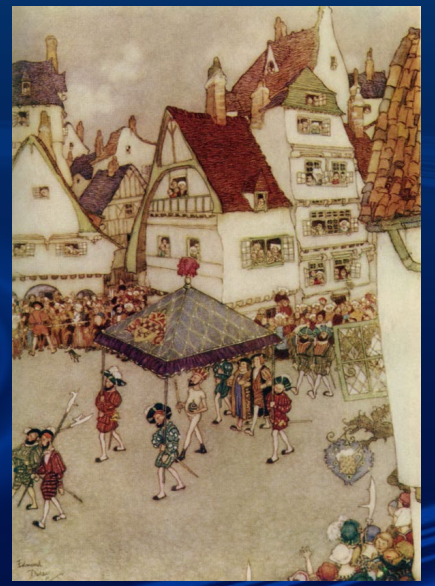
Friedrich-Alexander-Universität
Erlangen-Nürnberg

FAU

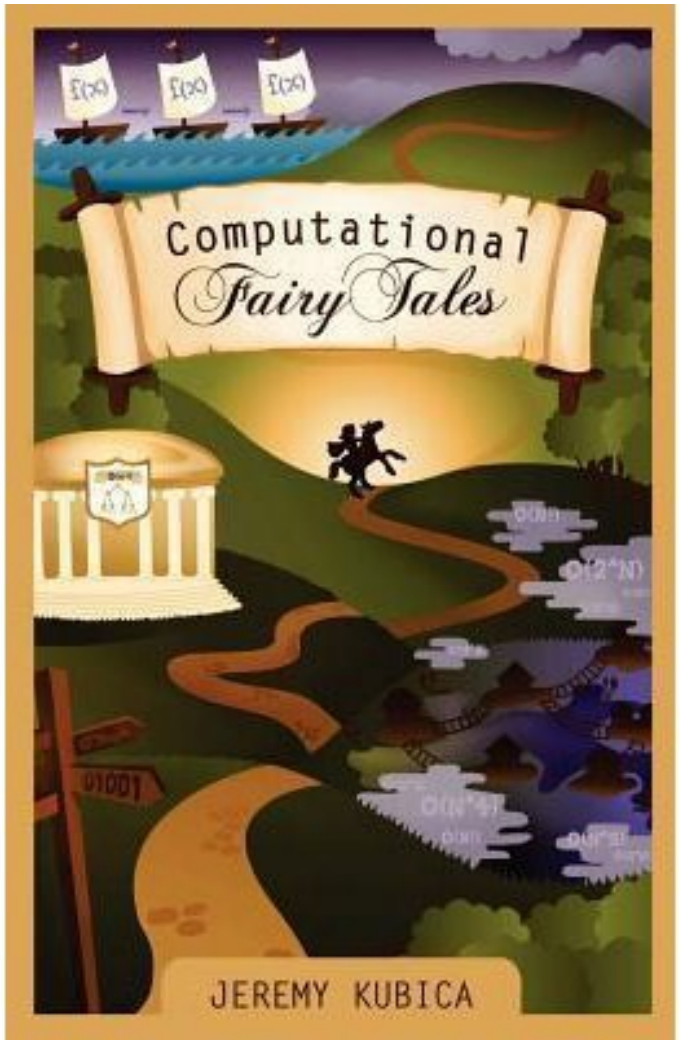
AI (in) Education – The Emperor's New Clothes?!



Marc Berges, Professorship for Computer Science Education

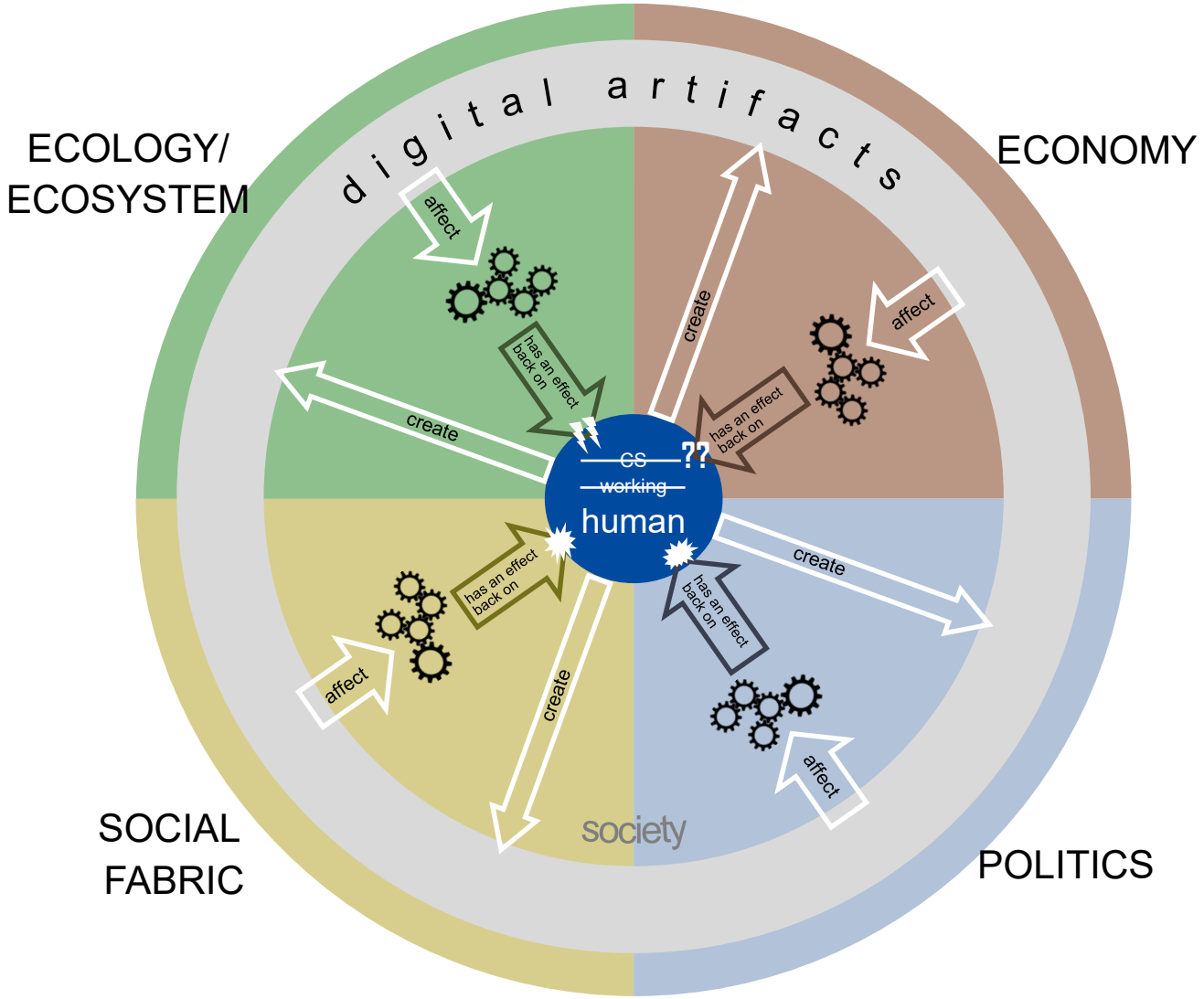
Friedrich-Alexander-Universität Erlangen-Nürnberg

