become nationalized, a teacher could use this example to draw attention to the present nature of citizenship and the need to impose limits on throughput growth collectively, just as the model suggests, for the benefit of not only the students' local community, but the entire nation, and indeed world. The School Strike for Climate movement (Fridays for Future, 2021) is one such example that could be construed as active citizenship and the need to join local actions with broader national, and international causes.

To provide a personal example, How can critical self-analysis, at both an individual and collective level, contribute to active citizenship and ecological sustainability as endorsed by the model above? Perhaps a courageous educator, at least in a developed country, could lead by acknowledging their disproportionately high use of resources, and asking students to consider what amount they think would be fair. This could lead to an exploration of, for example, what sort of lifestyle would be needed to bring the average person's consumption into line with what is ecologically sustainable at a global level, here again, connecting the local to the global. I tried this with an undergraduate class using an ecological footprint metric (Wackernagel & Yount, 1998), whereupon the class discovered that all of us were using much more than our fair share. It was a humbling experience, especially when I showed the class a miniature documentary I had made of a friend's ecological footprint, demonstrating how he was just managing to live within his fair share of what is sustainable.[7]

These examples of interpersonal relationships in an educational context could induct students to a social ecology which is at once their own, personal and localized, but that is also shared beyond their community, with others living at great distances, but who nevertheless have shared goals, values, and needs. Of course these examples should be understood simply as suggestions; they are not meant to be prototypes for active citizenship and ecological sustainability.

Above I cited in passing some existing civics and citizenship educational policy aimed at the common, or public good, but the question is, how effective are they, especially in contrast to the goal of employment preparation? While there are recent examples of young people carrying out their active citizenship responsibilities (e.g., Chile's Penguin Revolution (Chovanec & Benitez, 2008)), and the one just cited above as an attempt to impose some limitations on throughput (e.g., School Strike for Climate (Fridays for Future, 2021)), young people appear to be doing this in spite, rather than because of, their education. Large-scale studies suggest that young people believe that an open classroom climate that encourages students to express their views freely stands out as the most important factor contributing to young people's civics and citizenship outcomes, including students' perceptions of the importance of conventional citizenship, social movements, and trust in civic institutions (Barber & Ross, 2020; Blaskó et al., 2019, p. 375). Yet in contrast, they view schools as anti-democratic, closed spaces with rigid hierarchies of teachers and principals where students are taught obedience and deprived of contributing to decision-making (Bramwell, 2020, pp. 107–108), and most have no experience in taking part in decision-making about how their schools are run, nor in discussions at student assemblies (Cosgrove & Gilleece, 2012, p. 385). Thus, whether education for active citizenship is sufficient, especially in comparison to that for employment where they will "perform work, under the direction and control of someone else," is doubtful.

Meanwhile, policy promotion of economic growth and increases in throughput causing ecological degradation continue. The earth is finite and such growth will stop, the question is only a matter of when and how: will it occur through the earth's natural limitations, of which biodiversity loss, climate change, and other ecological aberrations are expressions? Or will it occur through the deliberate imposition of limits on throughput as described above? The first of these possibilities has ample precedent (Diamond, 2006); and while natural limitations were contributing to the decline and fall of the Roman empire (Gibbon, 1970, pp. 702–704), its school system continued to function as normal, dutifully imparting

rhetoric (Lucas, 1972, p. 123). The social ecological model of education presented in this article raises the possibility of generating the *collective* imposition of limits on throughput *via* active citizenship education. This collective imposition of limits is contrary to neoliberal doctrine, with its ostensible emphasis on individual freedom (free trade, a free market, etc.) (Harvey, 2007, p. 2), yet is the only one that matters: if you limit your resource use to a sustainable rate while everyone else does the opposite, the aggregate limitations needed for ecological sustainability will not be achieved.

Conclusion

This article has developed a novel, social ecological model of education, which may assist environmental and sustainability educators to work toward the goal of environmental education: "[t]o develop a world population that is aware of…the environment and its associated problems, and which…work[s] individually and collectively toward solutions" (UNESCO & UNEP, 1975, p. 3). In particular, the model developed adheres to environmental education's guiding principles 3 and 4: that it "should be interdisciplinary in approach" and "should emphasise active participation in preventing and solving environmental problems" (UNESCO & UNEP, 1975, p. 4). The model is not a blueprint for overcoming our social ecological crisis, but it does suggest a means forward: for an institution that engages a quarter of the human population with the purpose of preparing young people for wider participation in society upon graduation, it seems reasonable to suggest that active citizenship education should play a greater role, especially in relation to the increasingly commonplace goal of education for employment, for which young people are prepared to "perform work, under the direction and control of someone else." Active citizenship education is needed now for the collective imposition of limits on throughput to address our unprecedented environmental problems and to achieve ecological sustainability.

