TEACHING WITH EMERGING TECHNOLOGIES IN THE ´EDUCATION CHAIN´

Regina Lamscheck-Nielsen, Moeve aps, Denmark
INTED2025

This presentation includes AI-generated elements, created based on prompts by the author.

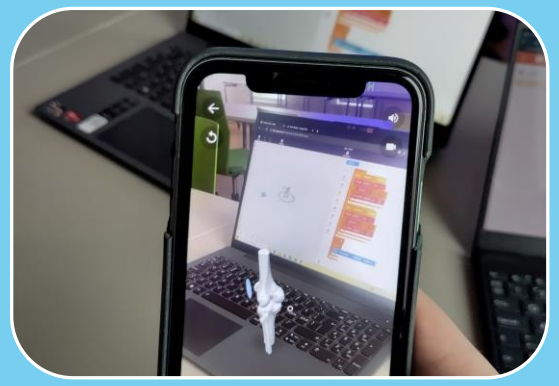
ADDITIONAL PRESENTATION: PODCAST

Explains and discusses the paper
"Teaching modules utilizing emerging technoligies in the education chain"

15 min.

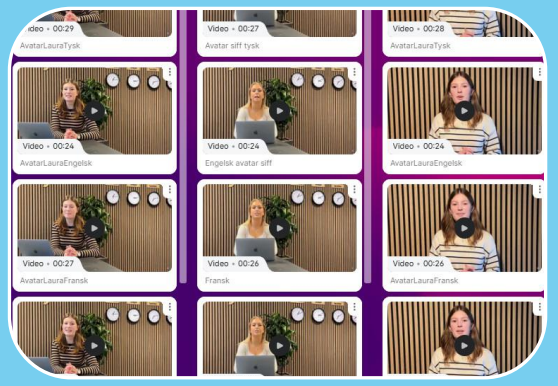
https://gdlt.sdu.dk/wp-content/uploads/2025/01/Teaching-Modules-and-Emerging-Technologies-in-Education.wav

AI-created with NotebookLM, 20th Jan. 2025



Metaverse

- Augmented Reality
- Virtual Reality
- Virtual mirrors
- Social media filters



Artificial intelligence

- Generative AI
- Interaction with human intelligence
- Applications
- Different approaches and history

Robotics

- Hardware
- Software

Trade-specific technologies

- Autonomous robotics and transport
- Welfare technologies
- Digital clones
- Complex data calculations

EMERGING TECHNOLOGIES

Identified through commercial channels, but not yet widely adopted in education.