Computational Fairy Tales



Computational Fairy Tales

Interdependence of Computer Science and Environment



Observations:

- change of society through computer-science and related artifacts
- retroaction effects of digital artifacts and environmental changes back on humanity

Implications on (CS) education:

- content must be continuously adapted to new requirements
- Requirements/retroaction from the environment must be known
- The consequences of creating digital (CS) artifacts and their impact on the environment must be assessed in advance and taken into account from the beginning

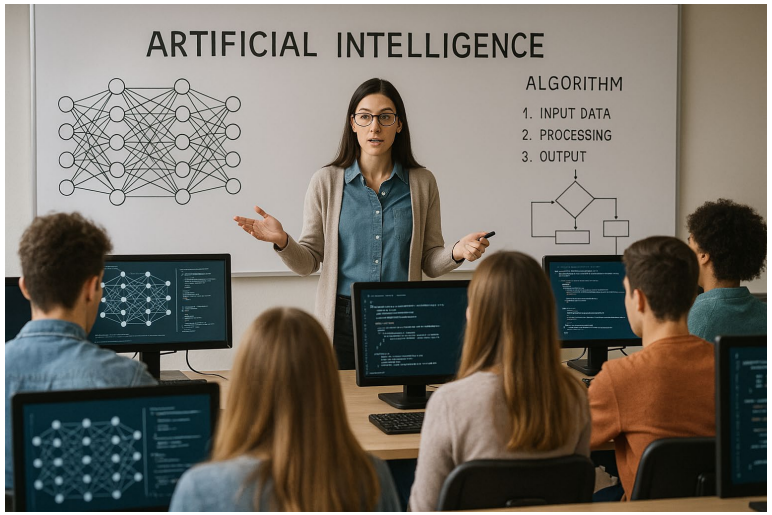
[Vollhardt & Berges, 2025]

AI-Education!

1. AI Education should be part of a digital enlightenment that demystifies and objectifies the discussion about AI.
2. AI Education is a multi-perspective and interdisciplinary challenge. It requires critical reflection and judgement in the context of individual and social behaviour
3. AI Education falls short when AI systems are presented as a solution to problems in the education system, such as the shortage of teachers and the increasing diversification of learning achievements
4. AI Education should incorporate the guiding principle of sustainable development for normative orientation and evaluation of the goals and consequences of the social use of AI
5. AI Education plays a central role in informatics education by promoting the combination of creative-formative and analytical-interpretive processes and thereby demonstrating architectural and relevance perspectives.
6. AI Education not only encompasses individual knowledge and reflection, but also enables social participation, co-determination and co-design in the social sphere. AI Education is always also political.

https://doi.org/10.21240/mpaed/00/2025.07.07.X

AI in the context of education



AI in School Management – Study Design

- Collecting school list with corresponding statistical details for all schools in all German federal states
- online questionnaire
- Have research approved in all federal states
- Sampling on the basis of the school list considering constraints (e.g. all types of schools should be represented, at least two schools in each bucket)
- Invitation by personalized email
- Reminder of the survey by e-mail
- Not under GDPR (by design)

Vollhardt & Berges, submitted

AI in School Management – Study Design

- School type, federal state, position, number of students, type of school authority
- Affinity for Technology Interaction (ATI) (Franke et. al, 2019)
- General Attitudes towards Artificial Intelligence (GAAI) (Schepman & Rodway, 2020 bzw. 2023)
- Scale for non-expert AI Literacy (SNAIL) (Laupichler, 2023 bzw. 2024)
- Experience with AI Systems (private and professional)
- Professional Development in AI
- Expectations on AI PD programs (content and organization)
- Readiness for AI PD programs (general and temporal)

Vollhardt & Berges, submitted

AI in School Management – Study Participants

Number of Participants: N=905 (1199) out of 8253 school invited

753 report a distinct function

Function	Rel. frequency
Principal	53%
Deputy principal	13%
Extended School management	14%
Responsible for digital school development	5%
IT representative	6%
School board member	1%
Miscellaneous	9%

Vollhardt & Berges, submitted

AI in School Management – Affinity for Technology Interaction

6-point Likert scale

9 items (3 negative formulation)

N=891

M=3.76; SD=1.29; α=.92

Vollhardt & Berges, submitted

AI in School Management – General Attitudes towards Artificial Intelligence

5-point Likert scale

20 items (12+8)

N=863

	Mean	SD	Cronbach
GAAIS-Positiv	3.60	1.11	.84
GAAIS-Negativ	3.24	1.10	.82

Vollhardt & Berges, submitted

AI in School Management – Scale for non-expert AI Literacy

N=878

Technical Understanding

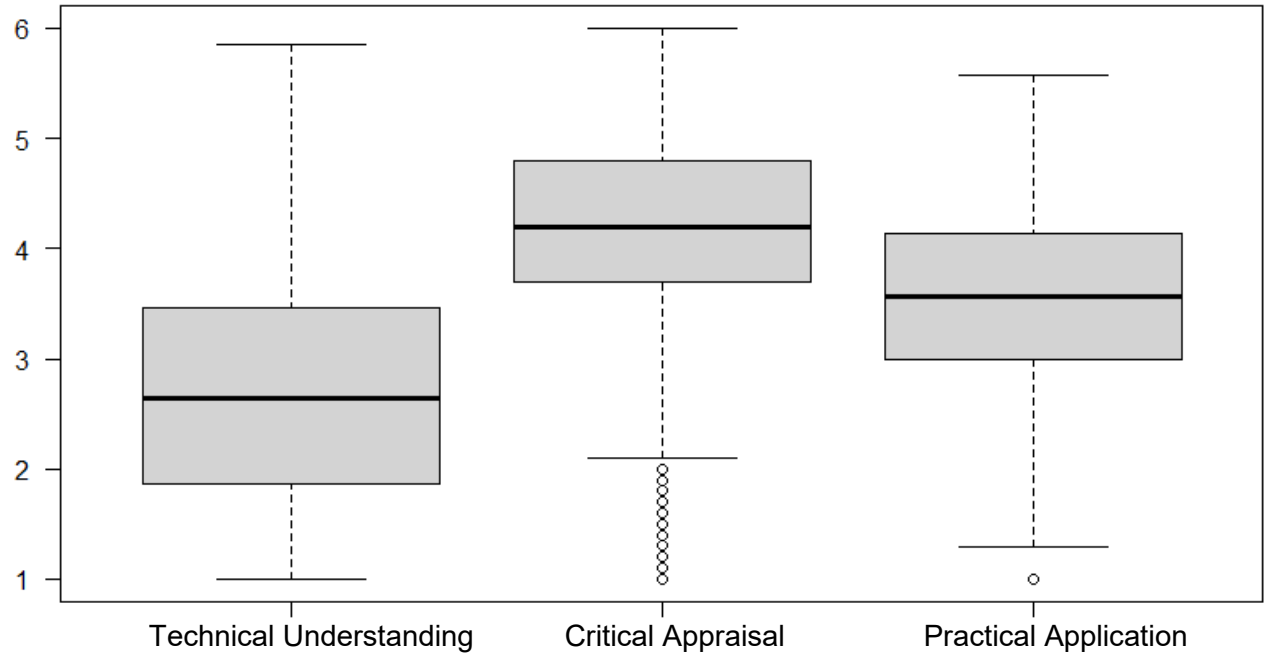
M=2.7; SD=1.4; α=.95

Critical Appraisal

M=4.15; SD=1.2; α=.93

Practical Application

M=3.56; SD=1.6; α=.82



Vollhardt & Berges, submitted

AI in School Management – Scale for non-expert AI Literacy

Web search	
Text work	
	Writing Letters
	Speechwriting
	Writing Emails
	Writing Texts (general)
	Writing performance reviews
	Translations
	Simplify texts
	Summarize Texts
	Writing letters to parents
	Misc

