Widening the frame: 'Digital First' education and environmental sustainability

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In CAIRN Journal Issue 2, Kenny Allan (West College Scotland) advocated for the reflection across the sector on the environmental impacts of a 'Digital First' approach to college education. If you haven't already read it yet, I recommend you do! This article delves further into the subject of education digitisation and sustainability.

Carbon tunnel vision

Before going into some of the research I found on this topic, I feel it is helpful to first touch on "carbon tunnel vision". You see, I spend a lot of time pulling together and analysing the greenhouse gas emissions data within reports that each college sends to Scottish Government. Once analysed, we publish our annual report and spend a lot of time communicating the results with the sector and advocating for action. I also deliver Carbon Literacy Training, a great course which explores climate science, the role colleges have in tackling climate change, and exploring impactful actions individuals can make. We published a commuting emissions calculator last summer and worked with University of Aberdeen to update an international student travel emission calculator.

This is to say that emissions make up a lot of my world! And no wonder. 2024 was the first year we reached 1.5c global warming levels. We have national and institutional targets to nearly eliminate our contributions to climate change. It is so easy then to become hyper-focussed on emissions to the detriment of us not seeing the bigger picture too.

A holistic view of environmental sustainability

The planetary boundaries framework (Image 1) can be useful in broadening our view of environmental sustainability. The framework takes a science-based approach for understanding what is a "safe operating space for humanity" to prevent dangerous, abrupt or irreversible environmental changes. Of the nine boundaries used in the framework, the world is breaching six of them. Therefore, when considering the environmental impacts of our college operations and teaching delivery, we must consider these holistically. In addition, whilst not discussed here, we should also consciously assess the impacts of our operations from a social lens too, recognising that the environment, society and the economy are all interrelated (image 2).

Image 1:

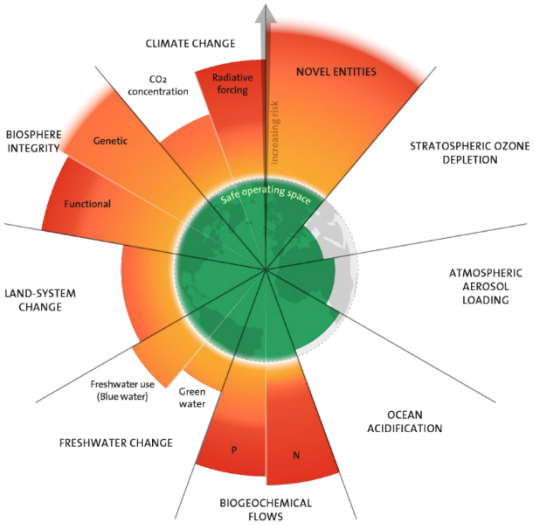

Image 1: the Planetary Boundaries Assessment for 2024 (Planetary Boundaries Science and the Potsdam Institute for Climate Impact Research 2024).

There are nine major systems and processes whose functioning and stability are thought to be critical to human societies. The planetary boundaries model depicts a 'safe operating space' – the green inner circle – which shows the extent to which human activities can probably safely disrupt each of the nine major Earth systems. Beyond the safe operating space is the zone of increasing risk, with risks getting higher the further they are from the centre of the diagram. Wedges which are orange- or red-ended show systems that have been severely disrupted, and whose altered functioning is a risk to us.

It is important to note that Earth systems are interlinked, and the disruption of one of them is likely to affect others.

Image 2:

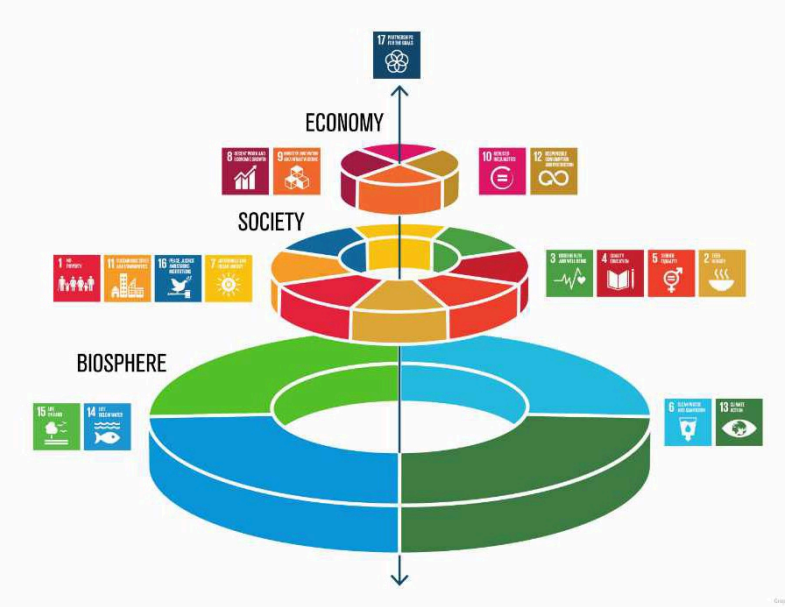

Image 2: the Sustainable Develop Goal Wedding Cake: A healthy living world is the necessary foundation to support a healthy society, which in turn supports a healthy economy (Stockholm Resilience Centre 2016).

