Youth Understandings of Economic Growth and Ecological Sustainability

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Youth Understandings of Economic Growth and Ecological Sustainability[1]

Economic growth has a lengthy history, and uncertain role, in environmental and sustainability education. It has been argued to be in conflict with ecological sustainability, yet young people's understandings of it have yet to be explored in a qualitative study. Twelve young people aged 18 to 24 were interviewed on their understandings of economic growth and ecological sustainability, and the results analyzed thematically based on a social ecological model of education, which is explained in the article. The results produced six themes for youth understandings of economic growth, including 'Increasing resource use', while that for ecological sustainability produced five themes, including 'Limiting resource use'. This particular combination of themes, defined as the 'Resource-use Conflict', has important pedagogical implications for environmental and sustainability educators, and arguments are made for why they should focus on it to achieve their objectives, especially in relation to the other themes that arose.

Keywords: economic growth; ecological sustainability; youth understanding; resource use; education for sustainability, social ecology

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Introduction

Environmental education was formally established in 1972 at the United Nations (1972) Conference on the Human Environment (Cutter-Mackenzie-Knowles et al., 2019). From this beginning, there was intense controversy over the concept of growth and its role in environmental, and subsequently, sustainability education. It was acknowledged that there was “growing evidence of man-made harm” to the environment and that the “natural growth of population continuously presents problems for the preservation of the environment” (United Nations, 1972, p. 3). Thus, the UN Secretary-General was to examine “a reduction in current levels of production and in the future rate of growth of the production of synthetic products and substitutes” (p. 27); and that research be directed toward a “policy of economic growth compatible with adequate environmental safeguards” (p. 30), in line with the “general agreement that a philosophy of ‘no growth’ was absolutely unacceptable” (p. 46).

This wary ambivalence of economic growth has persisted throughout environmental and sustainability education (UNESCO, 1997, p. 1; 2009, para. 1; UNESCO & UNEP, 1975, pp. 1, 4; 1977, pp. 12, 27, 40, 67, 75; United Nations, 1992, sections 2.19, 3.3, 4.10, 5.3 et passim; 2015, pp. 3, 4, 5 et passim; World Commission on Environment and Development, 1987, pp. xii, 1, 4, et passim), and continues today (United Nations, n.d., Goal 8). This ambivalence occurs because economic growth is endorsed as a solution to all things, including poverty, unemployment, and even, sometimes, environmental degradation (Hamaide, 2022).

Meanwhile, 1972 also saw the publication of The Club of Rome’s *The Limits to Growth* (Meadows et al., 1972), which raised alarm about both economic and population growth. While its cautionary message was ignored by mainstream economists (e.g. Simon (1981)), ecological economists integrated, refined, and prioritized the limits to growth argument as a means for achieving ecological sustainability (Daly, 1993b; Daly & Farley, 2011). The first goal of ecological economics is termed “sustainable scale”, which is concerned with keeping the size of the economy within the earth’s biophysical limits, and which requires the collective imposition of limits on resource use. To achieve this goal in our now “full world” (Daly, 2005), sustainable scale is opposed, in the aggregate, to the commonplace policy of economic growth (Daly & Farley, 2011). This appears to be the wiser response as many of the original *Limits to Growth* predictions appear to be on track (Hall, 2022), and as several of earth’s ecological limits have been breached in terms of biodiversity loss, climate change, overextension of the nitrogen and phosphorus cycles, amongst others (Richardson et al., 2023; Rockström et al., 2023).

Only a few studies have explored young people’s understandings of economic growth and have tended to be quantitative in nature (Berglund & Gericke, 2018; Nadeem & Nawaz, 2023; Wong, 2003), obscuring insight into their understandings, especially in relation to ecological sustainability, both of which are rather abstract concepts. And that which was qualitative did not attempt to explore what economic growth actually meant to the young participants (Sternang & Lundholm, 2012). As such, Lengyel et al. (2019, p. 322) observe that empirical research on undergraduate students’ understandings of economic growth is “virtually non-existent”, and Berglund and Gericke (2018, p. 14) suggest a qualitative study would be helpful in filling this research gap.

In this article therefore, I report results of a qualitative study of young people’s understandings of economic growth and ecological sustainability. I discuss the theoretical implications of these results in terms of a social ecological (hereafter SE) model of education (see Appendix A), and their practical implications for environmental and sustainability education. Given the continued policy support of economic growth world-wide (see for example van Tol (2020, p. 34)), the persistence of ecological degradation, and the ambivalence of what economic growth and ecological sustainability mean to young people, this article contributes to environmental education's objectives of helping people: students, teachers, and citizens alike, acquire an awareness and understanding of the total environment, its associated problems, and of humanity's critically responsible role in it (UNESCO & UNEP, 1975, p. 3).

Methods

Ethics approval for data collection was gained from my institution. I recruited twelve young people by emailing advertisements to undergraduate students in urban Australia, and by posting advertisements in a rural area of New South Wales, Australia. The advertisement requested young people's views of education, the economy, and ecological sustainability; the only criterion to participate was being aged 18 to 24. Respondents were required to supply a name and email address, were emailed a participant information sheet explaining more about the research, and a consent form to sign if they wished to proceed. Respondents were then asked to complete a recruitment form collecting personal and demographic data of their age and any current study. As this research was part of a larger doctoral research project, there were some other questions asked, but none relevant to the research reported in this article.

Participants were individually interviewed online using Zoom between September 2024 and April 2025, with each interview lasting approximately one hour. I used a semi-structured interview guide to inquire about all the topics germane to the study, and in an order which minimized biasing participants' responses (see Appendix B). The interviews were audio- and video-recorded, transcribed, and member checked. Participants were then assigned a pseudonym to protect their identity.