Vollhardt & Berges, submitted

AI in School Management – Professional Use

Teaching-related use	
	Lesson preparation/development of teaching materials
	Designing exam questions
	Support for students
	Corrections and Marking
	Develop teaching ideas
Image work	
	Generating images
	Creating presentations
	Image processing
Audio work	
Misc	

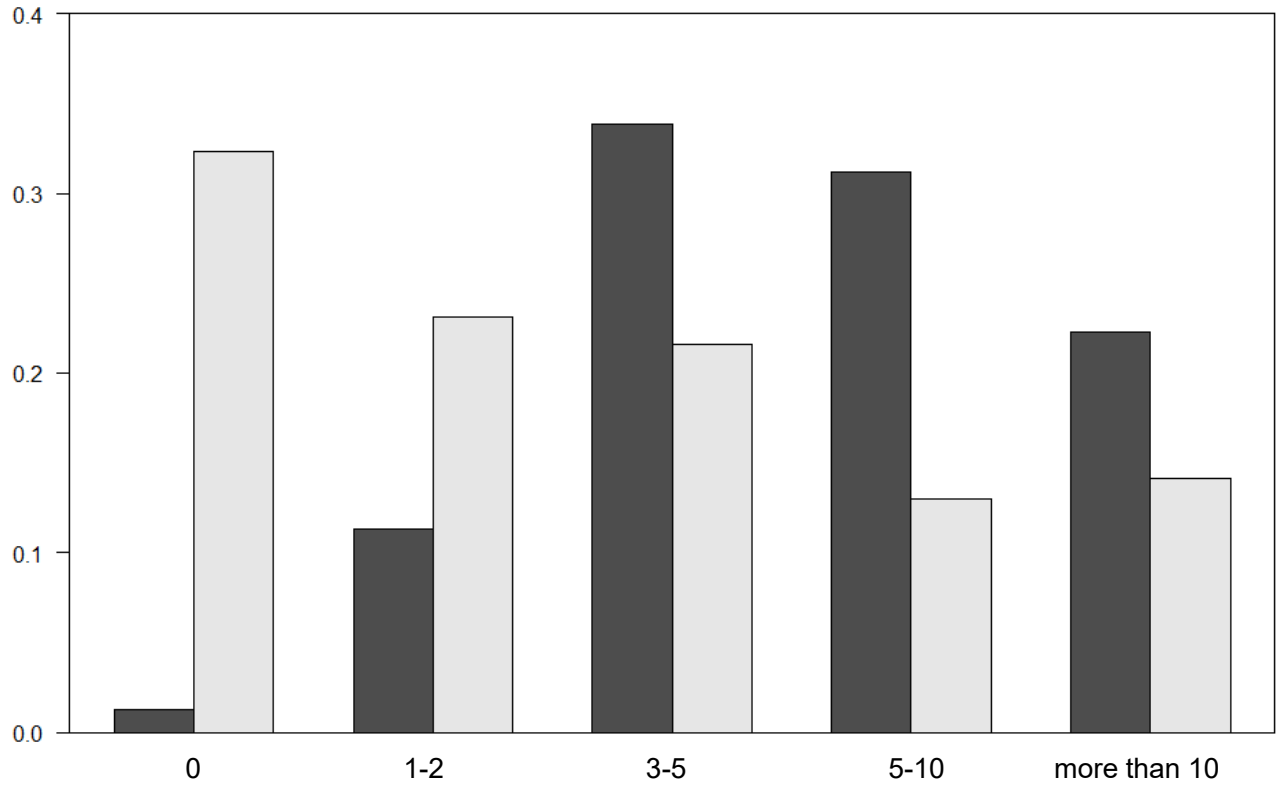
Vollhardt & Berges, submitted

AI in School Management – Professional Use

Name of the Tool	Rel. Frequency	Frequency
ChatGPT	63,0%	307
Fobizz	18,9%	92
Microsoft Copilot	6,4%	31
Perplexity	6,2%	30
DeepL	5,5%	27
AI-System provided by the Federal State	3,3%	16
To-Teach	3,1%	15
DALL-E	2,9%	14
Google Gemini	2,3%	11
Misc	25,1%	122

Vollhardt & Berges, submitted

AI in School Management – Readiness for Professional Development



How many hours can be spent for AI PD (dark gray) vs. Hours already spent (light gray)

Vollhardt & Berges, submitted

AI in School Management – Expectations in Professional Development

1. Identify meaningful ways to use AI systems in schools
   - Practical application (“Practical examples for use in schools.”)
   - Critical analysis (“Laying the foundation for critical analysis.”)
   - Subject-specific training (“Training courses specifically for my subjects (biology, chemistry, sciences) with concrete examples of application.”)

2. Identifying opportunities for support through AI systems
   - Relief from routine tasks (“Simplification of routine tasks, automated responses to frequently asked questions.”)
   - Increased efficiency (“Use for administrative tasks, use for school organization.”)

3. Legal and ethical aspects
   - Data protection (“Data protection and data security when entering data (GDPR, EU AI Act).”)
   - Ethical principles (“Highlight opportunities AND risks, promote fundamental openness to technology, but also train critical awareness.”)

Vollhardt & Berges, submitted

AI in School Management – Expectations in Professional Development

4. Enabling networking and exchange on AI-related issues
    - Sharing experiences (“Example prompts that can then be easily transferred to actual needs.”)
    - Integration into school development (“Implementing AI is a comprehensive school development project and should be treated as such.”)

5. Explain the technical fundamentals of AI
    - Understanding of the technology as a whole (“Technical functions of AI (what distinguishes the different systems that we commonly refer to as AI).”)
    - Technical understanding of AI tools (“How does AI or the algorithms work?”)

