Nachhaltige Digitalisierung oder digitale Nachhaltigkeit (in der Lehre)
RUBRIK ÖKOLOGIE

Circadian and eutark reduction of the energy trace of a digital school
“...It may be the case that the strongest eco-value of circadian and eutark devices does not reside in energy savings per se, but rather in habits these devices would help to reinforce and amplify.”

UNTERWEGS

I wish I were a Dutch student—student perspectives on the peer-to-peer exchange with the Netherlands
“...Three days in November 2018, 17 university representatives from all over Germany, three Dutch cities and uncountable impressions — a peer-to-peer exchange on digitalisation in higher education.”

NACHHALTIGKEIT

10 Bildung für nachhaltige Entwicklung als Öffnungsprozess für einen virtuellen Hochschulraum?
Georg Müller-Christ

18 Improving students’ competencies in sustainability science through the integration of digital teaching and learning in higher education
Alexa Böckel

22 Digital Literacy für die sozial-ökologische Transformation
Steffen Lange, Tilman Santarius

26 Nachhaltigkeit digital
Peter England, Stefanie Brunner

30 Digitalisierung und nachhaltige Entwicklung an Hochschulen: Synergien und Spannungsfelder. Digitalisierung — Werkzeug und Thema im Hochschulnetzwerk HOCH
Wolfgang Denzler, Claudia T. Schmitt

34 Transformationsprozesse für eine nachhaltige Zukunft gestalten. Digitale Landkarten als Möglichkeit zur Visualisierung und Vernetzung nachhaltigkeitsbezogener Inhalte
Claudia T. Schmitt, Sophie van Rijn

38 Was bedeutet Nachhaltigkeit im Blick auf universitäre Lehre? Eine erziehungswissenschaftliche Perspektive
Hans-Christoph Koller, Angelika Paseka, Sandra Sprenger
Nachhaltig erhöhte Lernautonomie beim Spracherwerb durch digitale Angebote. Über ein Online-Self-Assessment zur Sprachzertifizierung für internationale Studierende
Nilis Bernstein

Digitalisierung und Nachhaltigkeit. Potenziale für Lernen am Beispiel eines Prototyps für ein Ecological Securities-Portfolio
Ronald Deckert, Maren Metz, Thorsten Permien

Austausch von Praxiserfahrungen mit digitaler Lehre als Voraussetzung für Nachhaltigkeit. Die Digital Learning Map
Johannes Moskaliuk, Bianca Diller, Elke Kümmel

Die Virtuelle Akademie Nachhaltigkeit: digitalisierte Bildung für nachhaltige Entwicklung
Oliver Ahel, Thore Vagts

Projektbasierte Förderung digitaler Lehre – Nachhaltigkeit aktiv gestalten
Mareike Kehrer

Bayern im Diskurs. Digitalisierung und Nachhaltigkeit
Markus Vogt, Johann Engelhard, Lara Lütke-Spatz, Kristina Färber

NACHHALTIGKEIT
Bildung für nachhaltige Entwicklung als Öffnungsprozess für einen virtuellen Hochschulraum?
„Nachhaltigkeit lernen heißt die Welt als ganze Gestalt in den Blick nehmen und die individualisierten Nebenwirkungen von Forschungs-, Produktions- und Konsumprozessen auf Mensch und Natur abbilden zu können.“

RUBRIK INFRASTRUKTUR

EduArc. Eine Infrastruktur zur hochschulübergreifenden Nachnutzung digitaler Lernmaterialien
Michael Kerres, Tobias Hölterhof, Gianna Scharnberg, Nadine Schröder

Der Einfluss der Digitalisierung auf die Wissensgenese im Kontext einer nachhaltig-gerechten Entwicklung
Thomas Weith, Thomas Köhler

RUBRIK ÖKOLOGIE

Circadian and eutark reduction of the energy trace of a digital school
Daniel D. Hromada

Nachhaltigkeit? Handlungsfelder auf dem Weg zu einer ökologisch-verantwortlichen Mediennutzung an Hochschulen
Nina Grünberger, Reinhard Bauer

RUBRIK INFRASTRUKTUR

Der Einfluss der Digitalisierung auf die Wissensgenese im Kontext einer nachhaltig-gerechten Entwicklung
„Eine nachhaltige Entwicklung erfordert eine Neuorganisation der Wissensbestände und ihrer Verfügbarkeiten. Dabei geht es im Kern auch um ein neuartiges Verständnis einer Beteiligung an der Wissensgenese.“
In a situation where “extensive body of accumulated knowledge shows that global consumption of goods and services are among the key drivers of greenhouse-gas emissions” (Alfredsson et al. 2018), there exists one fairly simple way how to reduce a CO₂ trace of a person or an institution: reduce one’s overall energy consumption. This article describes how a wider deployment of so-called “circadian” and “eutark” devices and services in an educational setting could considerably reduce ecological trace associated to one’s activity in the digital world.