CHALLENGES

Emerging technologies with
high uncertainty
and
significant impact

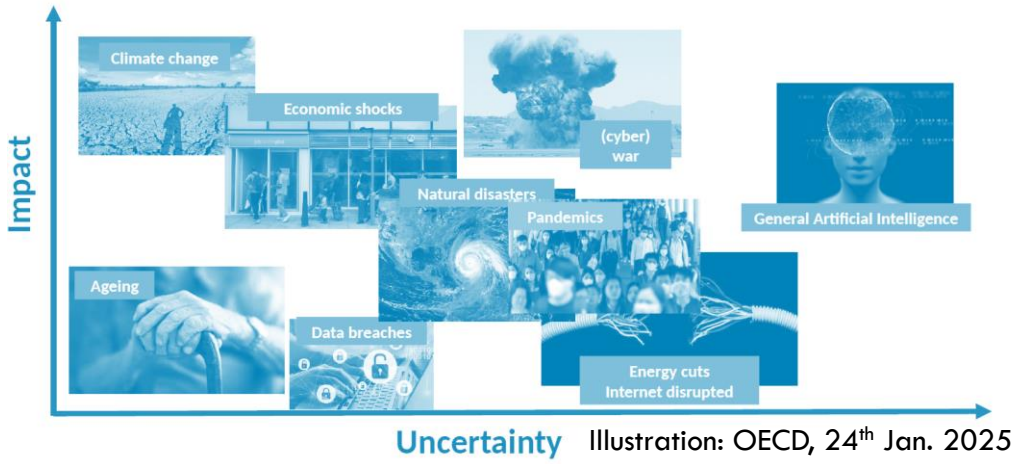


Illustration: OECD, 24th Jan. 2025

VISION

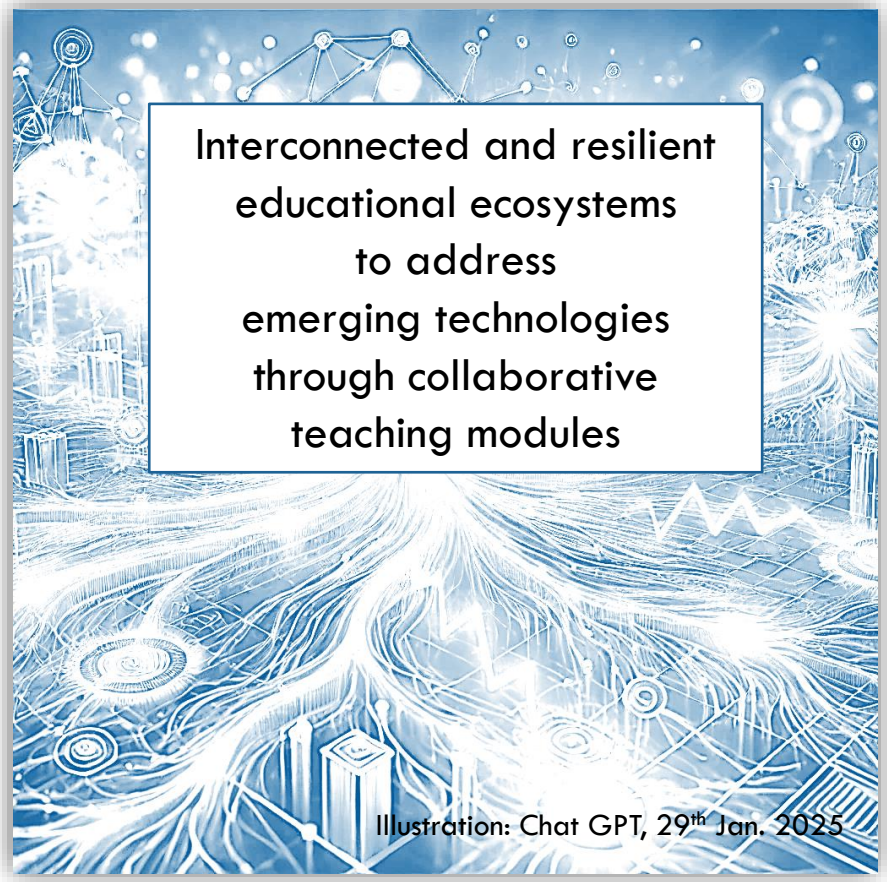


Illustration: Chat GPT, 29th Jan. 2025

´EDUCATION CHAIN´ - A CONTINUUM

Lower secondary education (grade 8 – 10)

> Upper secondary education

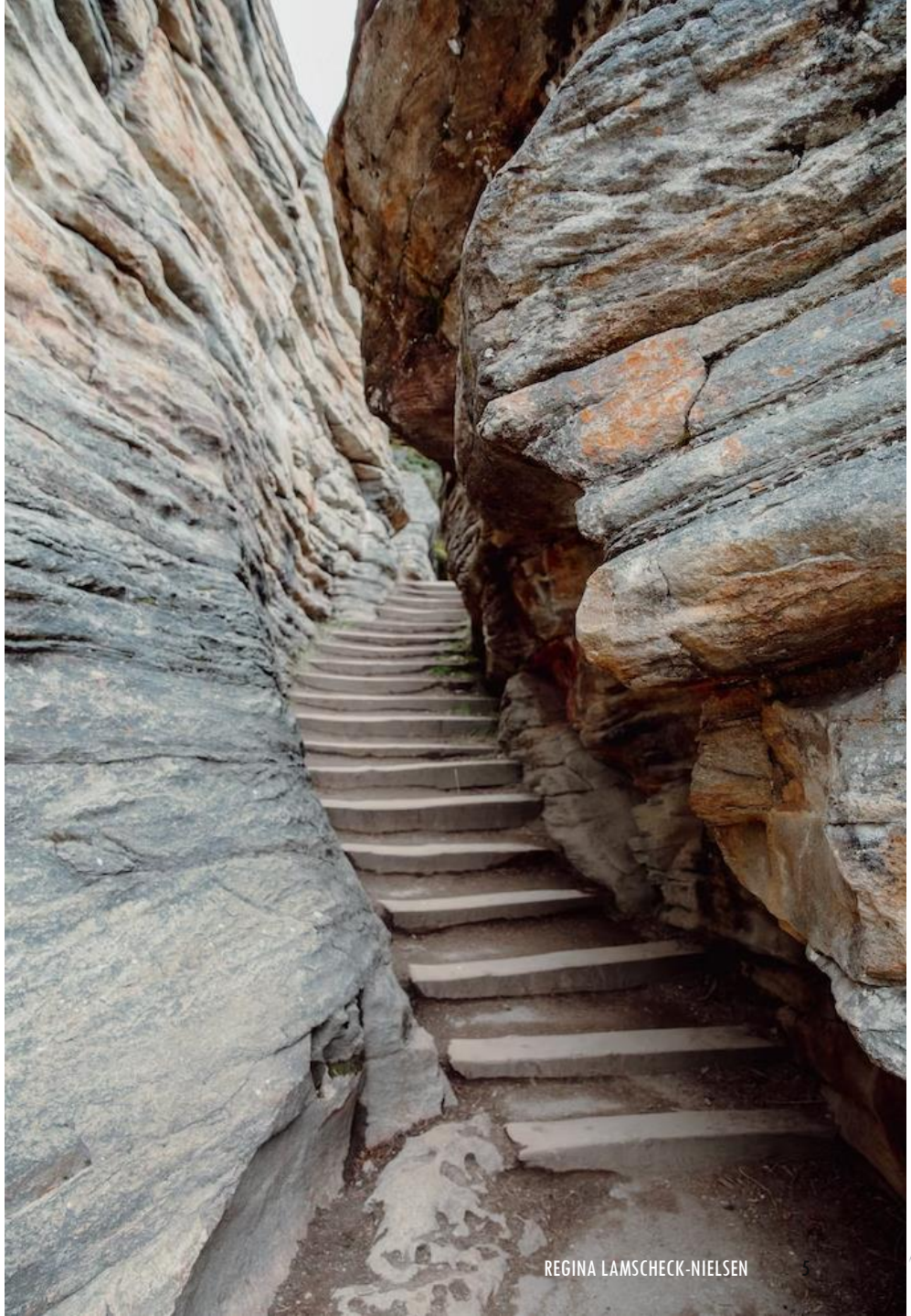
- Vocational colleges, dual education > Training companies, Job
- High schools