6. Address concerns and limitations regarding AI
    - Allay fears (“Convey the approach positively. Allay fears.”)

Vollhardt & Berges, submitted

AI in School Management – Expectations in Professional Development

7. Impact of AI artifacts on education and performance assessment opportunities
    - Reasonable performance assessment (“potential for change in diagnostics”)
    - Recognizing the use of AI (“dealing with student results generated by AI”)
    - Support in assessment and diagnosis (“help with performance assessment”)

Vollhardt & Berges, submitted

AI in School Management – PD Goals

Content Level

- Improve basic knowledge of AI
- Highlight the opportunities and risks of using AI systems in school management
- Present examples of good practice and ideas for the practical use of AI systems in school management
- Overall: Strengthen AI literacy and (as a result) decision-making and action-taking skills in the context of AI

Vollhardt & Berges, submitted

AI in School Management – PD Goals

Emotional-affektive Ebene

- Reflect on existing attitudes toward (the use of) AI
- De-anthropomorphize and demystify AI systems
- Achieve a value-neutral, open, and critically informed attitude toward AI technology

Motivationale Ebene

- Want to use artificial intelligence effectively in your everyday work
- Want to develop and implement a sound and sustainable AI strategy for your own school

Metakognitive Ebene

- Raise awareness of the impact of Artificial Intelligence
- Emphasize the importance of one's own professional role as key to successfully dealing with AI (cf. Diffusion of Innovations Theory, Rogers)

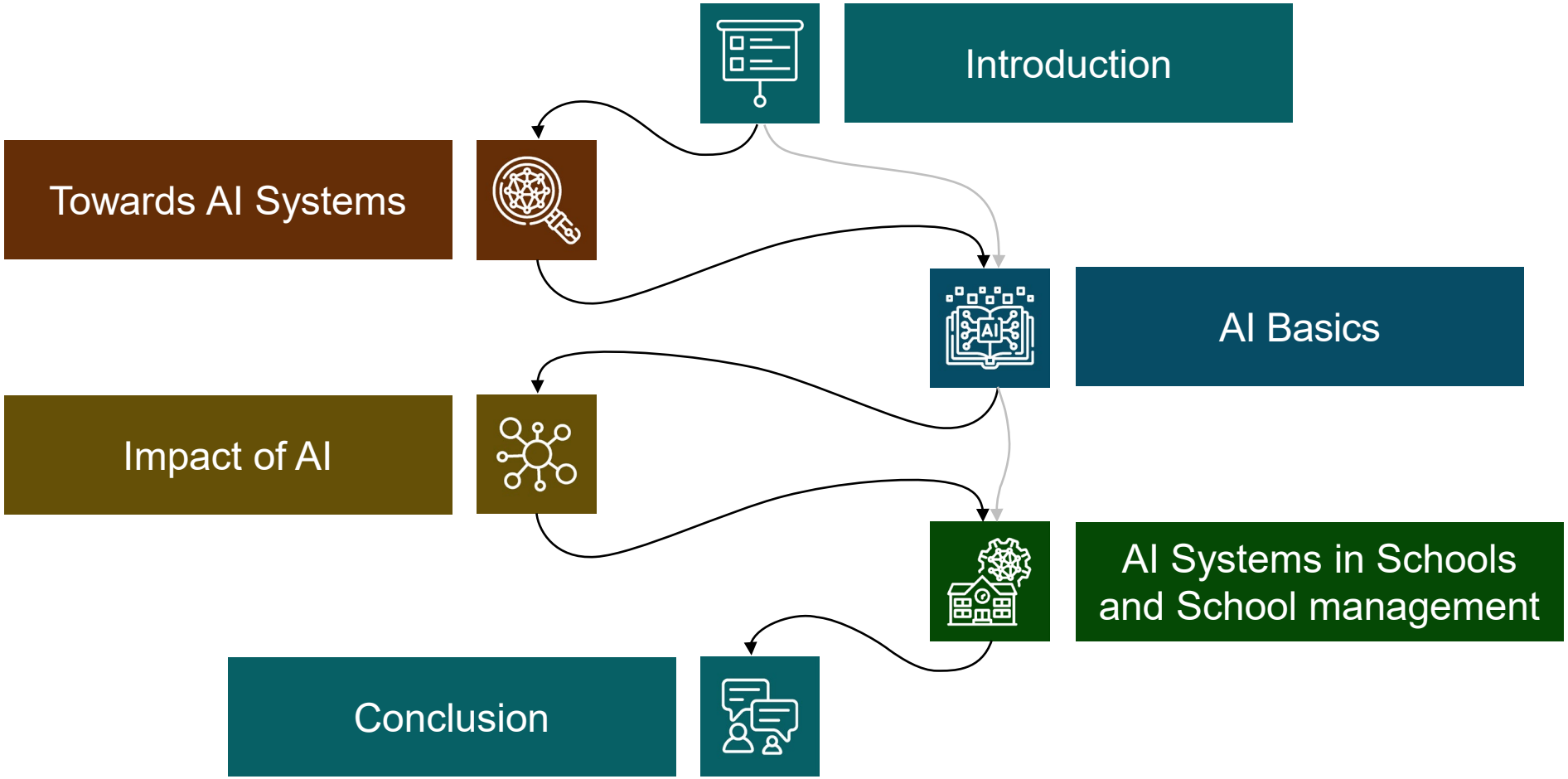
Vollhardt & Berges, submitted

AI in School Management – PD Format

- Digital and asynchronous self-study program
- Implemented as a Moodle course
- Strongly subdivided into many individual but interconnected learning units (so-called “modules”)
- Time required for one module: approx. 5–15 minutes
- A total of approx. 20 to 30 modules in four module groups
- No linear sequence, but rather a knowledge- and interest-driven sequence
- Can be supplemented by face-to-face sessions (for exchange and consolidation)