I then coded the transcripts using Nvivo software for all responses in relation to questions about economic growth and ecological sustainability, and then exported the entire codebook to Word to conduct a thematic analysis of the codes. The initial coding was quite literal, with little analytical interpretation, but as I began clustering the codes together to form candidate themes, I used a deductive approach to guide the analysis based on the SE model of education (see Appendix A). The key question driving the thematization of youth understandings of economic growth was: What do the young people think is increasing? For the questions about ecological sustainability, which is the goal of the SE model, the key analytical question was: How do the young people think ecological sustainability should be achieved?

Arguments based on information power (Malterud et al., 2016), emphasizing: the contribution of a sample to new knowledge, rather than number of participants; being based on established theory (see Appendix A); having a narrow aim; and high-quality dialogue, suggested that twelve participants was sufficient. The initial thematization was based on the first eleven interviews, with responses from the twelfth one supporting the existing themes, but not identifying any new ones, in line with conventional, but arguably less appropriate saturation-related considerations (Malterud et al., 2016, pp. 1758-1759).

As a brief positionality statement, I acknowledge my commitment to the literature on ecological economics, but that I mitigated confirmation bias through peer debrief. There were two codes that did not fit into the resultant typology for economic growth. Those codes were not included because they did not seem to add anything significant to the analysis, but I considered them to test the robustness of the themes. I mention them in the Results below.

Results

The results are presented in two sections: the first for young people's understandings of economic growth, and the second for those of ecological sustainability. In both sections the themes are ordered by prevalence, with those with the most responses appearing first.

Youth understandings of economic growth

The following themes are based on the key analytical question: What do young people think is increasing as the economy grows?

Increasing money

This theme was typified by Andy's (19; undergraduate in criminology and cybersecurity) response: "I'm pretty sure economic growth is regarding the economy becoming better. So what that means is, I'm guessing more money into the economy, and more people having expendable money." However, it also included things denominated in money such as prices, profits, inflation, and so on.

This theme is bounded by the representations of things in terms of exchange value; it does not include the things to be exchanged themselves. Thus, included here is: "It's the increase in the size of an entity's – whatever definition you want to use – it's an increase in the value of their goods and services" (Ken, 20; undergraduate in medical science). Increases in goods and services themselves are categorized in the following theme of 'Increasing resource use'. This distinction is crucial, for while money can theoretically grow without limit, increases in resource use are fundamentally limited by the laws of thermodynamics[2] – limits that are central to the ecological economic critique of economic growth (Daly & Farley, 2011).

The foregoing distinction draws attention to a methodological distinction, too: how is economic growth to be measured? In mainstream (i.e. neoclassical) economics growth is measured by increases in Gross Domestic Product (GDP), which is the final market value of all the goods and services produced in a country over a given period, usually one year. Some young people identified GDP in their responses, including Raquel (18; undergraduate in economics): "with economic growth there would be increase in GDP…. And then any decrease in economic growth would be in general a decrease in GDP." However, ecological economists have tirelessly argued that the dollars (or euros, yen, etc.) used to denominate GDP represent real goods and services, and thus growth ought to be measured as increases, not in terms of value of dollars, but of volume of materials and energy (Daly & Farley, 2011, p. 486).

These ontological and methodological distinctions have led to an important decoupling debate. Basically, can growth, measured in terms of GDP, be decoupled from increasing resource use? Haberl et al. (2020) have reviewed the literature and concluded that there is no evidence on any meaningful scale that growth is being

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[2] The first law of thermodynamics states that energy and matter are always conserved; they cannot be created or destroyed. This limits the quantity of 'stuff' in a system. The second law states that the energy in an isolated system is always becoming less useful, and rules out the perfect recycling of energy; some energy is always wasted as heat. The second law thus limits the efficiency of energy use, or more colloquially, it limits the quality of 'stuff' in a system. While the earth is not an isolated system, the quantity of incoming solar energy is limited by the first law. See for example Young and Freedman (1996).

decoupled from resource use and that the collective imposition of limits on resource use is essential.

This raises the question: Why is there so much political and economic allegiance to growth? If growth is causing so much environmental damage, why not shift to a degrowth strategy, and once our collective use of resource use has declined to sustainable levels, transition to a steady-state economy (Daly, 1993a)? Some insight is provided by Ken: “I think economic growth now is more, maybe growth for its own sake, and…I struggle to experience how having a bigger GDP has made my life better.” In mainstream economics increasing GDP is a proxy for increasing well-being (Samuelson & Nordhaus, 2010), and governments may be anxious to appear interested in this goal. Yet Ken’s response indicates the relationship between growth and well-being is not true for everyone. Further analysis is contained below in ‘Increasing well-being’.

Perhaps a better rationale for understanding the commitment to growth is that economic growth policies were developed after World War II to avoid the conflict between capital and labor, which was incendiary in the nascent Cold War (Blyth, 2002, pp. 91-95). So long as the economy is growing, the question of distribution – about how much everyone should get – can be avoided. In theory, growth will provide more for everyone, however disproportionately. Daly summarizes our choice under a competitive capitalist regime: “What are we going to do? Well, we’re going to grow. We can’t share because that’s politically and morally difficult” (Tree+, 2015, 3:48). This historical development of economic growth policies suggests that ecological sustainability cannot be separated from class antagonisms, the educational consequences of which I have outlined in van Tol (2024a, 2024b).

Increasing resource use

This theme is bounded by things dependent on matter and energy for their production, use, and maintenance. Leo (22; not studying) exemplified this theme well:

> the more a country wants to grow economically, the more products you'll have to make. I'll use the…example: 10,000 new Teslas, that's 10,000 new lithium batteries, that's 10,000 extra everything. The more trucks you need, the more fuel they're gonna burn, the more maintenance they're gonna require, the more oil they're gonna spill, the more mining that needs to be done. And that goes with anything, you can even say to a pencil, you know that's one more tree, that needs to be cut.