> Further education

- Academies
- University colleges
- Universities

> Job

Strongly simplified



REGINA LAMSCHECK-NIELSEN

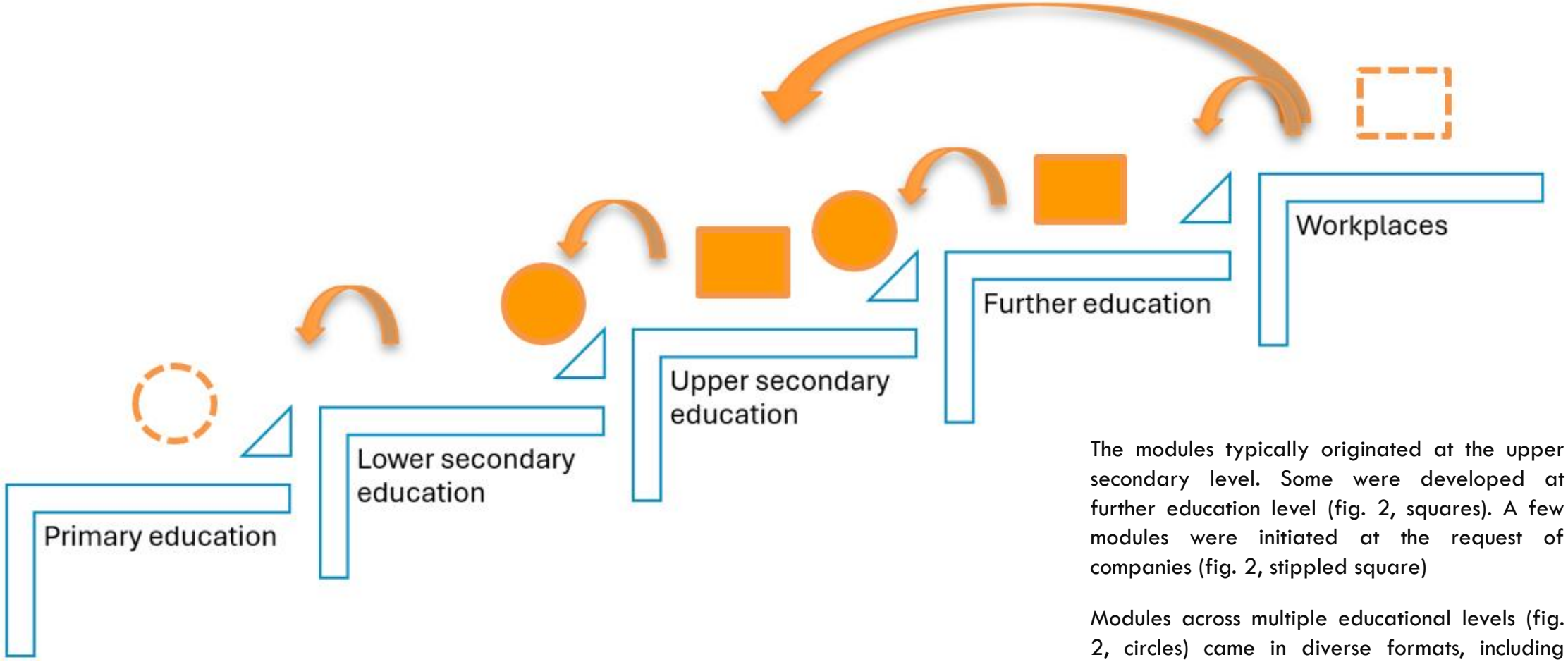


Figure 2. Teaching modules in the ´education chain´ (Lamscheck-Nielsen, 2024)

TEACHING MODULES

The modules typically originated at the upper secondary level. Some were developed at further education level (fig. 2, squares). A few modules were initiated at the request of companies (fig. 2, stippled square)

Modules across multiple educational levels (fig. 2, circles) came in diverse formats, including events, student-to-student tutoring within ordinary subjects, co-teaching for students from different programs, or joint product development by students across country borders.