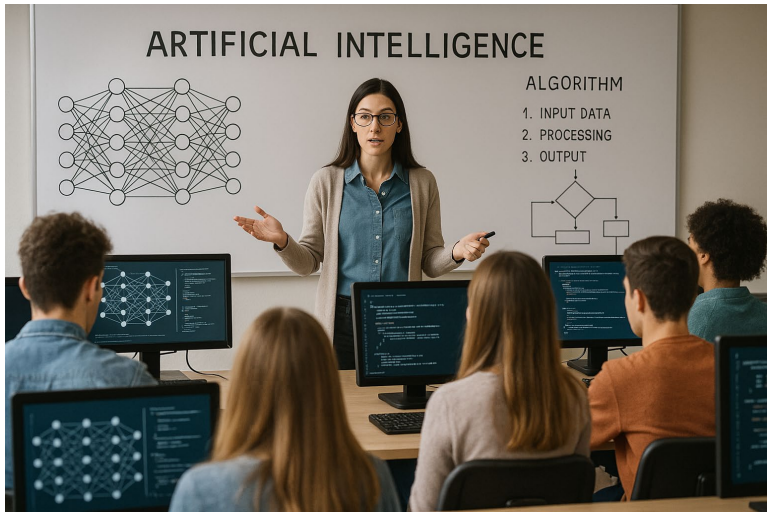
Vollhardt & Berges, submitted

AI in School Management – PD Format

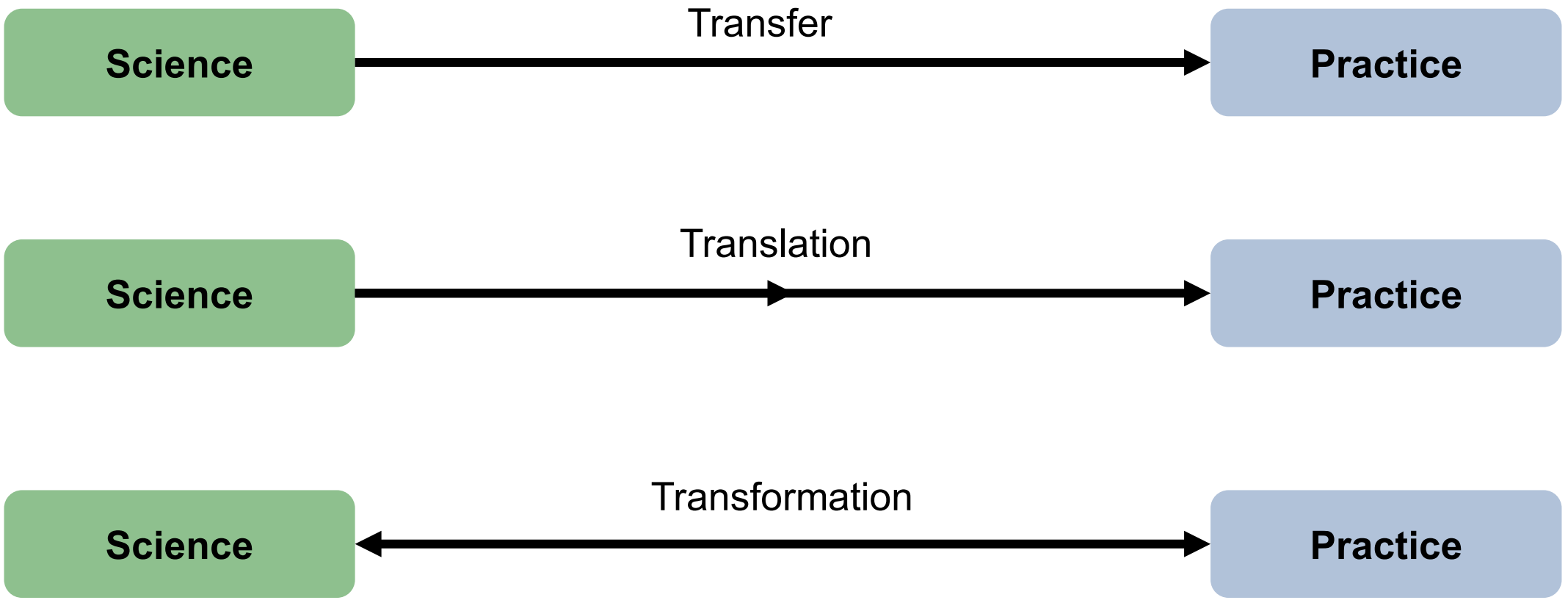


Vollhardt & Berges, submitted

AI in the context of education



Knowledge Transformation



[Carlile.2004]

From Homogenity to Diversity

Homogeneity

- The learners are considered comparable and therefore receive the same intervention/material.
- No recognition of differences

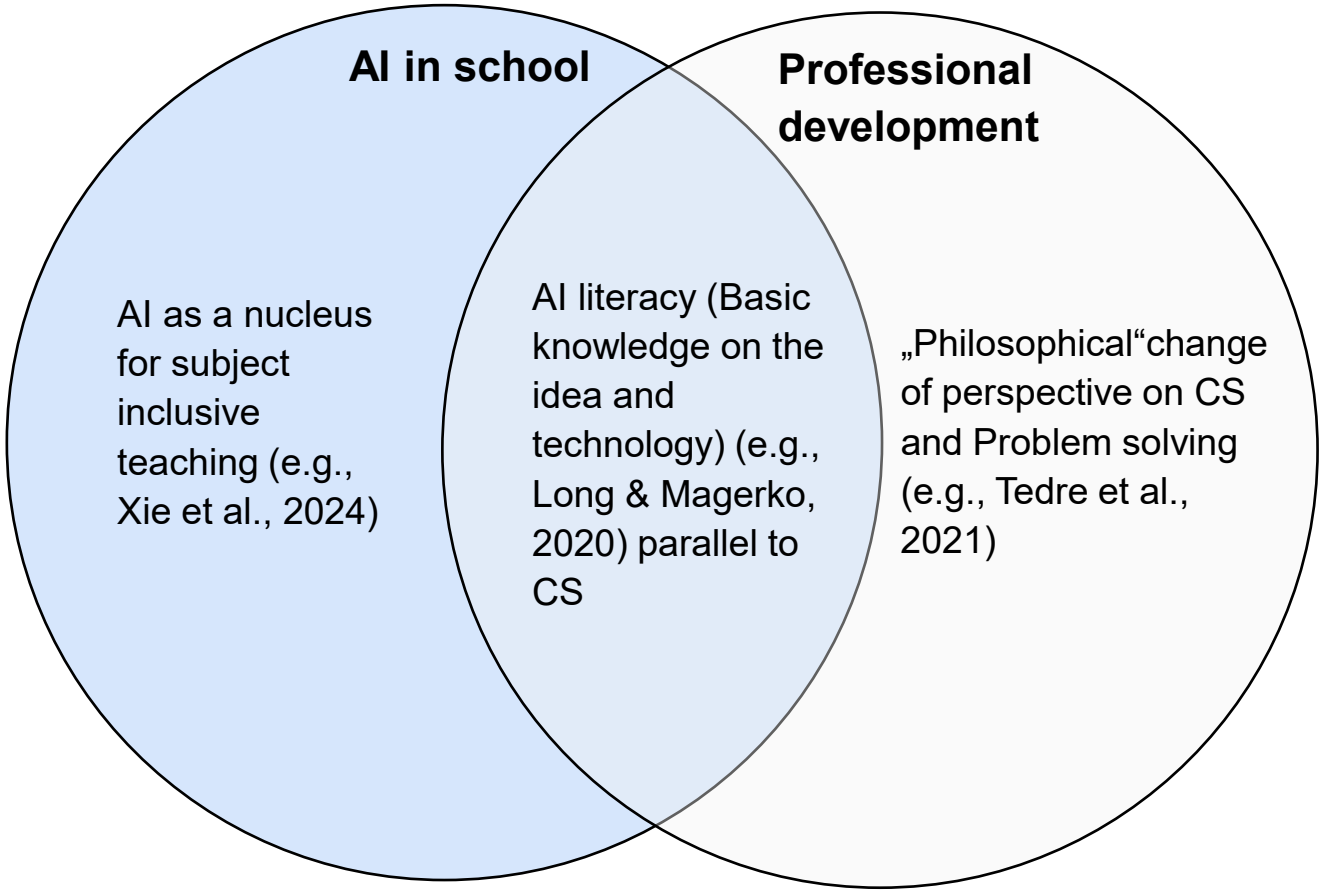
Heterogeneity

- Learners are considered to be different. Modifications are made to meet their different needs.
- Diversity as a challenge that must be faced