While increases in environmental provisioning of material and energy resources is a concern, so too is the environmental capacity for absorbing increased waste: “usually with economical growth, it means that a lot of resources are being used. And I think there's a lot of excess waste that gets produced within situations that have high economic growth” (Deejay, 21; undergraduate in design and international studies).

The waste generated from economic activity – from any activity as per the second law of thermodynamics – is notably absent in the so-called circular flow diagrams in economics textbooks (e.g. Samuelson & Nordhaus, 2010, p. 29), appearing as a kind of perpetual motion machine. Ecological economists have sharply censured this model as being anti-scientific, fragmented, and incomplete, insisting that the flow of production and consumption be accurately represented in relation to the wider ecosphere of which it is a part (Daly, 2014; Hall & Klitgaard, 2018), much as it is in Figures 2 and 3. From the latter perspective the environmental impact follows naturally: “there could be a connection between the economy rising and the production of goods and services also increasing. And by that, by extension, the damage in the environment increasing” (Leo).

Increasing population

This sub-theme, based on a single data extract, has to do with human population increase: “Firstly, it means that there is more people within an economy” (Ryan, 24; graduated in business and law). This inclusion is important because (economists’ favourite criterion) all else equal, an increasing population will increase resource use. The reasons for distinguishing this sub-theme are two-fold: first, resource use is normally associated with something that humans do, rather than what they are (notwithstanding economic concepts like ‘human resources’ and ‘human capital’); and second, both resource use by humans and population of humans are central concepts for the goal of ecological sustainability (see Figure 3 caption).

Increasing employment, jobs

This theme is bounded by the opportunities to do paid work, but does not include the pay itself (which is covered above by ‘Increasing money’). Raquel’s response was representative of most: **“**Well, it means, I suppose, that the economy is growing stronger and more jobs.”

The relationship between economic growth and increasing employment is central to the SE model of education, joining its social and ecological halves (see Figure 1). The principle of growing the economy for the purpose of creating jobs, central to Keynesian economics, has been pursued with differential priority since the end of World War II: from the end of World War II until the 1970s it was a top priority, but since then has been subordinate to controlling inflation (see van Tol (2024b) for how this transition has impacted education, and suggestions for how to resolve this tension). More specifically, under neoliberalism, while pro-growth policies persist, unemployment is now used as a tool for keeping inflation down, resulting in jobs deliberately made scarce. I highlight two results of this unemployment policy.

First, Sam's (20; undergraduate in physics) response, "Ultimately, I think it's just more jobs for the under- and unemployed" is inaccurate, especially since employers prefer to hire those that already have jobs, rather than the unemployed (Tcherneva, 2020). And second, without any popular understanding of governments' anti-labor, unemployment policies, politicians can appear interested in achieving full employment through growth (van Tol, 2024b): "When I think of economic growth, I think of politicians being like 'jobs and growth, jobs and growth'" (Tracy, 20; undergraduate in management and sustainability).

Increasing well-being

This theme refers to the good thoughts and feelings that a person experiences, bounded by what happens internally to a person, while acknowledging that it is related in part to what goes on externally. It has intrinsic importance for human beings: "economic growth is obviously good because without it you'd be in a recession, and usually that has a lot of implications on people's…well-being" (Deejay).

The relationship between economic growth and well-being, and its limits, is a heavily researched topic, and has resulted in the Easterlin Paradox (Easterlin, 1974; Easterlin et al., 2010). Basically, economic growth most improves the well-being of the most destitute, quickly diminishing logarithmically (Daly & Farley, 2011, p. 237), after which relative wealth is probably the more important determinant of one's life satisfaction (Helliwell et al., 2012, pp. 4-5), with clear implications for limiting inequality and redistributing income and wealth. Obviously that would upset free market fanatics, but if happiness is the object of the good life (as per Aristotle (2004)), and if economic growth does indeed increase resource use and is thus inherently limited, as argued by ecological economists, then the Easterlin Paradox is probably the most important result in all research on the environment-society interface. For "[i]f society's goal is to increase people's feelings of well-being, economic growth in itself will not do the job" (Easterlin, 2013, p. 1).

Increasing inequality

This theme is bounded by the inequality of what an economy produces, and of the opportunities for receiving it. While two of the data extracts contained reference to money, and one to jobs, it was decided to include them here as they refer specifically to the unequal distribution of money and jobs that is associated with economic growth.

> The jobs, the pays…aren't necessarily keeping up with the growth of the economy, which, of course, is much more harmful than doing good. So yeah, I think it's just things are getting much more expensive, but our pay, our – whatever we're doing or we get, isn't necessarily matching that growth. (Rashmi, 23; masters in secondary teaching)

There is no doubt that while pro-growth policies have persisted under neoliberalism, inequality has increased dramatically (Piketty, 2017, pp. 339-423). Yet, the preceding Keynesian period witnessed the highest ever rates of economic growth and a general decline in inequality of incomes (Piketty, 2017, p. 120).[3] These post-World War II economic developments occurred in tandem with the Great Acceleration of environmental decline (Steffen, 2022), which might seem to suggest that all that is required for reducing inequality is increasing rates of growth to new historic highs, likely accompanied by unparalleled levels of environmental destruction.

[3] France was a notable exception. See Piketty (2017, pp. 362-363)

Yet it was not just growth that conduced to decreasing inequality. The Keynesian period was also marked by significant government redistribution and the creation of the welfare state. The upper tax bracket in the United States, for example, peaked at 92 percent (in 1952 and 1953) (Tax Policy Center, 2023), and even Hayek (2006, p. 106), the great luminary of neoliberalism, acknowledged that there is “indeed a strong case” for reducing the inequality that results from a system of private property and inheritance, but was vague on how to accomplish this.