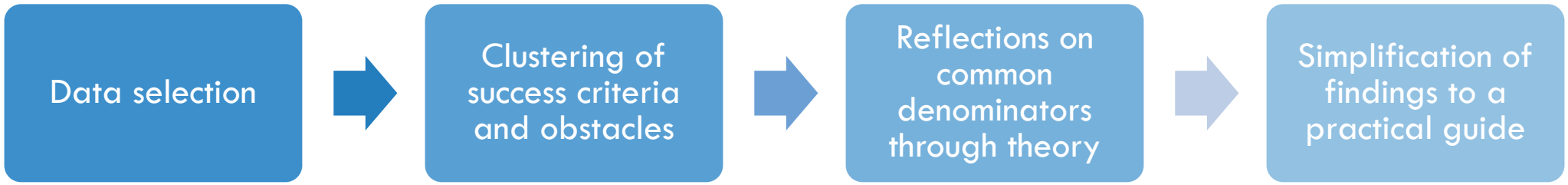
Several modules were scaled down to primary education (fig. 2, stippled circle), further expanding their reach.

Example 1, paper

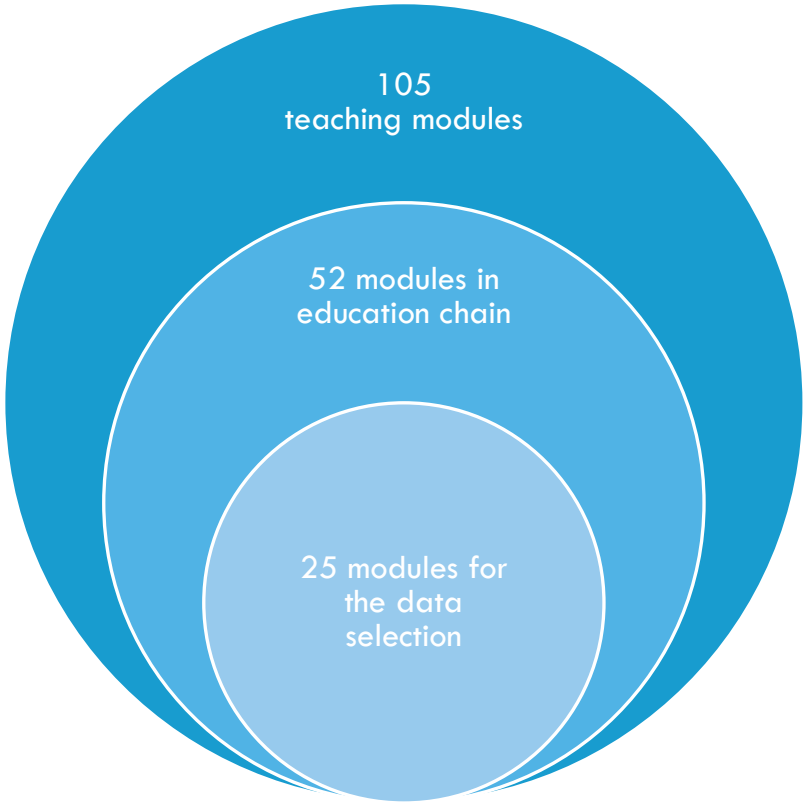
CRITERIA FOR TEACHING MODULES

- Including one or more emerging technologies
- Scalable to varying target groups, duration, levels, content
- Compliant with the respective local ordinances, as well as adaptable to different regulations
- Shared didactic framework
- A student-centered and practice-based approach: hands-on with technologies
- Origination from local initiatives, refined in teacher networks
- Focus on sustainability, wherever relevant

METHODOLOGY



DATA: 25 SELECTED TEACHING MODULES IN THE EDUCATION CHAIN



From 5 different projects (2017-2024)

Evaluated as exemplary modules

Descriptions and evaluation data available

3 examples given in paper (2023-2024)


GIRLS DAY am RBZ Wirtsch

Eine Initiative, die begeistert

MINT News

Am 5. Februar öffnete das berufliche Gymnasium des RBZ Wirtschaft Kiel seine Türen zu einem ganz besonderen Anlass: dem GIRLS DAY. Diese Initiative, die junge Schülerinnen für die MINT-Fächer (Mathematik, Informatik, Naturwissenschaften und Technik) begeistern soll, wurde dieses Jahr zum ersten Mal und mit großem Erfolg durchgeführt.