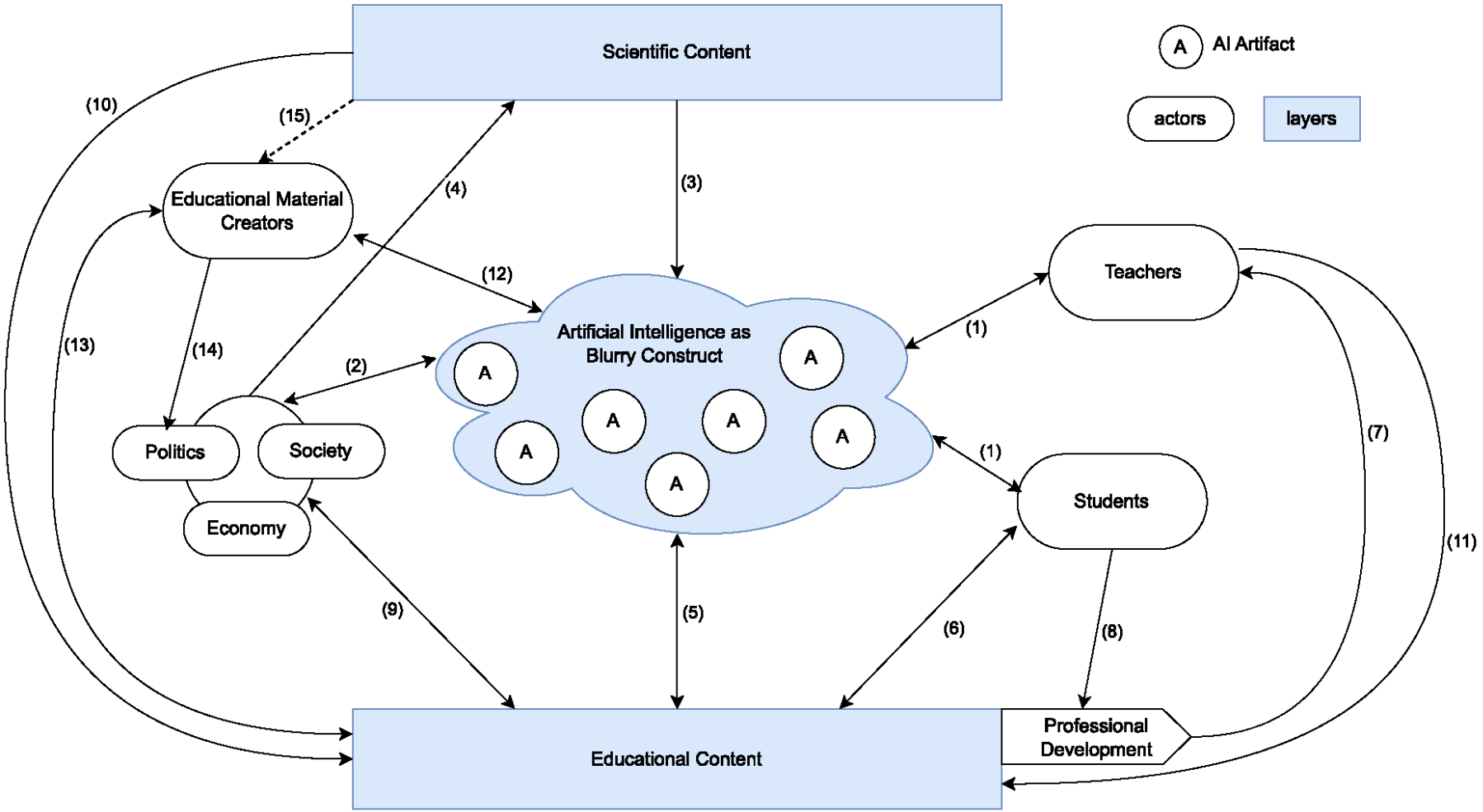
Diversity

- Learners are viewed as diverse. Diversity serves as a resource for individual and mutual learning and development.
- Differences are seen as an asset and a learning resource.

AI as content

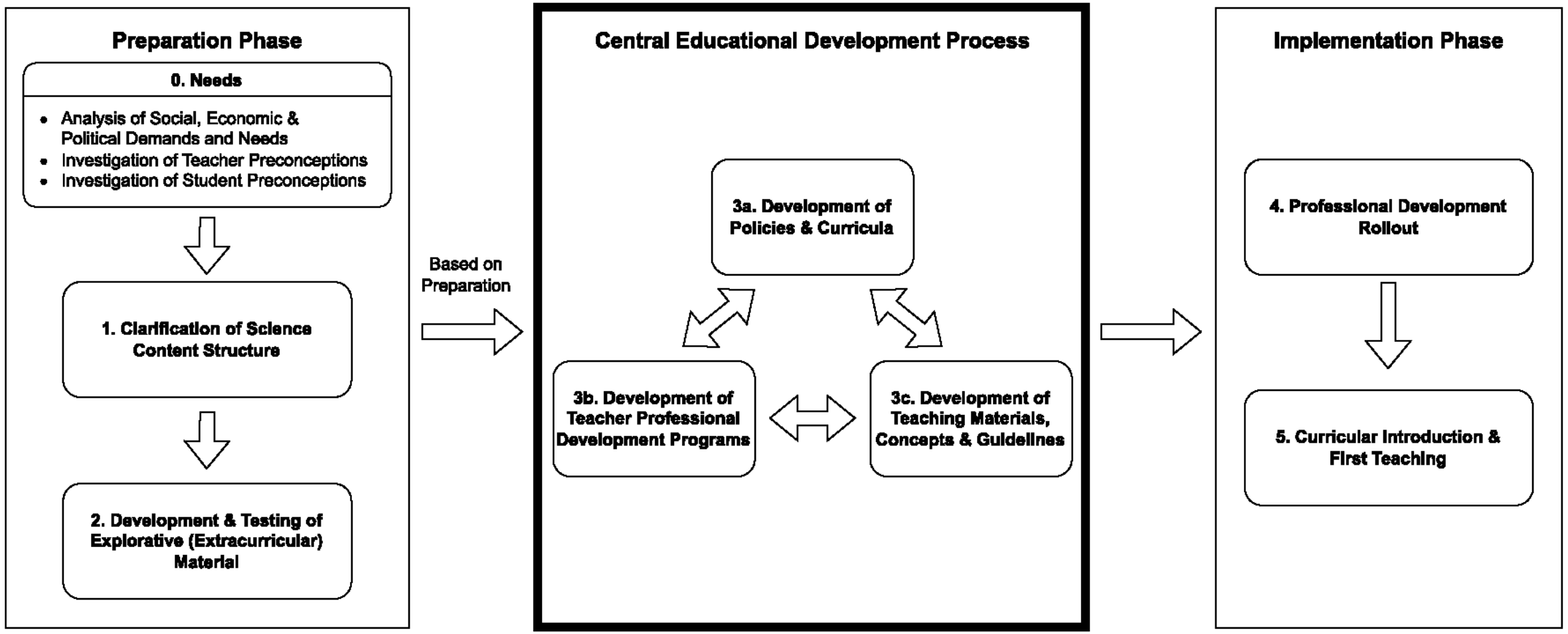


AI as content - Professional Development



[Lindner and Berges, 2024]

