Allgemein-didaktische Unterrichtsmodelle mit Generativer KI

– Himmelstore oder Sackgassen?

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I. Kontext: EDUCATIONAL THEORY BUILDING LAB

Digital Learning Research Group

Lehr-Lern-Theorie

Table 1. Instructional Strategies for Fostering Multidimensional Engagement

Levels	Goals	General Strategies in Elements of Learning
	Cognitive Engagement	
Knowledge	Stimulating rehearsal/repetition and encoding	-Repeat knowledge to be learned in intervals -Use memory aids
Comprehension	Making thinking explicit and visible	-Think aloud -Use visual representations
Convergent thinking	Varying task-contexts	-Make tasks the core elements of instruction -Diversify tasks
Evaluation	Promoting critical-analytic thinking	-Stimulate multiperspective reasoning -Cultivate standard-based knowledge revision
Synthesis	Supporting divergent thinking/idea generation	-Assist in theory building -Foster system-thinking
	Motivational Engagement	
Attention	Allowing choice-making and classroom structuring	-Permit to select/modify task assignments -Use activity schedules
Relevance	Generating utility value and multiple perspectives	-Communicate and self-generate utility value information -Strive for multiple goals
Interest	Being cool and dynamic	-Use popular topics -Use changing topics
Identification	Stimulating mastery orientation and positivity	-Focus on individual progress -Increase booster thoughts and behaviors
Intrinsic motivation	Enhancing fantasy and curiosity	-Establish game-like activities -Stimulate discovery learning
	Social-emotional Engagement	
Self-assertion	Considering prosocial contexts	-Foster identity building -Balance power
Entertainment	Covering enjoyment and emotional needs	-Offer sensations -Include moving experiences
Belongingness	Promoting acceptance and commitment	-Emphasize similarities and complementarities -Include service learning activities
Adaptiveness	Practicing mindfulness	-Forcing perspective recognition -Reducing prejudice and stereotyping
Security	Establishing nonthreatening atmospheres	-Striving for secure attachment -Building resilience

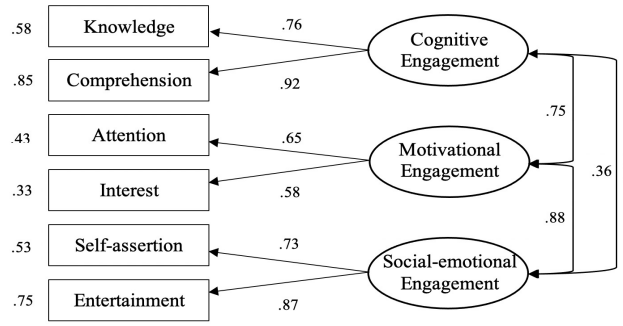
Astleitner, H. (2018). Multidimensional Engagement in Learning - An Integrated Instructional Design Approach. Journal of Instructional Research, 7, 6-32.

Messinstrument - Validierung

Fit Statistics for the CFA-Models on Student Engagement

Models	χ^2	df	NNFI	CFI	RMSEA	p	Changes to fit statistics		
							$\Delta\chi^2$	Δdf	ΔCFI
1. One factor	489.8	90	0.91	0.92	0.14	0.000	-	-	-
2. Two factors	488.5	89	0.91	0.92	0.14	0.000	1.3	1	0.00
3. Three factors – Higher order	484.0	87	0.91	0.92	0.15	0.000	4.5	2	0.00
4. Three factors	472.1	87	0.91	0.92	0.14	0.000	11.9	0	0.00
5. Three factors – Reduced with errors	107.1	42	0.95	0.97	0.09	0.000	365.0	45	0.04
6. Three factors – Strongly reduced without errors	6.0	6	1.00	1.00	0.00	0.424	101.1	36	0.05

Figure 1. Reduced factor model of multidimensional student engagement.