Im Mittelpunkt des Abends stand das Projekt des Mars Rovers, präsentiert von Runa, Jakob und Max aus der Klasse BG23a. Unterstützt von ihren Lehrern Merianne Alkio und Patrick Wenzel, gelang es dem Team, den Klassenraum in eine beeindruckende Erlebniswelt zu verwandeln. Die Besucherinnen und Besucher hatten die einzigartige Möglichkeit, die selbstgebauten Maschinen in Aktion zu erleben und so einen direkten Einblick in die faszinierende Welt der Robotik und Technik zu erhalten.

Das Mars Rover Projekt, ein Vorzeigebeispiel für die praktische Anwendung von MINT-Kenntnissen, diente als perfekte Plattform, um insbesondere junge Schülerinnen für diese Bereiche zu inspirieren. Die Schülerinnen und Schüler demonstrierten nicht nur ihre techni
auch für Fragen rund um
MINT-Bereich zur Verfügun

Die Resonanz auf die Ve
sitiv. Viele Teilnehmerinne
Möglichkeit, selbst Hand a
Projekten zu verstehen. De
hat gezeigt, wie wichtig u
um Stereotypen zu durchbr
Weg in bisher männerdomi

Die Veranstaltung war nic
die Teilnehmerzahlen, son
sie junge Menschen motiv
chern auseinanderzusetze
entscheidend, um das Inte
wissenschaftliche und tec
einen Grundstein für die Fa

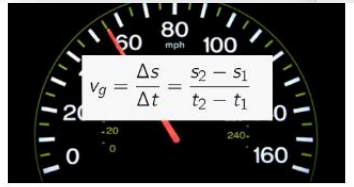
Text: Meria

RBZ Kiel & Gemeinschaftsschulen "Girls´ day with robotics"

Regina 0 comments July 22, 2024

The module was conducted 5th Feb. 2024, as a specific event in the framework of an "open house" activity at vocation
Wirtschaft Kiel, study line "business informatics". Duration: 4 hours, from 5 pm to 21 pm, plus preparation.

18 students , grade 11 from RBZ Kiel
the event. Approx. 70 pupils (predon
Patrick Wenzel, Informatics, and Mer




DK HTX Svendborg & Haahrs "Electric Go-Karts and Kinematics"

Teaching Design

Digital production

Digital literacy


DK SDU & UCL "XR in Health Education"

Teaching Design

Digital Production

Digital Literacy

Environment

January 2024

RESULTS (1) – CLUSTERED CHARACTERISTICS

Table 1. Characteristics of exemplary Teaching Modules (2017-2024)

• 25 exemplary teaching modules in the education chain (of 52 modules in the education chain) • DK: Svendborg, Odense, Glamsbjerg, Tønder, Sønderborg, Odense, Vejen, Vejle, Billund, Faaborg, Nyborg, Haderslev. DE: Kiel • Duration: from 3 hours up to 3 weeks • As lessons, blocks, events, co-lecturing, online collaboration on distance, and more		Technologies	Students´ Learning objectives	Students´ Learning
		Consciously chosen Scaled versions Students hands-on	Overlap between levels (generic objectives for educational programs) Learning results over average	Innovative learning products Personal interaction Co-influenced by students
Students´ motivation	Digital literacy	Students´ career learning	Teachers	Mind-set
High commitment Excitement Personal relevance	Critical approach, ethics, context-related to society Focus on students´ actionability IT-security	Peer-to-peer References to business Practical approach Collaboration with companies	Teacher-teacher collaboration across levels Joint ambitions Mutual benefits Mutual respect	Sustainability Integration in daily operations Agility, flexibility

RESULTS (2) – SUMMARIZED OBSTACLES

Obstacles	Well-proven solutions
Different school types operate with varying planning horizons and yearly schedules.	Planning well in advance, with active management support.
Lack of shared infrastructure to facilitate direct communication between teachers and students within the education chain.	Joint websites, TEAMS rooms, or Padlets as virtual communication channels accessible to all participants. Personal meetings.
Extraordinary costs, such as those associated with events or transportation	Incorporation of associated costs into the schools´ annual planning and budgets.
Additional time resources are often required for coordinating efforts among the teachers involved.	Local negotiations.
Differing cultural practices, values, and frameworks for pedagogical work across educational levels and sectors.	New mind-set required. Should be addressed, with mutual respect for differing approaches. Open-minded communication and trust-building are critical to success.