Notes

1. Worth noting is that mainstream economics also tends to avoid the issue of power (Fix, 2021).
2. The joule is the standard scientific unit for energy.
3. See Daly (2014, pp. 70–71) for a critical evaluation of extraterrestrial growth.
4. See Appendix C for an elaboration of these technicalities.
5. The underemployed are those that have work and want more, but cannot find it (Mitchell et al., 2019, p. 74).
6. While van Tol (2020) is aimed at high school geography teachers, the principles and perspective should be easily transferrable to other educational contexts.
7. The documentary and the ecological footprint quiz I used can be found by scrolling down to Ecological Sustainability at: https://jasonvantol.com/social-sciences/
8. Worth noting is that Aboriginal peoples' 'literally pure democracy' and land management practices sustained the Australian continent for at least 65,000 years (Clarkson et al., 2017). See Yunkaporta (2019, esp. pp. 202, 223–224) for an explanation of how the equitable distribution of power made this possible.

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References

Alves, A. (2019). The German tradition of self-cultivation (bildung) and its historical meaning. *Educação & Realidade*, *44*(2), 1–18. https://doi.org/10.1590/2175-623683003

American Academy of Arts & Science. (2018). *The state of the humanities 2018: Graduates in the workforce & beyond*. https://www.aau.edu/key-issues/humanities-grads-gainfully-employed-and-happy
Apple, M. W. (1995). *Education and power* (2nd ed.). Routledge.
Apple, M. W. (2013). *Knowledge, power, and education: The selected works of Michael W.* Apple. Routledge.
Australian Government Fair Work Ombudsman Fair Work Ombudsman. (2020). *Independent contractors and employees*. https://www.fairwork.gov.au/how-we-will-help/templates-and-guides/fact-sheets/rights-and-obligations/independent-contractors-and-employees
Australian Government Treasury. (2022). *Annual report 2021-22*. https://treasury.gov.au/publication/p2022-329943
Ayres, R. (2016). *Energy, complexity and wealth maximization*. Springer.
Bakunin, M. (1984). *Marxism, freedom and the state* (K. J. Kenafick, Ed.). Freedom Press.
Bank of Japan. (2022). *Japan's economy and monetary policy: Speech at a meeting with local leaders in Iwate*. https://www.boj.or.jp/en/about/press/koen_2022/data/ko220728a1.pdf
Barber, C., & Ross, J. (2020). Profiles of adolescents' civic attitudes in sixteen countries: Examining cross-cohort changes from 1999 to 2009. *Research in Comparative and International Education*, *15*(2), 79–96. https://ezproxy.scu.edu.au/login?url= https://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ1256421&site=ehost-live https://doi.org/10.1177/1745499920910583
Blaskó, Z., da Costa, P. D., & Vera-Toscano, E. (2019). Non-cognitive civic outcomes: How can education contribute? European evidence from the ICCS 2016 study. *International Journal of Educational Research*, *98*, 366–378. https://doi.org/10.1016/j.ijer.2019.07.005
Bookchin, M. (1974). *The limits of the city*. Harper & Row. https://theanarchistlibrary.org/library/murray-bookchin-the-limits-of-the-city
Bookchin, M. (1982). *The ecology of freedom: The emergence and dissolution of hierarchy* https://theanarchistlibrary.org/library/murray-bookchin-the-ecology-of-freedom.pdf
Bookchin, M. (1986). *Post-scarcity anarchism* (2nd ed.). Black Rose Books.
Bookchin, M. (1987). *The modern crisis*. Black Rose Books.
Bookchin, M. (1994a). *The philosophy of social ecology* (2nd ed.). Black Rose Books.
Bookchin, M. (1994b). *Which way for the ecology movement?* AK Press.
Bookchin, M. (2006). *Social ecology and communalism* (E. Eiglad, Ed.). AK Press.
Bookchin, M. (2015). *Libertarian municipalism: An overview*. Institute for social ecology. https://social-ecology.org/wp/1991/04/libertarian-municipalism-an-overview/
Bowles, S., & Gintis, H. (1976). *Schooling in capitalist America: Educational reform and the contradictions of economic life*. Routledge & Kegan Paul.
Bramwell, D. (2020). Systematic review of empirical studies on citizenship education in Latin America 2000 to 2017 and research agenda proposal. *Citizenship, Social and Economics Education*, *19*(2), 100–117. https://ezproxy.scu.edu.au/login?url= https://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ1261002&site=ehost-live https://doi.org/10.1177/2047173420922506
British Columbia Government. (2020). *Career development policy*. British Columbia Government. https://www2.gov.bc.ca/gov/content/education-training/k-12/administration/legislation-policy/public-schools/career-development
Brown, T., Jeanes, R., & Cutter-Mackenzie, A. (2014). Social ecology as education. In B. Wattchow, R. Jeanes, L. Alfrey, T. Brown, A. Cutter-Mackenzie, & J. O'Connor (Eds.), *The socioecological educator: A 21st century renewal of physical, health, environment and outdoor education* (pp. 23–45). Springer.
Caruso, E. M., Vohs, K. D., Baxter, B., & Waytz, A. (2013). Mere exposure to money increases endorsement of free-market systems and social inequality. *Journal of Experimental Psychology. General*, *142*(2), 301–306. https://doi.org/10.1037/a0029288
Chomsky, N., & McGilvray, J. (2012). *The science of language*. Cambridge University Press.
Chovanec, D., & Benitez, A. (2008). The Penguin revolution in Chile: Exploring intergenerational learning in social movements. *Journal of Contemporary Issues in Education*, *3*(1), 39–57. https://doi.org/10.20355/C5SG6J
Circle Economy. (2020). *The circularity gap report*, *2020*. https://www.circularity-gap.world/2020
Clark, C. (2007). *Iron kingdom: The rise and downfall of Prussia 1600-1947*. Penguin.
Clark, C. M. H. (1978). *A history of Australia IV: The earth Abideth for ever, 1851-1888*. Melbourne University Press.
Clarkson, C., Jacobs, Z., Marwick, B., Fullagar, R., Wallis, L., Smith, M., Roberts, R. G., Hayes, E., Lowe, K., Carah, X., Florin, S. A., McNeil, J., Cox, D., Arnold, L. J., Hua, Q., Huntley, J., Brand, H. E. A., Manne, T., Fairbairn, A., … Pardoe, C. (2017). Human occupation of northern Australia by 65,000 years ago. *Nature*, *547*(7663), 306–310. https://doi.org/10.1038/nature22968
Cosgrove, J., & Gilleece, L. (2012). An international perspective on civic participation in Irish post-primary schools: Results from ICCS. *Irish Educational Studies*, *31*(4), 377–395. https://doi.org/10.1080/03323315.2012.664948
Council of Australian Governments Education Council. (2019). *Alice Springs (Mparntwe) education declaration.* https://www.education.gov.au/alice-springs-mparntwe-education-declaration
Council of Australian Museum Directors. (2021). *Conviction politics: How convicts shaped Australian democracy*. https://camd.org.au/conviction-politics-how-convicts-shaped-australian-democracy/
Cullen, J. M. (2017). Circular economy: Theoretical benchmark or perpetual motion machine? *Journal of Industrial Ecology*, *21*(3), 483–486. https://doi.org/10.1111/jiec.12599