Astleitner, H. (2020). Handling validity problems in developmental measurement approaches – A confirmatory factor analysis approach on student engagement. In H. Astleitner, (Eds.), Intervention research in educational practice (pp. 109-125). Waxmann.

(Quasi-)Experiment

Tab. 1: Deskriptive Statistiken der abhängigen Variablen in Bezug zu persönlicher Bedeutsamkeit und Lernfragen ($31 < n < 52$)

Abhängige Variablen	Persönliche Bedeutsamkeit	Lernfragen	*M*	*SD*
Kognitives Engagement	Nicht bedeutsam	mit	3,42	0,60
		ohne	3,54	0,57
	Bedeutsam	mit	3,36	0,55
		ohne	3,55	0,67
Motivationales Engagement	Nicht bedeutsam	mit	3,25	0,74
		ohne	3,50	0,68
	Bedeutsam	mit	3,82	0,54
		ohne	3,74	0,68
Emotionales Engagement	Nicht bedeutsam	mit	2,72	0,81
		ohne	2,78	0,85
	Bedeutsam	mit	3,48	0,69
		ohne	3,11	0,84
Wissenstest	Nicht bedeutsam	mit	47,02	18,83
		ohne	49,55	20,21
	Bedeutsam	mit	70,39	21,34
		ohne	66,87	16,79

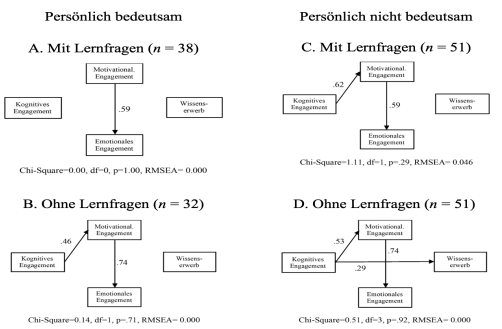
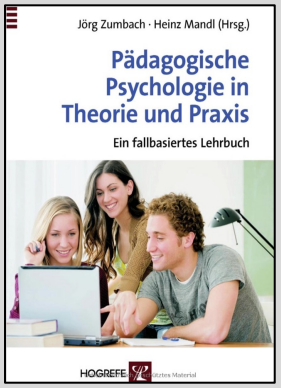


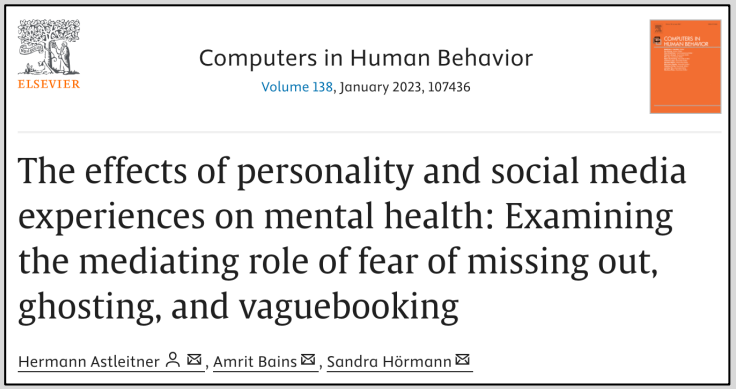
Abb. 1: Mediationsanalysen in den unterschiedlichen Untersuchungsbedingungen

Astleitner, H. (2020). Die paradoxen Effekte von instruktionalen Bedingungen auf multidimensionales Engagement in Vorlesungen. In M. Krämer, et al. (Hrsg.).(2020). Psychologiedidaktik und Evaluation XIII. Shaker.