Finally, as a segue to the following theme, Reena (23; masters in secondary teaching) described increasing inequality as follows: “I think the only way that the economy can grow is if you funnel it to X amount of people, excluding Y amount of people.” Using this example, at a given scale growth enriches X people, and leaves relatively impoverished Y. How then might economic growth result in increasing equity?

Increasing equity

An economy cannot increase inequality and equity[4] at a given scale at the same time. The two are logically opposed. However, it is possible for the two to occur simultaneously at different scales. Keeping to Reena’s example above, as the economy grows X people can become so enriched that they increase the average national wealth and equity between countries, while Y people remain relatively impoverished within countries. This is just what has been happening since 2005, for the first time since the

[4] The young people used the term equity to mean equality in terms of income and wealth, aligned with and opposed to the way in which they used inequality, to mean unequal income and wealth (and jobs).

industrial revolution (Goda & Torres García, 2017).

If the goal is to increase the equity of billionaires between countries, while leaving everyone else within countries relatively impoverished, then focusing on economic growth as the solution to inequality might be appropriate. Unsurprisingly, the young people did not use equity in this way:

> I think it's just things like…pay, making sure things like the gender wage gap matches, I guess both. It's more equitable. Things like interest rates match our pay rises…. We're not necessarily struggling or thinking about like, 'oh, my God, I may not have enough money next week to pay the rent'. (Rashmi)

Moreover, as argued in 'Increasing resource use' above, growth is coupled with environmental degradation. Thus, as argued in 'Increasing inequality', redistributing income and wealth is a necessary part of increasing equity.

Two participants expressed views that did not align clearly with any theme, and were coded as: economic efficiency, and business opportunities. The latter might arguably be included as a sub-theme of 'Increasing employment, jobs'. The former might seem to relate to the sub-theme 'Increasing efficiency', discussed below for ecological sustainability, but it was mentioned only in passing in relation to economic growth in a part of the interview relevant to a different part of the study, and amongst several other factors. Having considered what economic growth means to young people, I now turn to what ecological sustainability means to them.

Youth understandings of ecological sustainability

The key analytical question posed in this section was: How do young people think ecological sustainability should be achieved?

Limiting resource use

This theme is often able to be subdivided into individual impositions of limits on resource use (denoted by [IND]), and, more commonly, collective impositions (denoted by [COL]). In keeping with the complexity of social life, the boundary is not precise, but the data extracts generally describe one of two approaches. The first is not acting by not using resources (for individually imposed limits): “I think it should be something that people in their personal lives, if possible, pay more attention to. Even if that's not buying a new bag from Woolworth's every time you go there” [IND] (Ken).

The second is acting by stopping, preventing, or reducing the use of resources by others (for collectively imposed limits): “a good start would be to stop deforesting. Deforestation…would be one of the leading causes of ecosystem collapse” [COL] (Sam); “I think there needs to be action to prevent the detrimental and unreversible damage. And obviously the sooner we start the better” [COL] (Leo); “I would definitely prefer a reduction in factory farming and a reduction in free grazing cattle….for an ethical and sustainability point of view, we'd have to have free grazing and free range animals, but just less of them” [COL] (Sam). The second approach was often implied by referring to overconsumption: “humans’ capacity to live within the means of earth's resources, and if you overconsume the resources…then there are consequences for those actions” [COL] (Dave, 19; undergraduate in biotechnology and creative intelligence and innovation).

Compensatory actions

This is an overarching theme that contains the following two: ‘Technological development’ and ‘Remedial actions’. In contrast to the previous theme of ‘Limiting resource use’, which tended to involve not doing something, or stopping or preventing others from doing something, these themes contribute to ecological sustainability by actively doing something to compensate for ecological degradation. Technological development is the more prevalent of the two.

Technological development

Technological development is often endorsed by economists as a means of increasing the efficiency of resource use and reducing waste (e.g. Samuelson and Nordhaus (2010, p. 504)). Thus, this theme is bounded by any change to resource use that may be considered more efficient,[5] and contains the sub-theme of 'Increasing efficiency', whose data extracts cannot be interpreted as technological development.

Similar to 'Limiting resource use', this theme also tends to be sub-divided into individual and collective actions, the latter again denoted by [COL]. Perhaps because of the social nature of technological development, most examples are collective and none are explicitly individualistic, though some might be interpreted that way.

> In terms of the progress made for ecological sustainability there's definitely a lot of people who are working towards and trying to improve and develop more sustainable technology and systems using those technologies….even though a lot of our design degree, for example, is focused on sustainability and creating sustainable packages, packaging, and making sure we aren't wasteful in our use of resources, I would still think that most of the industry is still quite wasteful. [COL] (Deejay)

Often underpinning technological development is the assumption, or even assertion, that it alone will achieve ecological sustainability:

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[5] The key word is "considered" more efficient, since economists have often had a myopic view. For a classic study demonstrating this, see Costanza (1980).

> I can't stress enough that I don't think the ecological and the environment outweighs human advancement…. because I believe the more advanced the human species becomes, more technologically proficient we are, the better tools we have for preventing that stuff for the environment. [COL] (Leo)

But technological development is, as argued above, simply a change in the way we use resources, and one which is considered more efficient. However, technology, of whatever sort, embodies matter, requires energy for its production, use, and maintenance, and is therefore subject, just like all matter and energy, to the laws and limitations of thermodynamics. If it is to make any contribution to ecological sustainability, technological development must thus be underpinned by and subordinated to limitations on resource use. In simple terms, consider: if resources were unlimited, why would it matter how efficiently we used them?