Cutter-Mackenzie-Knowles, A., Lasczik, A., Wilks, J., Logan, M., Turner, A., & Boyd, W. (2020). (Eds.) *Touchstones for deterritorialising socioecological learning: The anthropocene, posthumanism and common worlds as creative milieux*. Palgrave MacMillan.

Daly, H. E. (1993a). The steady-state economy: Toward a political economy of biophysical equilibrium and moral growth. In H. E. Daly & K. N. Townsend (Eds.), *Valuing the earth: Economics, ecology, ethics* (pp. 325–363). MIT Press.

Daly, H. E. (1993b). Sustainable growth: An impossibility theorem. In H. E. Daly & K. N. Townsend (Eds.), *Valuing the earth: Economics, ecology, ethics* (pp. 267–273). MIT Press.

Daly, H. E. (1997). *Beyond growth: The economics of sustainable development*. Beacon Press. https://books.google.com/books?id=UV-TAAAAIAAJ

Daly, H. E. (2014). *From uneconomic growth to a steady-state economy*. Edward Elgar.

Daly, H. E. (2015). *Economics for a full world*. Retrieved January 28, 2020, from https://greattransition.org/publication/economics-for-a-full-world

Daly, H. E., & Farley, J. (2011). *Ecological economics: Principles and applications* (2nd ed.). Island Press.

Department of Finance Canada. (2022). *2022 Budget: A plan to grow our economy and make life more affordable*. https://www.budget.canada.ca/2022/home-accueil-en.html

Department of the Treasury. (2022). *Strategic plan 2022–2026*. https://home.treasury.gov/about/budget-financial-reporting-planning-and-performance/strategic-plan

Diamond, J. (2006). *Collapse: How societies choose to fail or survive*. Penguin.

Doherty, C., Luke, A., Shield, P., & Hincksman, C. (2012). Choosing your niche: The social ecology of the International Baccalaureate Diploma in Australia. *International Studies in Sociology of Education*, *22*(4), 311–332. https://doi.org/10.1080/09620214.2012.745346

Douglass, F. (1886). *Three addresses on the relations subsisting between the white and colored people of the United States*. Gibson Bros. https://archive.org/details/threeaddresseson00dougrich

European Central Bank. (2023). *Economic policy*. https://www.ecb.europa.eu/mopo/eaec/ecopolicy/html/index.en.html

Fix, B. (2021). *Power: Don't mention it*. https://www.themintmagazine.com/power-dont-mention-it/

Frank, D. (2017). *Socioecological education: Faculty knowledge, beliefs, values, and practice in post-secondary outdoor education*. University of Minnesota.