ANALYSIS AND FINDINGS (1)

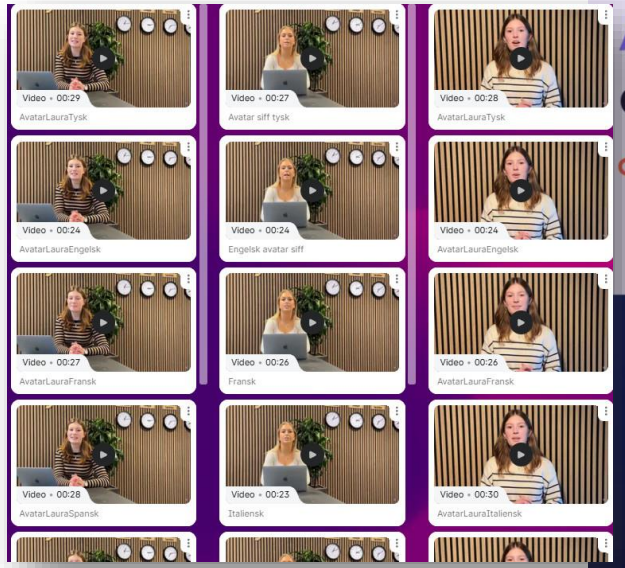
Technologies and Digital Literacy

It is possible to adapt emerging technologies (Gartner Hype Cycle)to educational purposes.

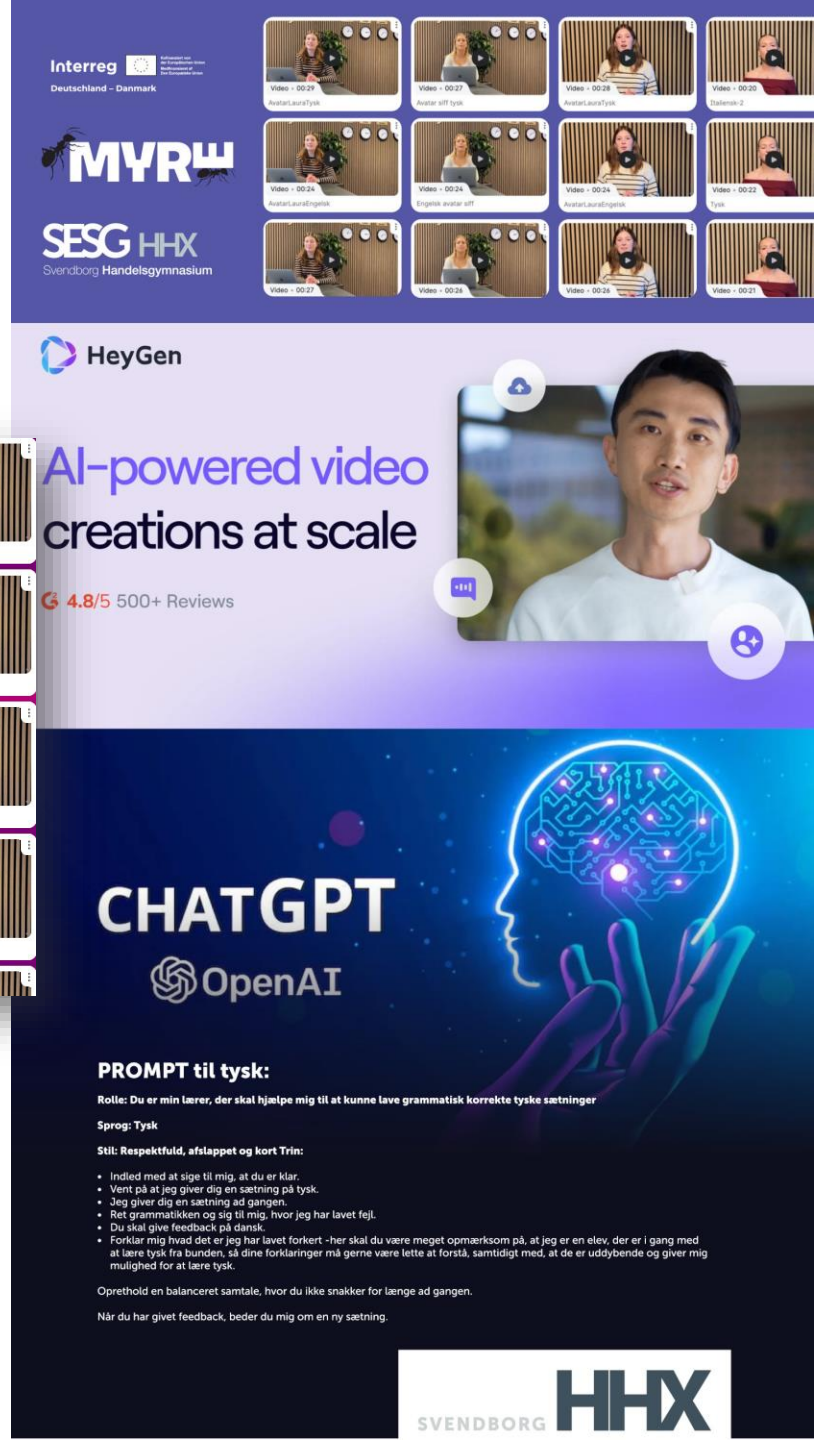
These technologies can be adapted to various educational levels by using differently advanced hardware and software versions.