Yet at least since World War II technological development has occurred in tandem with enormous growth of both material (Lenzen et al., 2022) and energy resources (Our World in Data, n.d.). It is thus an ideologically driven solution to ecological sustainability, usually endorsed uncritically, and independently of collective limitations on resource use. Environmental and sustainability educators should thus emphasise the priority of limits over technological development, or any solution based on efficiency increases.

Increasing efficiency

A minority of data extracts could not be interpreted as technological development, but implied increasing efficiency nonetheless: “densification of cities, because as we use less area for humans, it gives more area to wildlife” [COL] (Sam). Perhaps some people would like to live in more crowded conditions, but others may do so only by economic forces related to jobs and wages. In either case, the same logical dependency on limiting resource use applies; no matter how dense our cities become, they will not contribute to ecological sustainability so long as they are coupled with increasing resource use.

Remedial actions

This theme is bounded by any action that aims to clean up or restore the environment. As above, the extracts can be sub-divided into collective and individual actions. "Definitely cleaning up our pollution of the waterways" [COL] (Sam). To highlight the delineation of themes, Sam also mentioned "stopping polluting of the waterways", which would be categorized as 'Limiting resource use'. In the former case the pollution has already been created, in the latter it is halted before it is created. Again for emphasis: because remedial action – any action – requires energy, it too is limited by the laws of thermodynamics and is thus necessarily subordinate to limiting resource use. No matter how frantically humans try to clean up the environment, so long as those efforts take place within an economy that increases resource use, they will not contribute to ecological sustainability. Collectively limiting resource use is necessary.

In summary, these 'Compensatory actions' are subordinate to the preceding theme of 'Limiting resource use'. This result has important applications for teaching about sustainability, which is frequently presented in schools as recycling (a form of efficiency increase) or cleaning up the school grounds or surrounding environment (a form of remedial action). Rather, environmental and sustainability educators should emphasize the need to collectively impose limits on resource use so that compensatory actions, like recycling and cleaning up green spaces can support the sustainability of ecosystems. Without such collective limitations in place, compensatory actions will make no aggregate contribution to the goal of ecological sustainability. In this way, the order of the '3Rs' should be emphasized: reduce (and limit), reuse, and then recycle.

Education

This theme is bounded by instruction and the creation of resources and experiences aimed at developing people's understanding of ecological sustainability. The supporting extracts do not always use the term 'education' explicitly; sometimes they refer to informal teaching and learning. This theme has important theoretical links to the social, specifically educational, half of the SE model of education (see Appendix A).

> So I think it is vital that there is an importance put on ecological sustainability. Now, how is that done? That's where I'm not as educated or well versed as I'd like…. So I'd say educating people would be a big thing, that's me included. I definitely need to educate myself more as to what I can do as an individual.…So what comes to mind in my head is there should be more education for everyone. (Andy)

None of the supporting extracts linked education to understanding limits to resource use, but sometimes this might be inferred in relation to the discussion above for 'Technological development': "education for the consumer. So the consumer knows what is the process that goes into making certain things" (Deejay); "you can't just tear something away, now that there's so much reliance on it. You have to make people firstly, see the importance of having alternative measures in place" (Ryan).

Andy suggested that "there should be some sort of metric that we measure on, and it should be something that is more publicly displayed." This extract supports Giroux's (2021) unwavering argument that education is always political: what metric we choose, how, where, and to whom it should be communicated, are all socio-political questions with social ecological consequences. Richardson et al. (2023) suggest a metric based on Human Appropriated Net Primary Production (HANPP), which is the percentage of Net Primary Production (NPP)[6] directed toward human use. Richardson et al. (2023) argue that to maintain biospheric integrity, the safe planetary boundary of HANPP should be less than 10 percent of pre-industrial NPP, but is currently at 30 percent, suggesting an enormous reduction is needed. Environmental and sustainability educators could endorse this metric and the goal which is based upon it.

Reducing power imbalances

In this theme the reduction of power imbalances is never explicitly named. Rather, it is implied by criticizing the concentration of power. It is bounded by individuals, whether flesh-and-blood or corporate,[7] that wield great power relative to most other individuals. It has important theoretical links to the SE model of education, for which power is the central concept (see Appendix A).

> I'll always say when it comes to legislation or bringing up laws for businesses, because they can do things at a mass scale, a much bigger scale. So even a whole suburb, if a whole suburb works together, and they're doing something right, one business can negate that whole thing. And yeah, businesses have a lot of power. Big businesses have a lot of power and same with privatized companies…like private airlines that celebrities may fly on, the emissions that they're putting out can offset, an entire – all of Southwest Sydney, just from their quick little 20-minute, 10-minute private jet ride. (Andy)

[6] Net Primary Production is the rate of energy fixed via photosynthesis minus the energy that plants use for respiration. This surplus energy is the basis for virtually all food chains on Earth and is thus central to ecological sustainability.

[7] In many countries corporations have the same rights as flesh-and-blood persons in business dealings. This legal concept is referred to by various terms such as corporate personality, legal personhood, etc. For a history of this development, see Davoudi et al. (2018).

Rashmi shared Andy’s concern for the exercise of power by both corporate and flesh-and-blood persons, but with a class-based dimension:

> all these politicians, all these famous celebrities…are using jets to fly…just 20 minutes away. Bigger companies are just dumping oil into the water for example. Again, it's very much, unfortunately…like a working-class issue, rather than like a whole world issue.

This suggestion that ecological sustainability is a “working class issue” supports the argument in ‘Increasing money’ that ecological sustainability cannot be separated from class antagonisms. It also supports the criticism of employment, and education for employment, in the SE model of education (see Appendix A, and van Tol (2024a) for more detail).

Table 1 summarizes the themes for each section.