Fridays for Future. (2021). Fridays for Future. https://fridaysforfuture.org/what-we-do/strike-statistics/list-of-countries/

Gasiorowska, A., Chaplin, L. N., Zaleskiewicz, T., Wygrab, S., & Vohs, K. D. (2016). Money cues increase agency and decrease prosociality among children: Early signs of market-mode behaviors. *Psychological Science*, *27*(3), 331–344. https://doi.org/10.1177/0956797615620378

Gedye, S., & Beaumont, E. (2018). "The ability to get a job": Student understandings and definitions of employability. *Education + Training*, *60*(5), 406–420. https://doi.org/10.1108/ET-10-2017-0159

Georgescu-Roegen, N. (1971). *The entropy law and the economic process*. Harvard University Press.

Gibbon, E. (1970). *The decline and fall of the Roman empire, abridged* (F. C. Bourne & Laurel, Eds.). Dell.

Government of Ontario. (2023). *Civics and citizenship: Overview*. Retrieved May 9, 2023, from https://www.dcp.edu.gov.on.ca/en/curriculum/canadian-and-world-studies/courses/chv2o/overview

Graeber, D. (2014). *Debt: The first 5,000 years*. Melville House.

Hall, C. A. S. (2022). The 50th anniversary of the limits to growth: Does it have relevance for today's energy issues? *Energies*, *15*(14), 4953. https://www.mdpi.com/1996-1073/15/14/4953 https://doi.org/10.3390/en15144953

Hall, C. A. S., & Klitgaard, K. (2018). *Energy and the wealth of nations: An introduction to biophysical economics* (2nd ed.). Springer.

Harvey, D. (2007). *A brief history of neoliberalism*. Oxford University Press.

Henare-Solomona, R. (2021). Transformative Learning through Maori Migration to Australia. In D. Wright & S. B. Hill (Eds.), *Social ecology and education: Transforming worldviews and practices* (pp. 121–130) Routledge.

Henderson, D. X., Baxter, S., Gordon-Littréan, B., Flemmings, J. B., & Edwards, C. (2023). 'Push through everything': Using phenomenological inquiry to investigate how Black males' socioecology and identities promote perseverance in the U.S. public education system. *Race Ethnicity and Education*, *26*(5), 602–622. https://doi.org/10.1080/13613324.2020.1798383

Higgs, K. (2021). A brief history of the limits to growth debate. In S. J. Williams & R. Taylor (Eds.), *Sustainability and the new economics: Synthesising ecological economics and modern monetary theory*. Springer.

Hill, S. B. (2011). Social ecology: An Australian perspective. In D. Wright, C. Camden-Pratt, & H. Stuart (Eds.), *Social ecology: Applying ecological understanding to our lives and our planet* (pp. 17–30). Hawthorn Press.

Hill, S. B. (2021). Transformative learning priorities. In D. Wright & S. B. Hill (Eds.), *Social ecology and education: Transforming worldviews and practices* (pp. 28–40). Routledge.

HM Treasury. (2022). *Policy paper: The growth plan 2022*. https://www.gov.uk/government/publications/the-growth-plan-2022-documents/the-growth-plan-2022-html

Hobsbawm, E. (1994). *Age of extremes: The short twentieth century, 1914-1991*. Abacus.

Holohan, K. J. (2018). Social ecology as an ethical foundation for ecological and community-based education. *Issues in Teacher Education*, *27*(2), 68–82.

Holohan, K. J. (2023). Bringing the social and ecological into teacher education: Place-conscious teacher education for cultivating community well-being. In J. Lupinacci, R. Turner, & A. Happel-Parkins (Eds.), *Ecocritical perspectives in teacher education* (pp. 116–137). Brill Publishers.