Cross-level co-exploration of the latest technologies benefits both teachers and students.

There is an urgent need for Digital Literacy in teaching (Majgaard, Lamscheck-Nielsen), including IT security, data protection, ethical considerations, and the societal impact of technology.



Students created AI-generated avatars to communicate about themselves and the Danish education system across the country border (2024)



ANALYSIS AND FINDINGS (2)

From ´Education Chain´ to ´Learning Chain´

Coherent learning objectives and transparency of pedagogical and didactical approaches

Diminishment of traditional competition between the educational instituion (Moore)

New focus on shared high ambitions for the students, the quality of teaching, teachers´ mutual empowerment, and increased avalailability of technological resources

Promotion of ”societal resilience” (Anholt et al.) through new ”adaptive and transformative capacities” in the local education chains, with understanding for different approaches, which are complementary to each other

´Education chain´ as ”ambition loops” (McGrath et al.) for professional teacher empowerment

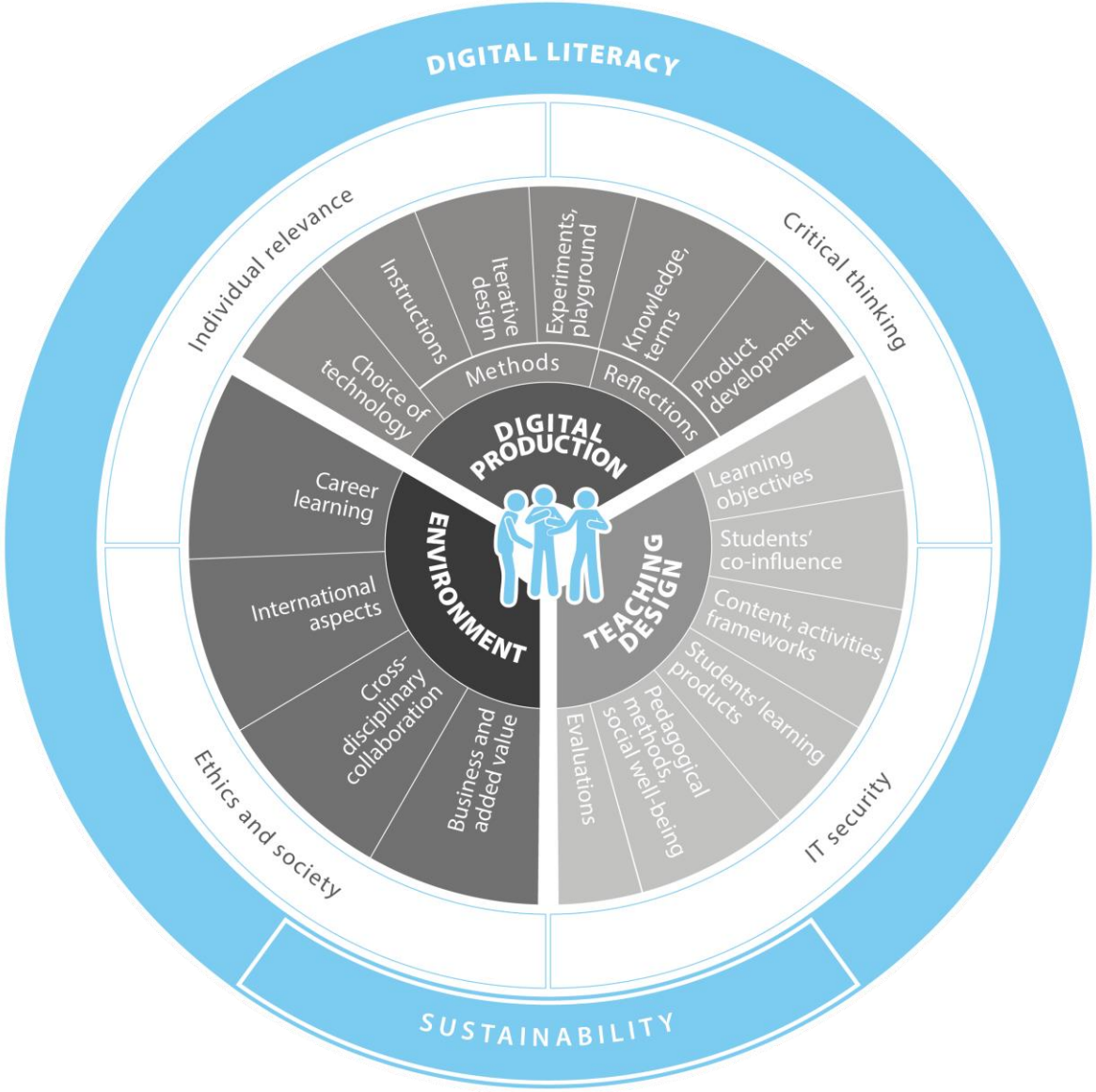
Teachers and lecturers across educational sectors and levels (2023-2024)