(Insert Table 1 here)

Discussion

The results demonstrate that both economic growth and ecological sustainability mean a variety of things to young people, congruent with the argument in the Introduction that these concepts can appear ambivalent, and sometimes contradictory. In addition to the analysis in the Results, I thus suggest some ways of making sense of these varied meanings, highlighting any contradictions, all with the general aim of fulfilling environmental education’s objectives named in the Introduction: raising awareness and understanding of the total environment, its associated problems, and of humanity’s critically responsible role in it.

Conflict between economic growth and ecological sustainability?

The SE model of education argues that economic growth is in tension, or conflict, with ecological sustainability. Readily apparent from reviewing the themes above is that 'Increasing resource use' and 'Limiting resource use' are indeed in conflict, just as proposed by the SE model. Thus, the conflict in the model, between economic growth and ecological sustainability, should be understood through this combination of meanings. I define this combination as the 'Resource-use Conflict'.

Yet there are several other themes for both economic growth and ecological sustainability, giving rise to many other possible combinations of understandings of the relationship between the two, some of which may be in conflict, others not. For example, if economic growth is understood as 'Increasing inequality', and achieving ecological sustainability as 'Reducing power imbalances', then this combination of understandings may also lead to a perception of conflict.

On the other hand, if economic growth is understood as 'Increasing money', as it often was, and ecological sustainability achieved through 'Technological development', as it too often was, then young people may see no conflict between them; banks simply need to use their extraordinary power to create money from nothing (Mitchell & Fazi, 2017, p. 255), and invest it in technological development. I will report the nature and extent of how these young people understood the conflict between economic growth and ecological sustainability, if at all, in a separate article, as well as their understandings of any limits to economic growth.

The emphasis on the Resource-use Conflict is not to ignore other combinations of meanings, but to concentrate on that which is primary in the SE model of education, and also that which seems to best address the objectives of environmental education named above. It is also to provide environmental and sustainability educators with a language that makes precise what each of the terms refers to. In this sense ecological sustainability in relation to economic growth is very different from sustainable development, which in its mainstream usage is clearly a political, rather than a scientific concept.[8] Imagine, for instance, if the word 'electron' referred to 17 different things, each with its own characteristics and targets. Ecological sustainability in the SE model of education is meant to be a scientific concept, rather than a political one. It is not 'all things to all people'. Sustainable development concerns having to do with the distribution of income and employment are also important issues, but they are distinct concepts and goals, requiring their own policies and means for achieving them. While they may be related to the Resource-use Conflict, they should not be conflated with it.

Education for ecological sustainability

According to the SE model of education a necessary feature of ecological sustainability is the collective imposition of limits on resource use (see Appendix A). To teach for ecological sustainability environmental and sustainability educators should therefore focus on the Resource-use Conflict defined in the preceding section. The creation of high quality, time-lapsed video resources, informed by the relevant data, showing the increases in material and energy use, as well as, *inter alia*, increasing population, increasing land use, and declining biodiversity, may support the teaching and learning of ecological sustainability in relation to the Resource-use Conflict. The aim should be to confer deep understanding and historical knowledge of the socially modified environment, and its limits.

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[8] But compare Daly's (1996) concept of sustainable development, which is radically different from the mainstream usage, and essentially aligned with the concept of ecological sustainability as endorsed here, requiring the collective imposition of limits on resource use.

Education for ecological sustainability can also include culturally diverse stories about and practices for limiting growth. For example, the Māori concept of rāhui involves the collective imposition of limits on resource use to maintain biodiversity (McAllister et al., 2023, pp. 5-6), a fundamental indicator of ecosystem integrity. And Bly (Bly & Woodman, 1998, p. 69) has noted the unmatched maturity of the Inuit in respecting the earth's limits, especially compared to western people's child-like belief that mother earth will never stop giving. Pattnaik (2024a) gives a variety of other indigenous perspectives on ecological sustainability, especially notable is what Pattnaik (2024b, pp. 37-38) calls "kincentric ecology", which, amongst other features, involves imposing limits on resource use to maintain biodiversity. Finally, in western history too, there is a similar aversion to unlimited growth, and that which is unlimited generally: "evil, as the Pythagoreans represented it, is a form of the unlimited, and good of the limited" (Aristotle, 2004, p. 41).

Speculative Implications

The reference above, in 'Increasing money', to the development of economic growth policies to avoid the conflict between capital and labor, could form part of education for ecological sustainability. Labor history read as a struggle over the control and scale of work, and the resources used for it, can draw on means developed by labor in this struggle for the purpose of collectively limiting resource use. In particular, the general strike, where workers across all sectors of an economy strike in unison, was considered one of the most powerful weapons working class people can use to oppose capital's exploitation (Luxemburg, 2008). With extensive enough education of workers and union leaders, the general strike (or any strike for that matter, especially in key industries like energy), could contribute to the collective imposition of limits on resource use, and to reducing power imbalances, notwithstanding the immense difficulties this presents (Luxemburg, 2008).

The "laws for businesses" that Andy mentioned in 'Reducing power imbalances' could include forbidding donations to political parties, more rigorous processes for combatting tax evasion, and more generally limiting the scope of corporate activity and existence. Banks in particular, which have the ultimate power of creating money from nothing and lending it out at interest, should be nationalized and brought under popular control to fulfil public, rather than private profit-making interests (Mitchell & Fazi, 2017, pp. 255-259).

Future research

For future research a quantitative study asking respondents to rank the themes for economic growth, and ecological sustainability, identified in this article will help to understand how prevalent young people's understandings of each of these different themes are. Such a study could also include a qualitative component asking respondents if either economic growth or ecological sustainability means anything else to them. What little research has been done on this topic has, as noted in the Introduction, obscured this understanding. Moreover, Berglund and Gericke's (2018) study inquired about economic growth in relation, not to ecological sustainability, but sustainable development, which as noted in the Discussion is a radically different concept.