Internal Revenue Service. (2020). *Employee (common-law employee)*. https://www.irs.gov/businesses/small-businesses-self-employed/employee-common-law-employee
International Energy Agency. (2021). *World energy balances highlights* (2021 Edition). https://www.iea.org/data-and-statistics/data-product/world-energy-balances#data-sets
IPBES. (2019). *Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. https://ipbes.net/sites/default/files/2020-02/ipbes_global_assessment_report_summary_for_policymakers_en.pdf
IPCC. (2021). *Climate change 2021: The physical science basis. Contribution of working Group I to the sixth assessment report of the intergovernmental panel on climate change*. C. U. Press. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report.pdf
Keating, J. (2011). Education policy and social inclusion. In A. McClelland & P. Smyth (Eds.), *Social policy in Australia* (pp. 210–223). Oxford University Press.
Keynes, J. M. (2009). *The general theory of employment, interest and money*. Classic Books America. (Original work published 1936)
Krausmann, F., Erb, K.-H., Gingrich, S., Haberl, H., Bondeau, A., Gaube, V., Lauk, C., Plutzar, C., & Searchinger, T. D. (2013). Global human appropriation of net primary production doubled in the 20th century. *Proceedings of the National Academy of Sciences of the United States of America*, *110*(25), 10324–10329. https://doi.org/10.1073/pnas.1211349110
Laherrère, J., Hall, C. A. S., & Bentley, R. (2022). How much oil remains for the world to produce? Comparing assessment methods, and separating fact from fiction. *Current Research in Environmental Sustainability*, *4*, 100174. https://doi.org/10.1016/j.crsust.2022.100174
Lenzen, M., Geschke, A., West, J., Fry, J., Malik, A., Giljum, S., Milà I Canals, L., Piñero, P., Lutter, S., Wiedmann, T., Li, M., Sevenster, M., Potočnik, J., Teixeira, I., Van Voore, M., Nansai, K., & Schandl, H. (2021). Implementing the material footprint to measure progress towards Sustainable Development Goals 8 and 12. *Nature Sustainability*, *5*(2), 157–166. https://doi.org/10.1038/s41893-021-00811-6
Limits to growth? It's time to end a 50-year argument. (2022). *Nature*, *603*, 361. https://doi.org/10.1038/d41586-022-00723-1
Lucas, C. J. (1972). *Our western educational heritage*. Macmillan.
Luxemburg, R. (2008). Reform or Revolution. In H. Scott (Ed.), *The essential Rosa Luxemburg*. Haymarket Books. (Original work published 1899)
Marx, K., & Engels, F. (2010). *The communist manifesto*. Vintage Classics. (Original work published 1848)
McLean, I., & McMillan, A. (Eds.). (2009). *The concise Oxford dictionary of politics* (3rd ed.). Oxford University Press.
McNeill, J. (2020). Afterword: Green shoots in the shadow. In A. Cutter-Mackenzie-Knowles, A. Lasczik, J. Wilks, M. Logan, A. Turner, & W. Boyd (Eds.), *Touchstones for deterritorialising socioecological learning: The anthropocene, post-humanism and common worlds as creative milieux* (pp. 275–279). Palgrave Macmillan.
Meadows, D. H. (2008). *Thinking in systems: A primer*. Chelsea Green Publishing.
Meadows, D. H., Meadows, D. L., Randers, J., & Behrens, W. W. I. (1972). *The limits to growth: A report for the club of Rome's project on the predicament of mankind*. Universe Books.
Mitchell, W., & Fazi, T. (2017). *Reclaiming the state: A progressive vision of sovereignty for a post-neoliberal world*. Pluto Press.
Mitchell, W., Wray, L. R., & Watts, M. (2019). *Macroeconomics*. Red Globe Press.
Moore, S. (2022). Thirty years later, voters are still telling us it's about the economy stupid! *New York Post*. https://nypost.com/2022/10/24/thirty-years-later-voters-are-still-telling-us-its-about-the-economy-stupid/
Moore, T. (2010). *Death or liberty: Rebels and radicals transported to Australia, 1788-1868*. Pier 9.
Moran, M. J., & Shapiro, H. N. (1996). *Fundamentals of engineering thermodynamics* (3rd ed.). John Wiley & Sons.
Neem, J. N. (2017). *Democracy's schools: The rise of public education in America*. Johns Hopkins University Press.
New York State Education Department. (2015). *100.2 General school requirements*. New York State Education Department. Retrieved October 5, 2020, from http://www.p12.nysed.gov/part100/pages/1002.html#h
New York State Education Department. (2023). *Civic readiness initiative*. Retrieved May 9, 2023, from https://www.nysed.gov/curriculum-instruction/civic-readiness-initiative
New Zealand Ministry of Education. (2020a). *Action plan for Pacific education 2020–2030*. https://conversation.education.govt.nz/conversations/action-plan-for-pacific-education/
New Zealand Ministry of Education. (2020b). *Civics and citizenship education*. https://sltk-resources.tki.org.nz/curriculum-resources/
Niemann, Y. F. (2016). The social ecology of tokenism in higher education. *Peace Review*, *28*(4), 451–458. https://doi.org/10.1080/10402659.2016.1237098
O'Connor, J., Jeanes, R., Alfrey, L., & Wattchow, B. (2014). Becoming a socio-ecological educator. In B. Wattchow, R. Jeanes, L. Alfrey, C. Brown, A. Cutter-Mackenzie, & J. O'Connor (Eds.), *The socioecological educator: A 21st century renewal of physical, health, environment and outdoor education* (pp. 47–68). Springer.
Ontario Ministry of Education. (2013). *Creating pathways to success: An education and career/life planning program for Ontario schools*. Queen's Printer for Ontario. http://www.edu.gov.on.ca/eng/document/policy/cps/CreatingPathwaysSuccess.pdf
Parrique, T. (2019). *The political economy of degrowth* (Publication Number NNT: 2019CLFAD003). Université Clermont Auvergne & Stockholm University. https://www.researchgate.net/publication/339844751_The_Political_Economy_of_Degrowth

Parrique, T., Barth, J., Briens, F., Kerschner, C., Kraus-Polk, A., Kuokkanen, A., Spangenberg, J. H. (2019). *Decoupling debunked: Evidence and arguments against green growth as a sole strategy for sustainability*. E. E. Bureau. https://eeb.org/library/decoupling-debunked/

Payne, P. G. (2010). Moral spaces, the struggle for an intergenerational environmental ethics and the social ecology of families: An 'other' form of environmental education. *Environmental Education Research*, *16*(2), 209–231. https://doi.org/10.1080/13504620903580545

Piketty, T. (2017). *Capital in the twenty-first century* (A. Goldhammer, Trans.). The Belknap Press of Harvard Univesity Press.