Voracity of round-the-clock paradigm
One of the main undisputed principles of current digital revolution can be described as follows: Servers, routers, hubs, switches and access points (APs) are “always on”, digital services function “round-the-clock”, and what user wants is “ich, alles, sofort und überall!” (Granow & Pongratz 2018).

While usefulness of such “omni-temporal” paradigm for merchants who are able to disseminate their products and ads across all time-zones and cultures is undeniable, thematization of omnitemporality of digital services in an educational context brings forth following kinds of questions:

- What are pros and cons of having an educational system which is “always on”?
- Isn’t the very essence of learning related to rhythms wherein the period of relaxation, sleep, vacation and cognitive consolidation follows a period of intense information processing?
- How many gigawatt hours consume “idle” WLAN APs in German schools during 365 nights of one year?

Inviting ecologists to join forces with cognitive scientists, we leave the first two questions open for future debate and focus on the third. And we do so from a position of a hypothetic Hausmeister who:

- ponders that in Germany alone, there are approximately 33 000 general education and vocational schools
- conservatively assumes that, in average, each school is equipped with 5 APs
- estimates that an average WLAN AP consumes 5 Watt hours (Wh) of electricity (Chiaravalotti et al. 2011; Ashley 2012; Urban et al. 2014)

Such Hausmeister could easily see savings caused by implementation of a general policy to turn off all APs when school is empty, for example between 23:00 and 06:00:

\[
33\,000\ \text{schools} \times 365\ \text{days} \times 9\ \text{hours} \times 5\ \text{APs per school} \times 5\ \text{Wh} = 2,71\ \text{GWh}
\]

This kind of reasoning naturally leads us to proposal of “circadian devices”.

Circadian devices and circadian services
It is well known that during a 24-hour cycle, an energy-level level of a human being oscillates between diverse phases such as deep sleep, REM-sleep, peak awareness state, declining awareness state etc. (Aschoff 1965).

Per analogiam, a circadian device (CD) is defined as a device with pre-built daily “rhythms” (Hromada 2019). That is, a device...
manifesting at least two state transitions (for example “deep-sleep to full activity; full activity to deep-sleep”) within a 24-hour period. Ideally, the very hardware of such device is designed & optimized to be automatically turned “on” and “off” often and on a regular basis.

In this sense, CDs are more radical than classical devices whose “idle”, “hibernation” or “suspend” modes often just mislead the user into believing one is acting in a responsible way while, in fact, such devices often continue to operate in a sort of surveillance modus with a non-negligible eco-trace.

Contrary to these, a “deep sleep” of a certified CD is to be characterized by energy consumption limitely close to zero. This implies that—with exception of few micro- or nanoamperes keeping the reactivation-clock battery alive in order to know when to trigger the relaunching spark—a certified CD will be simply and measurably, off.

Eutark devices
Another means of reduction of operational costs of one’s digital infrastructure is deployment of energy-autark (or simply “eutark”) devices. We define an eutark device as a device able to produce energy necessary for its own operation.

It is not difficult to foresee the deployment of such eutark devices for educational purposes. For example, instead of forcing elementary school pupils to carry kilograms of books on their backs, kids can rather carry around a book-like digital Primer covered with photo-voltaic circuitry. Combining a circadian strategy like “boot at 15:30, halt at 16:30” with a low power consumption system-on-a-chip, such primers shall not only reduce the consumption of grid-provided electricity, but—and this is even more important—lead to enrichment of pupil’s technological and environmental awareness.

Raising awareness
A sceptic may smile, when reading the proposal to save few gigawatts a year by means of enforcing a general policy within a highly diversified German education context. And a cynic will most point out that such an effort is laughable when one realizes how much energy is consumed in an hour by an IT-component factory or a FAANG corporation data-center. And both sceptic and cynic will be right.

Or, rather, would have been right, if our proposal had not been positioned, from its very beginning, in the educational setting. That is, in a setting wherein knowledge and “best practices” are being transferred from the brain of one human agent—the teacher—into brain of one or multiple students. And students, they themselves, are also agents: ils agissent.

Hence, it may be the case that the strongest eco-value of circadian and eutark devices does not reside in energy savings per se, but rather in habits these devices would help to reinforce and amplify. By charging one’s tablet from the Grid, one acquires one kind of habits; by putting the Primer near the window to charge itself, one acquires the other kind. McLuhan’s predicament “Medium is the message” can have ecological implications, too.

Thus, at the end of the day, it may be the case that the very design of the educational medium shall motivate a pupil to turn off the light when leaving the classroom and optimizing the thermostat settings when leaving the school. An auto-catalytic spark of responsibility has been ignited and tera watts of energy can be, in the long run, saved.

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DOI 10.25592/issn2509-3096.007.016

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