Finally, exploring more fully young people's understandings of the relationship between economic growth and increasing inequality, or equity, may also be an important avenue for future research to determine which of these two generally opposing views prevails.

Conclusion

This article suggests that economic growth and ecological sustainability mean a variety of things to young people. When teaching for ecological sustainability environmental and sustainability educators should be aware of these multiple meanings and focus on the Resource-use Conflict: namely, economic growth as increasing resource use, and ecological sustainability as requiring collective limits on resource use. Focusing education on this combination of meanings will support the achievement of environmental education's objectives of raising awareness and understanding of the total environment, its associated problems, and of humanity's critically responsible role in it. Should this awareness and understanding become widespread enough, further objectives of environmental education may be achievable: namely, supporting students, teachers, and citizens alike to develop the motivation for, and skills and ability to actively participate in solving environmental problems (UNESCO & UNEP, 1975, pp. 3-4). In the current growth-oriented paradigm of political economy, this solution will involve a conflict over resource use.

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Appendix A: A social ecological model of education

The premise of social ecology is that ecological problems, like biodiversity loss and climate change, stem from social problems, like patriarchy and racism; hence the name: social ecology. More specifically, it proposes that humans' power over nature stems from humans' power over one another (see blue arrow at the bottom of Figure 1), and that therefore to solve our ecological problems we should focus on solving of our social problems, especially those having to do with power and domination. The underlying supposition is that democratic control over resources will provide better stewardship of the environment than hierarchical control.

A capitalist economy is placed at the centre of the SE model of education (see Figure 1). Thus, humans' power over nature is expressed through economic growth and its tension with ecological sustainability, while humans' power over one another is expressed through education for employment. The model proposes to support the resolution of this social ecological problem through active citizenship education, creating a second tension in the model (see Figure 1). See van Tol (2023, 2024a) for complete development of the model.

(Insert Figure 1 here)

Most important for this article is that economic growth is argued to be closely coupled with the growth of material and energy resources, and inter-defines economic growth and ecological sustainability based on the concept of throughput, the technical term for resource use. As such, economic growth requires increasing resource use, whereas ecological sustainability requires the collective imposition of limits on resource use. These contrasting concepts are depicted in Figures 2 and 3.

(Insert Figure 2 here)

(Insert Figure 3 here)

Appendix B: Semi-structured interview guide

(Only the questions relevant to this article are included)

Introduction:

- How fair do you think the economy (of our country) is? What makes you say that? Could you give me an example?
- What do you think about the state of the environment nowadays?
    - Are you concerned / worried at all about the environment? What makes you say that? Could you give me an example?

Elaborations of the above:

Moving to some more specific questions related to the previous ones…

- What are you views on / do you think / know about ecological sustainability?
    - What makes you say that? Could you tell me a bit more about that? Could you give me an example of that?
- What are your views of economic growth?
    - What do you know / understand about it? What does it mean to you? Could you give me an example of that?
    - **IF NO VIEW**:
    - Have you heard of Greta Thurnberg?

- **YES**: In 2019, at the UN Climate Action Summit, Greta Thurnberg said to world leaders: "…all you can talk about is money and fairy tales of eternal economic growth. How dare you!"
  - Why do you think Greta said this / what did she mean by it?
- **NO**: Economic growth occurs when more goods are made or services provided in a country. For example, starting a new mine, growing more food, building new roads, and offering more social services. Globally, both energy and material production have grown steadily for many decades; pretty much all governments try to grow their economies.
    - Do you have any view of this process?

Tables

Table 1. Summary of themes of youth understandings for economic growth and ecological sustainability.

Youth understandings of economic growth	Youth understandings of ecological sustainability
Increasing money	Limiting resource use
Increasing resource use	Compensatory actions
Increasing population	Technological development
Increasing employment, jobs	Increasing efficiency
Increasing well-being	Remedial actions
Increasing inequality	Education
Increasing equity	Reducing power imbalances