Polanyi, K. (2001). *The great transformation: The political and economic origins of our time*. Beacon. (1944)

Prak, M. (2018). *Citizens without nations: Urban citizenship in Europe and the World, c.1000-1789*. Cambridge University Press.

Reynolds, H. (1990). *With the white people: The crucial role of Aborigines in the exploration and development of Australia*. Penguin.

Samuelson, P. A., & Nordhaus, W. D. (2010). *Economics* (19th ed.). McGraw-Hill Irwin.

Savani, K., Mead, N. L., Stillman, T., & Vohs, K. D. (2016). No match for money: Even in intimate relationships and collectivistic cultures, reminders of money weaken sociomoral responses. *Self and Identity*, *15*(3), 342–355. https://doi.org/10.1080/15298868.2015.1133451

Smil, V. (2014). *Making the modern world: Materials and dematerialization*. Wiley.

Smil, V. (2017). *Energy and civilization: A history*. MIT Press.

Smil, V. (2019). *Growth: From microorganisms to megacities*. MIT Press.

Standing, G. (2009). *Work after globalization: Building occupational citizenship*. Edward Elgar.

Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., Biggs, R., Carpenter, S. R., de Vries, W., de Wit, C. A., Folke, C., Gerten, D., Heinke, J., Mace, G. M., Persson, L. M., Ramanathan, V., Reyers, B., & Sörlin, S. (2015). Planetary boundaries: Guiding human development on a changing planet. *Science*, *347*(6223), 1259855. https://doi.org/10.1126/science.1259855

Sukarieh, M., & Tannock, S. (2015). *Youth rising? The politics of youth in the global economy*. Routledge.

Texas Education Agency. (2020). *19 Texas Administrative Code (TAC) Part II: Texas education agency*. Texas Education Agency. http://ritter.tea.state.tx.us/rules/tac/index.html

Tomlinson, M. (2012). Graduate employability: A review of conceptual and empirical themes. *Higher Education Policy*, *25*, 407–431.

Tymon, A. (2013). The student perspective on employability. *Studies in Higher Education*, *38*(6), 841–856. https://doi.org/10.1080/03075079.2011.604408

UK Department for Education. (2013). *Citizenship programmes of study: Key stages 3 and 4*. https://www.gov.uk/government/publications/national-curriculum-in-england-citizenship-programmes-of-study

UK Department for Education Department for Education. (2017). *Unlocking talent, fulfilling potential: A plan for improving social mobility through education*. https://www.gov.uk/government/publications/improving-social-mobility-through-education

UNESCO & UNEP. (1975). *The Belgrade Charter: A framework for environmental education*. UNESCO & UNEP.

United Nations (n.d.). *Sustainable Development Goals*. https://sustainabledevelopment.un.org/

Universities Australia. (2022). *Employer satisfaction with uni graduates reaches record levels*. Retrieved February 3, 2023 from https://www.universitiesaustralia.edu.au/media-item/employer-satisfaction-with-uni-graduates-reaches-record-levels/

van Tol, J. (2020). How big should the economy be? *Geography Bulletin*, *52*(1), 33–41.

van Tol, J. (in press). Education and full employment in the Capitalocene: Political possibilities, ecological imperatives. *The Journal of Environmental Education*, *55*(2). https://doi.org/10.1080/00958964.2023.2259838

Vohs, K. D. (2015). Money priming can change people's thoughts, feelings, motivations, and behaviors: An update on 10 years of experiments. *Journal of Experimental Psychology. General*, *144*(4), e86-93–e93. https://doi.org/10.1037/xge0000091

Vohs, K. D., Mead, N. L., & Goode, M. R. (2006). The psychological consequences of money. *Science*, *314*(5802), 1154–1156. https://doi.org/10.1126/science.1132491

Vohs, K. D., Mead, N. L., & Goode, M. R. (2008). Merely activating the concept of money changes personal and interpersonal behavior. *Current Directions in Psychological Science*, *17*(3), 208–212. https://doi.org/10.1111/j.1467-8721.2008.00576.x

von Humboldt, W. (1969). *The limits of state action* (J. W. Burrow, Ed.). Cambridge University Press.

Wackernagel, M., & Yount, J. D. (1998). The ecological footprint: An indicator of progress toward regional sustainability. *Environmental Monitoring and Assessment*, *51*(1/2), 511–529. https://doi.org/10.1023/A:1006094904277

Wallerstein, I. (1974). *The modern world-system I: Capitalist agriculture and the origins of the European world-economy in the sixteenth century*. Academic Press.

Wallerstein, I. (2006). *World-systems analysis: An introduction*. Duke University Press.

Wallerstein, I. (2011). *The modern world-system IV: Centrist liberalism triumphant, 1789-1914*. University of California Press.