I. Kontext: EDUCATIONAL THEORY BUILDING LAB

Digital Learning Research Group





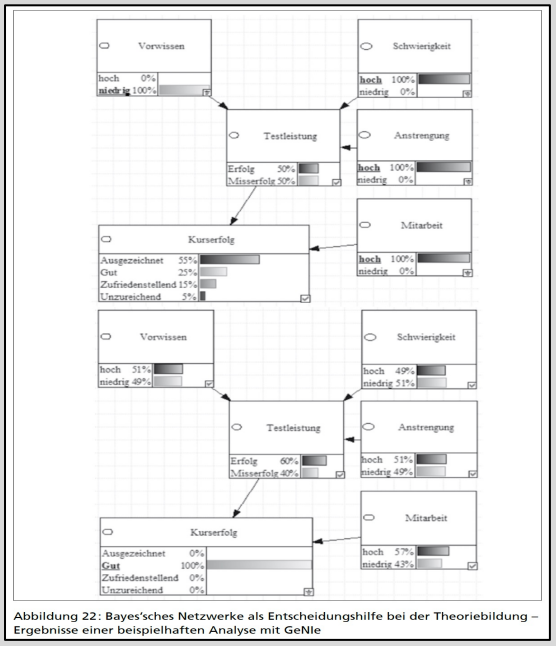
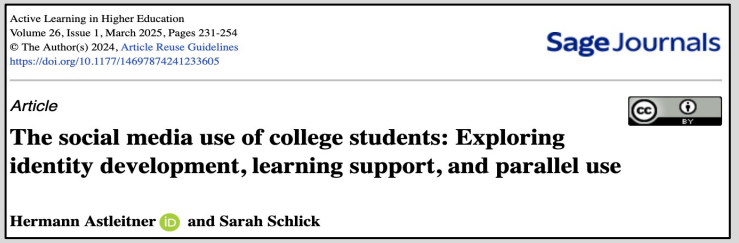


Abbildung 22: Bayes'sches Netzwerke als Entscheidungshilfe bei der Theoriebildung – Ergebnisse einer beispielhaften Analyse mit GeNIe



Astleitner, H. (2026). Can artificial intelligence be controlled? In Ottmann, G. et al. (Eds.), AI and the disruption of the social. Routledge.

Astleitner, H. (2027). Will artificial intelligence change the creativity in theory building? In Theoretical frameworks on digital learning.

II. Axiome: GenKI-Ambivalenz

... und -Indifferenz:

Bevor man alte Bildungsprobleme löst, spielt man lieber mit Neuem herum!

Effektivität reflektierter GenKI

Gu, J., & Yan, Z. (2025). Effects of GenAI interventions on student academic performance: A meta-analysis. *Journal of Educational Computing Research*, *63*(6), 1460-1492.

$g = 0.68$: $R^2 = 0.11$

Yeo, G., & Lansford, J. E. (2025). Effects of Artificial Intelligence on Educational Functioning: A Review and Meta-Analysis. *Educational Psychology Review*, *37*(4), 110

AI had large positive effects on cognition, r = 0.530 (

$ES = 1.3$: $R^2 = 0.30$

) ... with generative AI demonstrating the largest effects.

https://visible-learning.org/hattie-ranking-influences-effect-sizes-learning-achievement/

Lehrer:in: 0.32
Lehrer:innenausbildung: 0.12
Co-/Team-Teaching: 0.19

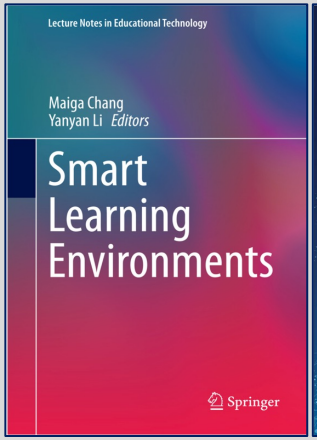
d.velop blog

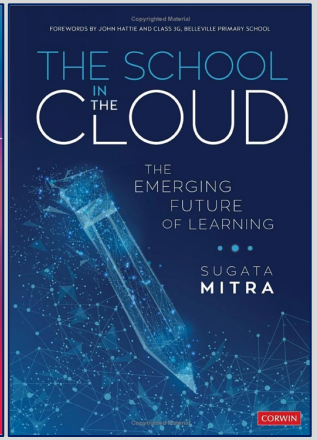
Starke vs. Schwache KI – Wo stehen wir aktuell?