AI as content - Professional Development

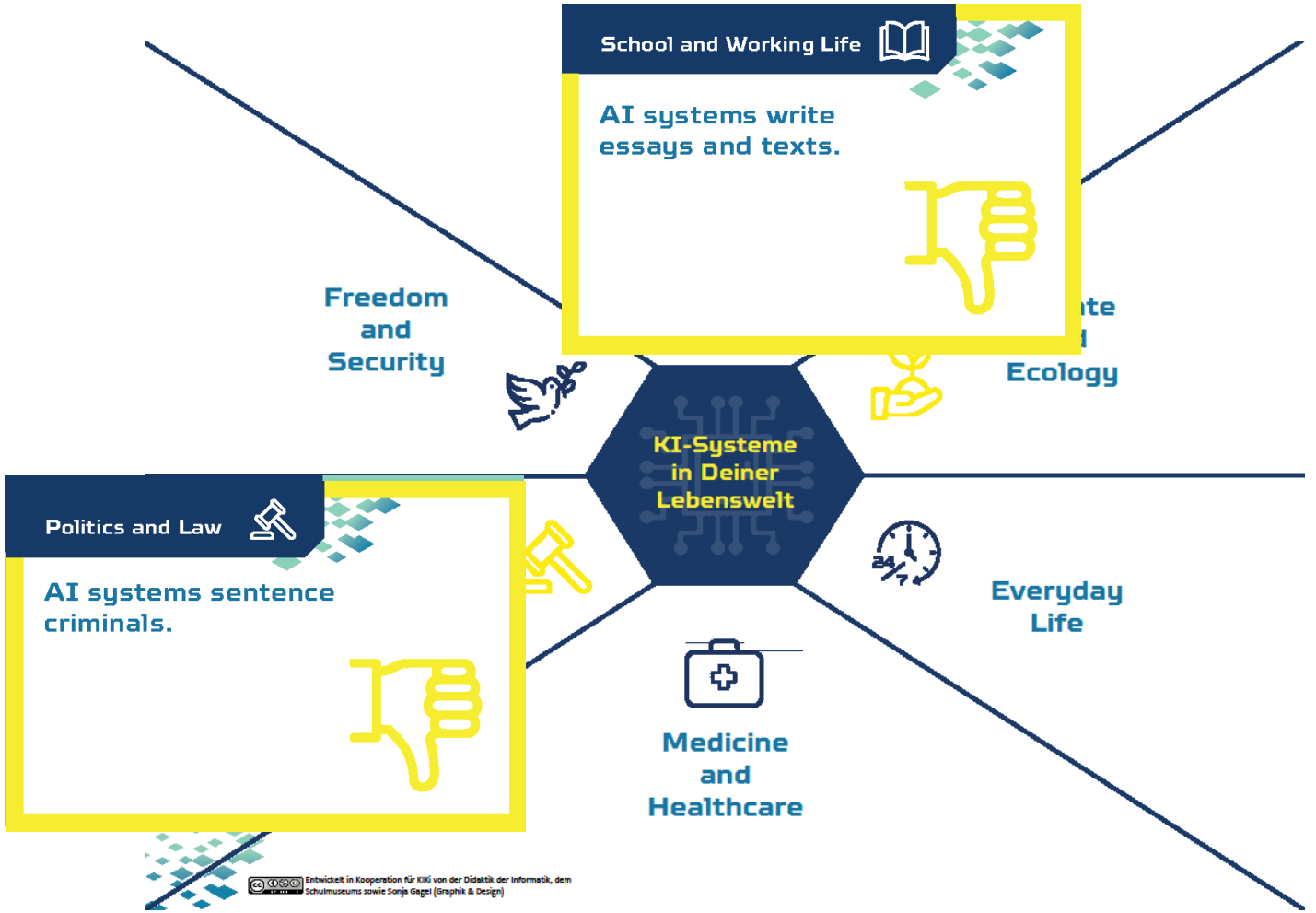


Lindner and Berges, 2024

AI as content – AI in the Box

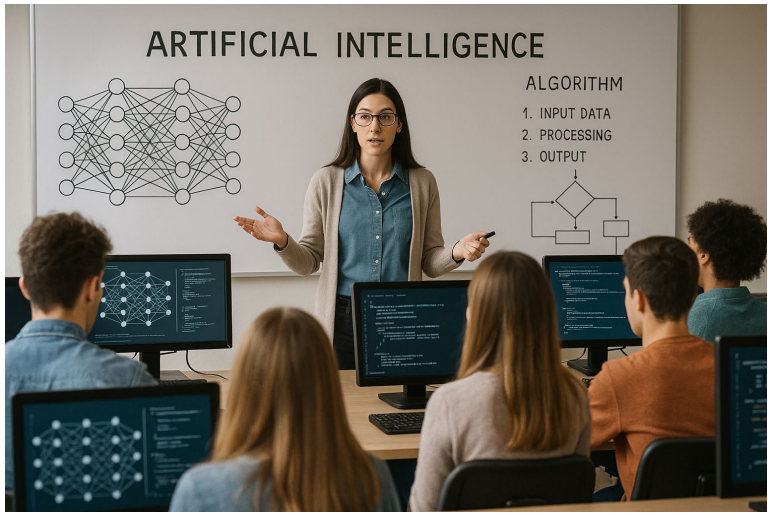
[Lindner et al., 2023]

AI as content – AI in the Box



[Lindner et al., 2025]

AI in the context of education



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für Forschung, Technologie
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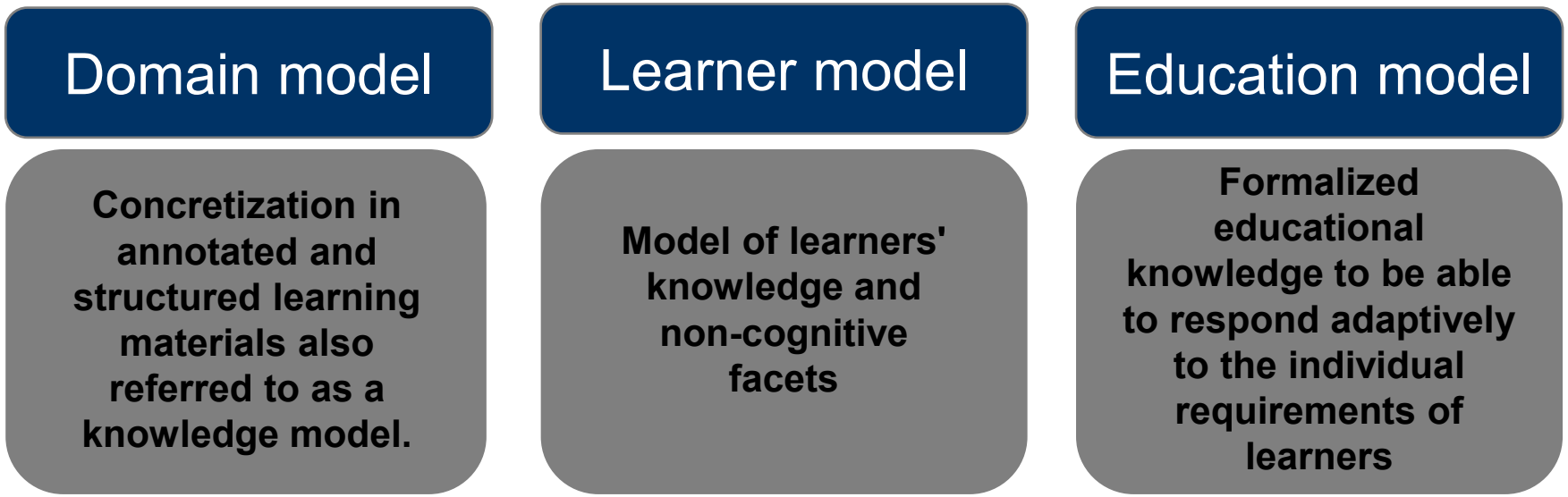
AI as Educational Technology – ALeA topology