Ward, J. D., Sutton, P. C., Werner, A. D., Costanza, R., Mohr, S. H., & Simmons, C. T. (2016). Is decoupling GDP growth from environmental impact possible? *PloS One*, *11*(10), e0164733. https://doi.org/10.1371/journal.pone.0164733

Wattchow, B., Brown, T., Jeanes, R., O'Connor, J., Cutter-Mackenzie, A., & Alfrey, L. (2014). Conclusions and future directions: A socio-ecological renewal. In B. Wattchow, R. Jeanes, L. Alfrey, T. Brown, A. Cutter-Mackenzie, & T. O'Connor (Eds.), *The socioecological educator: A 21st century renewal of physical, health, environment and outdoor education* (pp. 205–227). Springer.

Wattchow, B., Jeanes, R., Alfrey, L., Brown, T., Cutter-Mackenzie, A., & O'Connor, T. (Eds.). (2014). *The socioecological educator: A 21st century renewal of physical, health, environment and outdoor education*. Springer.
Wiedmann, T. O., Schandl, H., Lenzen, M., Moran, D., Suh, S., West, J., & Kanemoto, K. (2015). The material footprint of nations. *Proceedings of the National Academy of Sciences of the United States of America*, *112*(20), 6271–6276. https://doi.org/10.1073/pnas.1220362110
Woolf, S. (1989). French civilization and ethnicity in the Napoleonic empire. *Past and Present*, *124*(1), 96–120. https://doi.org/10.1093/past/124.1.96
Woolf, S. (1992). The construction of a European world-view in the revolutionary-Napoleonic years. *Past and Present*, *137*(1), 72–101. http://www.jstor.org.ezproxy.scu.edu.au/stable/650852 https://doi.org/10.1093/past/137.1.72
Wright, D., & Hill, S. B. (2011). Introduction: The emerging field of social ecology. In D. Wright, C. Camden-Pratt, & S. B. Hill (Eds.), *Social ecology: Applying ecological understanding to our lives and our planet* (pp. 1–13). Hawthorn.
Young, H. D., & Freedman, R. A. (1996). *University physics* (9th ed.). Addison-Wesley.
Yunkaporta, T. (2019). *Sand talk: How indigenous thinking can save the world*. Text Publishing.

Appendix A: Bookchin's social ecology

Bookchin's social ecological thesis was usually described using the term "domination," as in: humans' domination over nature stems from humans' domination over one another. Yet this terminology limited the range of meaning of the interaction between humans and nature, and weakened the argument that human activity is degrading natural environments and compromising the goal of ecological sustainability. As Bookchin stated:

> humans cannot "exploit" nature, owing to a "commanding" place in a supposed "hierarchy" of nature. Words like *commanding*, *exploitation*, and *hierarchy* are actually social terms that describe how people relate to each other; applied to the natural world, they are merely anthropomorphic. (Bookchin, 1994a, p. 23)

In other places he wrote that "the very *notion* of the domination of nature by man stems from the very *real* domination of human by human" (1982, p. 6, emphasis added), and in *Post-Scarcity Anarchism* he encouraged people to transcend quantitative analyses and the earth's biophysical limitations through the use of technology (Bookchin, 1986, p. 116). To overcome this difficulty and strengthen the argument, I reformulate Bookchin's thesis using the term "power," as in: humans' power over nature stems from humans' power over one another. This has the advantage of drawing together the two distinct, but related, meanings of power elaborated in the body of the article.

Appendix B: Population methods

These numbers are derived from the World Bank Development Indicators (https://databank.worldbank.org/source/world-development-indicators), which I retrieved on December 6, 2022. "Country" was set to World and "Time" to 2019—the most recent year for which data was available at the time of retrieval. For students, I summed the data from the Series SE.PRE.ENRL, SE.PRM.ENRL, SE.SEC.ENRL, and SE.TER.ENRL, which correspond to the number of students of both sexes enrolled in pre-primary, primary, secondary, and tertiary education respectively. This yielded a total of 1,784,787,654 students. Note that corresponding data for student attendance, which may be lower, was not available.

For teachers, I used the same Country and Time variables, and summed the data from the Series SE.PRE.TCHR, SE.PRM.TCHR, SE.SEC.TCHR, and SE.TER.TCHR, which correspond to the number of teachers of both sexes teaching in pre-primary, primary, secondary, and tertiary education respectively. This yielded a total of 93,870,951 teachers.

As for the claim that these combined numbers represent about a quarter of the global population, I used the United Nations' Department of Economic and Social Affairs' Population Division's dataset for Population by Single Age—Both Sexes, retrieved December 7, 2022 from https://population.un.org/wpp/Download/Standard/Population/. From this I summed the world populations of all ages for 2019, which produced a total of 7,764,951,000 people. Dividing the total number of teachers and students by this equals 0.2419, or about 24.19%, which is almost a quarter of the global population.

Appendix C: Natural limits and laws of thermodynamics

The concept of a limit plays a key role in this article, and one which I would like to develop more fully in future. While limits in the social realm may vary according to culture, custom, law, and morals, those in the natural (or physical) realm do not. Among these natural limits most utilized by ecological economics are the first and second laws of thermodynamics. These are explained in detail in any standard textbook on thermodynamics or physics; those sitting in front of me are Moran and Shapiro (1996) and Young and Freedman (1996). I summarize the aspects most important for my purposes below.