ANALYSIS AND FINDINGS (3)

Students´ Learning and Didactics

A joint didactic framework facilitated communication and was supportive for mutual understanding across educational levels and sectors:

- Digital production, selecting appropriate technologies and methods for production
- Teaching design, addressing classic elements such as defining learning objectives, selecting pedagogical methods, and specifying students' learning products
- Environment focusing on interactions with the school's ecosystem
- Digital literacy, encompassing ethics, IT security, and personal relevance of the technologies
- Sustainability, encompassing both environmental and social aspects, as a shared responsibility
- Students at the center of the didactics



´DigiDidactics´ (Nov. 2024, project MYRE DK-DE)
Originated from ´ROBOdidactics´ (2019)

GUIDE FOR SUSTAINABLE IMPLEMENTATION

Step (1) includes exploration and commitment to collaboration within the local education chain.

Step (2) relates to scaling of the teaching design across the educational levels, integrating digital production, focus on digital literacy, and potentially incorporating other aspects of the environment.

Step (3) transfers the decisions made into educational practice, ensuring quality assurance and focusing on the long-term sustainability of the implemented modules.

3 SUSTAINABLE IMPLEMENTATION a) Coordination and practical agreements, cross-organizational communication channels, and shared virtual infrastructure b) Shared didactic framework for communication, joint terminology, quality assurance, and mutual feedback c) Focus on sustainability with integration in ordinary daily operation and budgets	
2 SCALABLE TEACHING MODULES a) Identification of technologies, topics, subjects, and ethical challenges b) Drafting of teaching module as original (or reuse of previous modules) c) Scaling of technologies and content to different target groups and settings	
1 FOUNDATION FOR THE CONNECTIVE PRINCIPLE a) Identification of partners for the local education chain b) Commitment from management: joint vision of a resilient educational ecosystem with mutual respect and meaningful benefits for all educational partners c) Professional dialogues among teachers, exploring each other´s mindsets	

Table 3. Sustainable Implementation of Scalable Teaching Modules (Lamscheck-Nielsen, 2024)

CONCLUSIONS

Need for connectivity between educational institutions

- relatively easy to implement
- directly benefits all involved partners

Co-created teaching modules across educational levels, scaled and adapted to each context, have the potential to serve as vital links

Connective teaching modules appear to

- empower the students and teachers involved
- strengthen the local ecosystem by equipping educational institutions to engage with the technologies of the future

´Societal resilience´ is increasingly necessary in the face of megatrends and global crises

A sustainably maintained connectivity

- is integrated into daily operations
- utilizes teaching modules that are created with purpose and meaning for all stakeholders

Aligned with SDG #17 for multi-stakeholder partnerships

- encouraging reuse, promoting resource sharing, strengthening communities, facilitating the transparent involvement of new partners

REFERENCES

B. Law, “Building on what we know – career-learning thinking for contemporary working life”. In: Watts Anthony G. et al. (eds.): Rethinking Careers Education and Guidance – Theory, Policy and Practice. London: Routledge, 2010.

G. Majgaard et al., “Digital Literacy and Course Design”. Proceedings of the 18th Conference on e-learning ECEL 2019. Academic Conferences and Publishing International.

J. Kawakita (Rev. Ed.), The Original KJ Method. Tokyo: Kawakita Research Institute, 1991.

J. Moore, Death of competition. New York: HarperBusiness, 1996

J. McGrath, “What systematic connections should we have around schools to support the work of teachers?” OECD Education Working Papers no. 296, 2023

P. Schlögl (ed.), Wie wollen wir arbeiten? Berufliches Lernen zwischen Tradition und Transformation. Proceedings of 7th BBFK, Bundesministerium Bildung, Wissenschaft und Forschung, 2022.

R. Anholt, et al., “Understanding Societal Resilience” in Multisystemic Resilience (M. Ungar), p. 551-564 Oxford University Press, 2021.

R. Lamscheck-Nielsen, “Resilience for Innovation projects in the Education sector”, presented at 15th International Conference on Education and New Learning Technologies EDULEARN 2023.

DigiDidactics myre.tech (coming up, 2025)