[Berges et al., 2023]

AI as Educational Technology - Evaluation

Mixed-Methods online survey (15-20 Min)

Participants from AI1 lecture (app. 500 students)

111 data sets, N = 88 complete

73 male, 10 female, 0 non-binary, 5 no answer

NASA-Task Load Index (TLX)

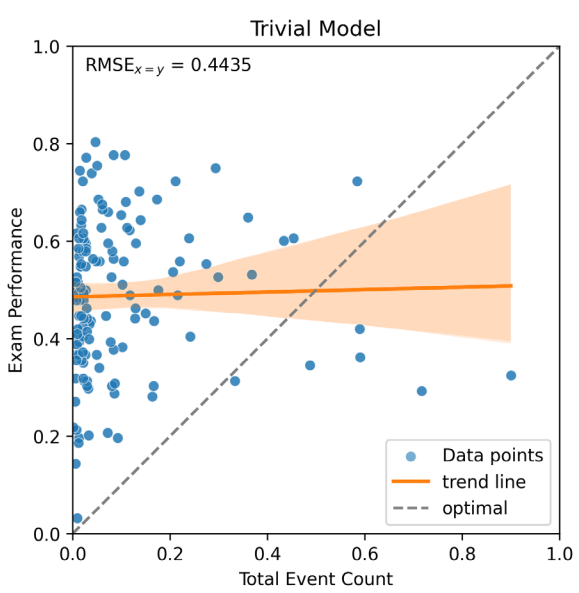
- Moderate mental load
- Moderate perceived performance
- Moderate Frustration

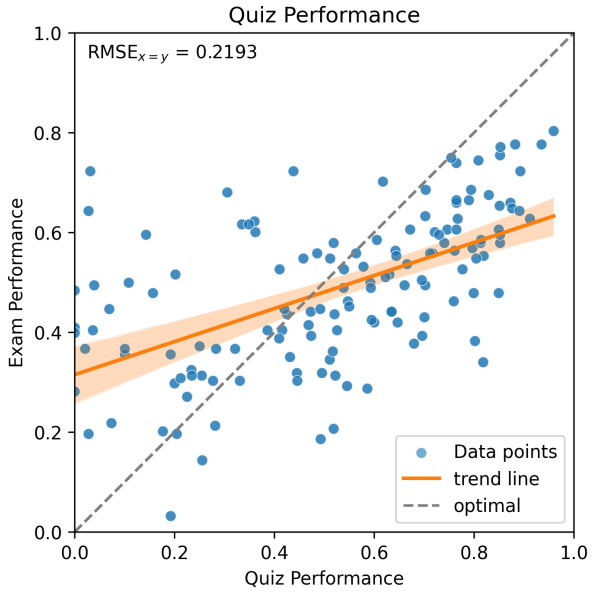
System Usability Score (SUS): 59,77 out of 100

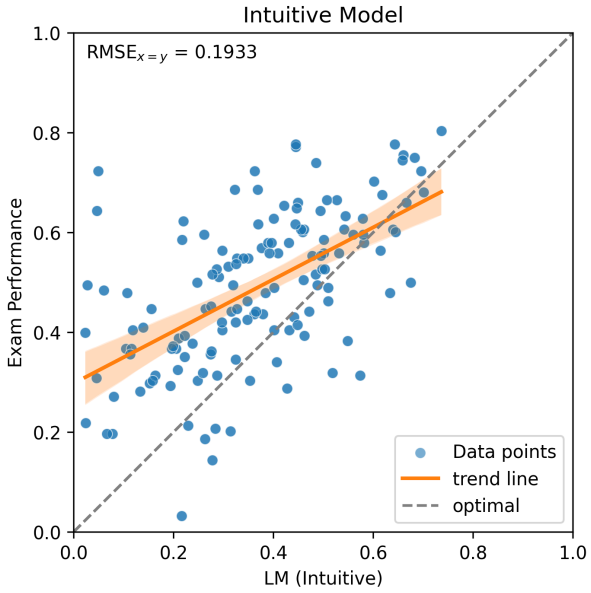
Perceived Creepiness in Technology Scale (PCTS) Wert: 16,74

[Grelka et al., 2025]

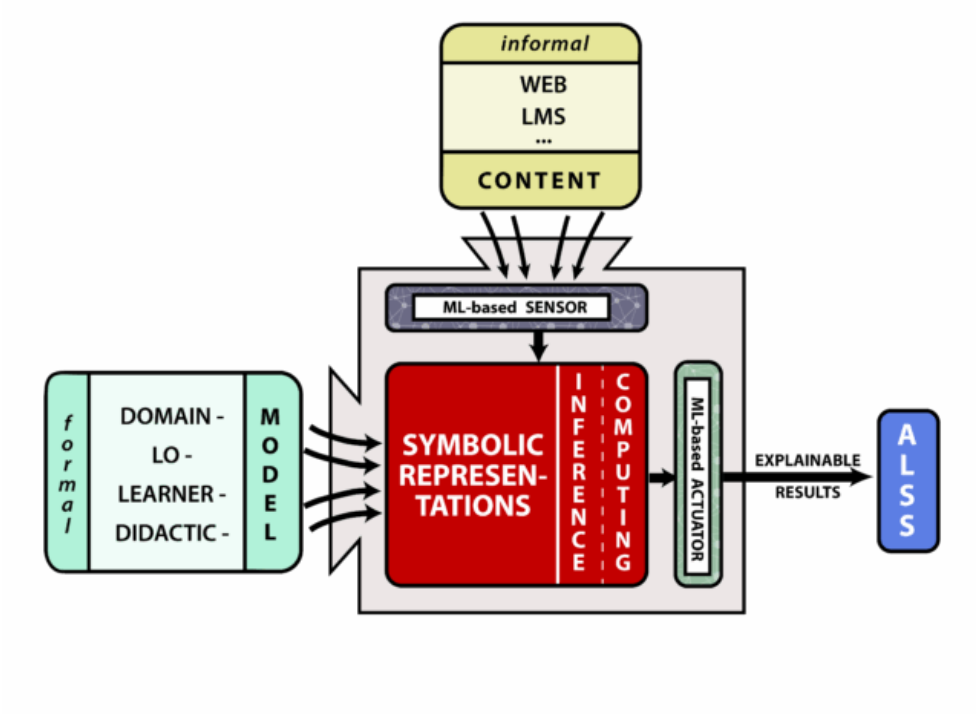
AI as Educational Technology - Evaluation







AI as Educational Technology – The Symbolic Core



https://www.voll-ki.fau.de/sail/

Thank you!

Marc Berges

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