The first law of thermodynamics is a generalization of the principle of conservation of energy, which states that energy cannot be created or destroyed, only transferred or transformed from one type to another. Because of Einstein's well-known formula:

$$E = mc^2$$

(where E is the energy, m is the mass, and c is the speed of light), and the recognition that mass and energy are often interconvertible in nuclear reactions, the first law may also be extended to matter (mass), so that we can say that matter and energy are conserved together: their total cannot be created or destroyed. Important to note is that matter and energy are the foundations of physicists' ontology; everything that is held to exist must be composed of one, the other, or both. For our purposes this is important because it sets a limit on much "stuff" there is for humans and our artifacts, or in other words, on how big the economy can be (this ignores the possibility for extraterrestrial growth; but see footnote 3).

The second law of thermodynamics is more abstract, and can be expressed in different ways. Here I will simply say that it places a limit on the efficiency of energy transformations, ruling out the recycling of energy. Instead, the availability of energy to do work in an isolated system is always decreasing. For our earthly concerns this limits the amount of energy available to do work (which includes driving any natural process; work in this context should not be associated exclusively with human labor). The sun of course drives many biogeochemical processes on earth (the water cycle, the carbon cycle, the nitrogen cycle, etc.), but this incoming energy is itself limited. For more on the second law of thermodynamics in relation to economic growth and its limitations, see Georgescu-Roegen (1971); also Ayres (2016).

Appendix D: Brief history of employment

Standing (2009, p. 6) points out that in the nineteenth century being employed was virtually a badge of shame. It meant then, as it does now, a stable source of wage labor, with the shame deriving from the subordinated, disciplined role an employee has in the production process. Wage labor was thus generally considered akin to a form of slavery and was commonly referred to as such: opposition to wage slavery was a position of the Republican Party in the US at that time, it was Abraham Lincoln's position, and one could read about it in editorials in the *New York Times* (Chomsky & McGilvray, 2012, p. 119). Moreover, Frederik Douglass, who had lived as both a de facto chattel slave and a wage slave considered the difference between the two as negligible (Douglass, 1886, pp. 12–13).

Similar attitudes existed amongst both Aboriginal and white Australians at that time. About 3,600 of the 164,000 convicts sent to Australia were political prisoners (Council of Australian Museum Directors, 2021, The Forgotten Political Convicts section), many of whom were vying for workers' rights (Moore, 2010, p. 10). Following the Selection Act of 1862, class antagonisms flared since the land selector either rose to the ranks of capitalist or, as Clark (1978, p. 167) characterized it, sunk to "the class of hirelings for wages on the land." As for Aboriginal Australians, they outrightly rejected every inducement to work for wages, preferring their "love of erratic liberty" (Broughton 1836, as cited in Reynolds, 1990, p. 88) in a society which Symmons (1841) referred to as "a literally pure democracy" (as cited in Reynolds, 1990, p. 96; see pp. 87–97 for a fuller description of Aboriginal rejection of wage labor viewed as a form of subservience).[8]

However, ensuring the provision of a labor market is central to a capitalist economy (see Harvey, 2007, pp. 167–172 for a recent description under neoliberalism; Polanyi, 2001; Wallerstein, 1974, ch. 2, for a more long-term account), and Graeber (2014, p. 350) contends that capitalism has never been organized primarily around free labor. For all of these reasons many leading figures in the history of the labor movement sought to abolish employment and wage labor (e.g., Bakunin, 1984, pp. 33–34; Luxemburg, 2008, p. 41; Marx & Engels, 2010, p. 65). Their opposition rested on classical liberal arguments for freedom of expression through work; that to work freely was the only mode of labor befitting of a dignified human being. As von Humboldt (1969, p. 27) put it: "men who love their labor for its own sake, improve it by their own plastic genius and inventive skill, and thereby cultivate their intellect, ennoble their character, and exalt and refine their pleasures."

Appendix E: Psychological consequences of money

The basis of employment is wage labor, which by definition is denominated in terms of money. Reminders of money tend to atomize people and lead to anti-social behavior (Savani et al., 2016; Vohs et al., 2006), detracting from and in opposition to citizenship education, which by its nature is pro-social. Also, even subtle reminders of money motivate people to work harder and increase their workloads, compared to those who are not reminded of money (Vohs et al., 2008); such behaviors are naturally conducive to employment. Such effects extend beyond individual behaviors: mere reminders of money enhance people's justification for social systems that legitimize inequality, free-market capitalism, and beliefs that the powerful should dominate the disadvantaged (Caruso et al., 2013; Vohs, 2015), all of which is antithetical to the common good and pro-social behaviors encouraged through citizenship education, but which supports the system of wage labor and employer-employee relationships. These two opposing behaviors, referred to as "communal" and "market" respectively, are already demonstrated by children aged three to six, and money, the basis of wage labor and employment, cues them to shift toward market behaviors, and away from communal ones (Gasiorowska et al., 2016).