Figures

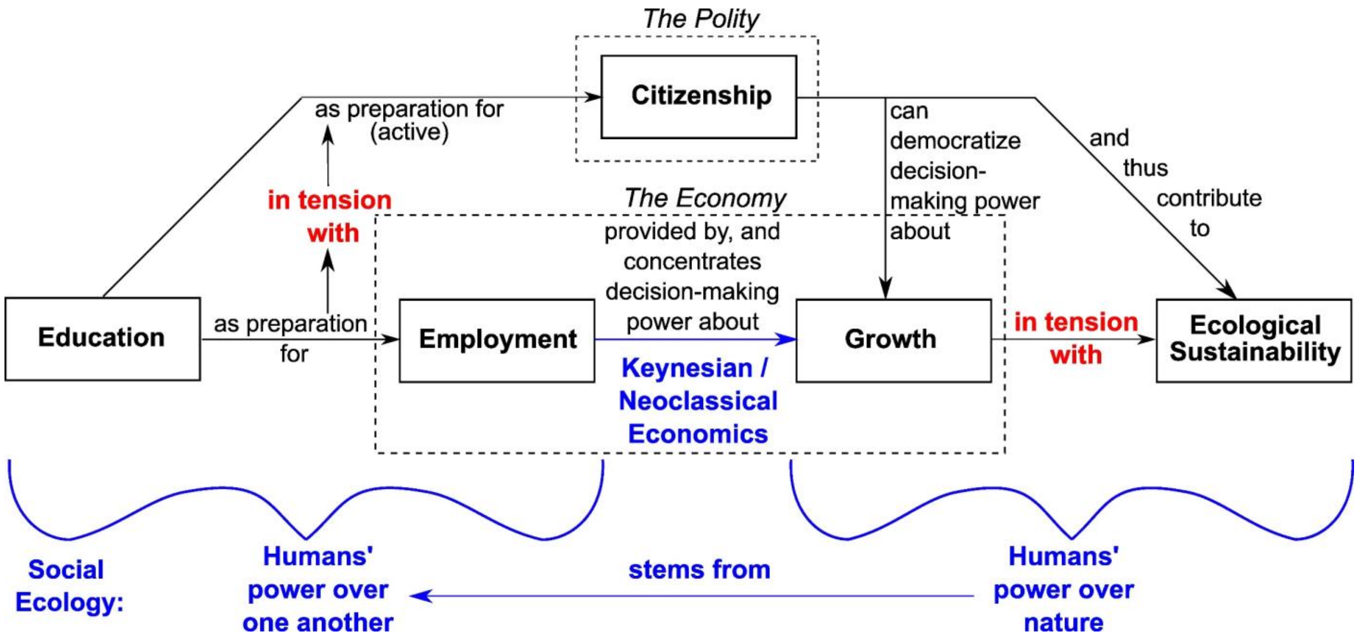

Figure 1

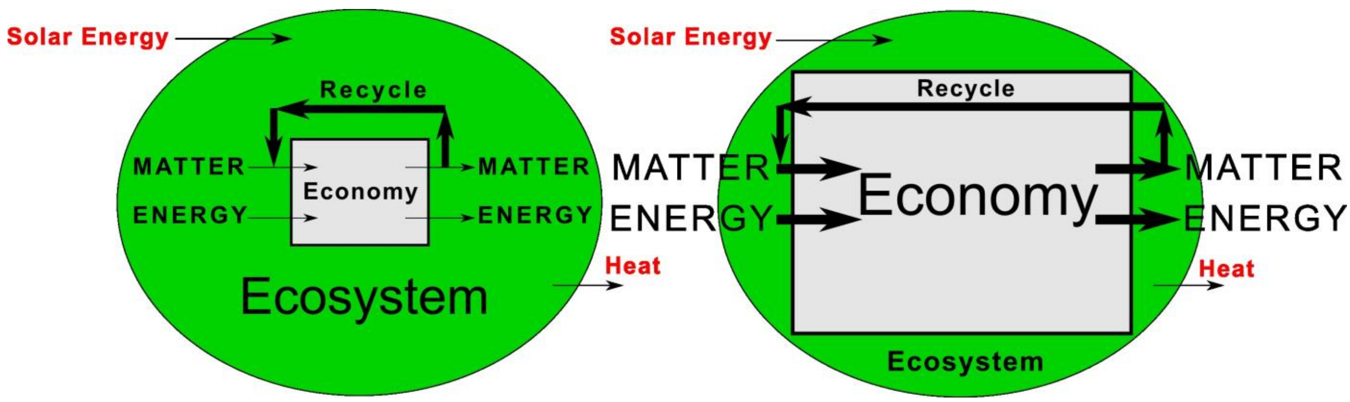

Figure 2

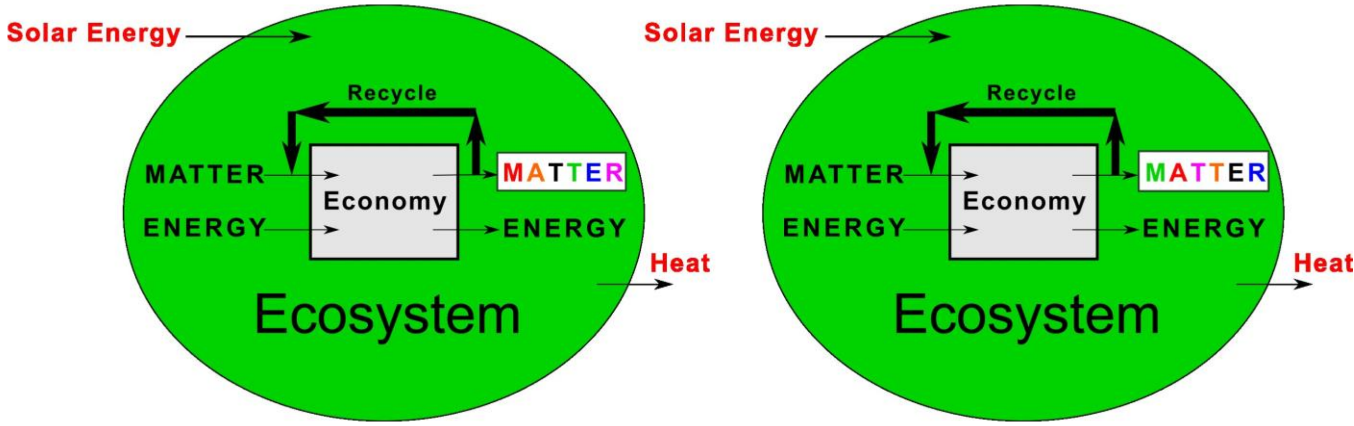

Figure 3

Figure Captions

Figure 1. A social ecological model of education. Concepts and relations are shown in black; theoretical framework is in blue; tensions are in red. For the full development of this model of education see van Tol (2023, 2024a). Source: van Tol (2024a).

Figure 2. Economic growth. Entails an increase in matter and energy use (throughput), which come from the environment as resources and return to it as waste. As the economy grows it expands into ecosystems degrading their functionality. Source: van Tol (2024a).

Figure 3. Ecological sustainability. Requires a limit on matter and energy use (throughput). Note that the while the quantity of matter and energy flowing through the economy is held steady, qualitative changes in material output are permitted, represented by the change of color of material output (i.e. by the color of the word 'MATTER'). Such qualitative changes could include technological development, changes in information, education, fashion, and culture. Coupled with a constant or mildly fluctuating human population, ecological economists refer to this scenario as a steady-state economy (Daly, 1993a). Source: van Tol (2024a).