The environmental impact of digital vs in-person education

The table below presents an overview of how these forms of educational delivery may negatively impact the environment:

Source of environmental impact	**What are the main environmental impacts and context?**	**Relationship with digital education and in-person education**
IT device manufacturing e.g. tablets and laptops	Climate change Land system change Freshwater use Ocean acidification Biodiversity loss To manufacture a tablet, smartphone or laptop requires a significant amount of natural resources. One of the largest areas of impact is through the mining of precious metals needed to manufacture the device. Mining operations can drive deforestation and cause water and air pollution, as well as causing the release of greenhouse gas emissions.	Digital education is expected to require a greater number of IT devices for learner engagement with studies compared to in-person education. However, if teaching involves a blend of in-person and digital education, then the number of devices needed is expected to be equal to those needed for full-time digital education delivery.
Data storage and transfer	Climate change Freshwater use Ocean acidification Biodiversity loss Data stored directly onto a device's internal storage has minimal environmental impact. However, data stored on remote servers such as through shared drives and 'cloud-based' storage has a larger impact. This is due to the electricity needed to store and transfer data, as well as the water needed to cool data centres.	Digital education is expected to require a greater amount of data storage and transfer compared to in-person educational delivery. However, given that learning materials are likely to be stored digitally even for in-person delivery (e.g. module presentations) and shared afterwards, the net environmental saving for data storage compared to digital-first might be less than expected.
Heating, electricity and travel	Climate change Ocean acidification Biodiversity loss To study and work in a comfortable environment, we use energy to heat our buildings and electricity to power our IT devices. The burning of fossil fuels for heating and electricity	In most researched scenarios homeworking uses less energy overall than office working. This is largely due to the savings made from not commuting to work by fossil fuel powered vehicles. In addition, home workers and learners can often better adapt their heating requirements to the space they are using, for example one or two rooms

	production is a significant source of greenhouse gas emissions which drives climate change. For in-person education, unless taking active travel modes such as walking or wheeling, travelling to campuses requires external energy sources such as petrol, diesel or electricity. These energy sources cause greenhouse gas emissions and air pollution either locally (e.g. whilst driving) or distantly (e.g. at a power plant producing electricity).	using radiator thermostatic valves. By comparison, a college might have to heat up a large office despite low numbers of staff using the space.

It is important to note that the environmental impacts of digital and in-person education are very context specific and will also change over time as we decarbonise our energy systems. For example, whilst on average homeworking and learning is more environmentally friendly than being on campus, if colleges are able to move their heating to zero or low carbon systems at a faster pace than individuals install heat pumps in their homes, then we might see that homeworking becomes less environmentally friendly than being on campus.

So, which is better?

As you might have guessed at this point, its complex and it will continue to be complex as there are many factors in play. However, going back to Kenny's original article, I agree that we need to be much more aware of the impacts of our actions, be that the move to a 'digital-first' approach or any other policy or process change. We also need to challenge the status quo – do the processes and behaviours we currently facilitate and engage with fit with a sustainable world and where we need to be?

Quick environmental wins whilst delivering education digitally

As a final note, whether you are currently engaged with digital delivery of education, or are going to engage with it in future, there are actions you can take to make its delivery more sustainable, including:

Actions for everyone:

1. **Ditch high-definition videos.** Reduce energy use by 86% by switching online videos (live or recorded) from High Definition (HD) to Standard Definition (SD).
2. **Delete old digital files.** It feels so easy to simply store away digital files just in case they're needed in future. This can unnecessarily increase the amount of data storage needed by individuals and colleges whilst also potentially posing data protection issues with GDPR. Regularly review the files and emails you keep stored and delete ones you no longer need. Your team, department or college could even hold a 'data spring clean day' to do this together.

Actions for procurement leads:

1. **Engage your cloud storage supplier on sustainability.** Where the cloud storage is and how it is powered/managed matters. For example, certain data centres are powered by renewable energy through a direct line from a wind turbine to the centre. The emissions for data storage in this example are therefore greatly reduced compared to a data centre powered by the national grid. Choose suppliers that support sound sustainability practices.

Actions for organisational development leads:

1. **Convert these actions into a resource for your staff intranet.** Many educators are currently concerned about the environmental impact of digital education and AI. Communicate your college's responsible procurement actions around IT devices and cloud services, as well as the actions individuals can take to reduce the environmental impact of their digital activities.

Author Biography

Matt Woodthorpe is the Scotland Director for EAUC, leading the strategic direction and delivery of EAUC's SFC-funded work in Scotland. Prior to this role, they worked at the University of Stirling Students' Union for three years as their Environmental Development Coordinator, helping to develop and implement sector-leading projects within the campus community.

Matt achieved an MSc in International Land and Water Management from Wageningen University and has a wide background in sustainability issues. Previous work has included Fuel Poverty Officer at Bradford Council, consultancy projects in Spain and Kenya on sustainable land management and outdoor education and community work with the National Trust at Wicken Fen.

In their spare time Matt can often be found training for an adventure, daydreaming up new challenges or picking up some knitting needles.

The EAUC is the Alliance for sustainability Leadership in Education, championing good practice for the environment across universities and colleges.