	Schwach - Narrow AI (bezogen auf eine konkrete Aufgabe)	Stark - Strong AI / AGI (breites Spektrum an Aufgaben, Fähigkeit des Erlernens neuer Fähigkeiten)
Level 1: Emerging Vergleichbar oder etwas besser als ein ungeschulter Mensch	Emerging Narrow AI Einfache, regelbasierte Systeme	Emerging AGI ChatGPT, Bard, Llama 2, Gemini
Level 2: Competent Besser als 50% der qualifizierten Erwachsenen	Competent Narrow AI Smart Speaker (Alexa, Siri, Google Assistant), State-of-the-Art LLMs für bestimmte Aufgaben (Programmieren, Texte zusammenfassen)	Competent AGI Noch nicht erreicht
Level 3: Expert Besser als 90% der qualifizierten Erwachsene	Expert Narrow AI Generative Modelle zur Bild-Generierung (Imagen, Dall-E 2), Modelle für Rechtschreib- und Grammatik-Prüfung	Expert AGI Noch nicht erreicht
Level 4: Virtuoso Besser als 99% der qualifizierten Erwachsenen	Virtuoso Narrow AI AlphaGo	Virtuoso AGI Noch nicht erreicht
Level 5: Superhuman Übertrifft 100% der Menschen	Superhuman Narrow AI AlphaFold, AlphaZero	Artificial Superintelligence (ASI) Noch nicht erreicht

https://www.d-velop.de/blog/digitaler-wandel/arten-von-ki/
https://arxiv.org/pdf/2311.02462

II. Axiome: GenKI-Professionalität





Völlige Neudefinition der Rollen des Lehrenden und Lernenden

GenKI-Regularien zur Optimierung

- Nutzungsregeln
- Anti-Cheating-Tools
- Technologieakzeptanz
- **Prompt Engineering**
  - Hohes Vorwissen
  - Kritische Prüfung
- **Lehr-Lerntheorie**

Ann-Christin Faix, Elke Wild, Birgit Lütje-Klose & Annette Textor

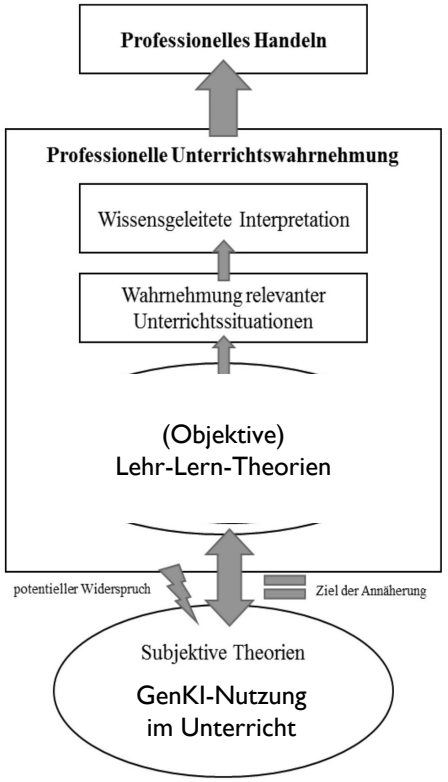


Abbildung 1: Zusammenhang von Subjektiven Theorien, Einstellungen, bildungswissenschaftlichem Wissen und professioneller Unterrichtswahrnehmung (eigene Darstellung)

Faix, A. C., Wild, E., Lütje-Klose, B., & Textor, A. (2019). Professionalisierung für inklusiven Unterricht ... *Journal für Psychologie*, 27(2), 71–94. (Modifiziert)

III. Interrogative und Methodik

Interrogative
In der vorliegenden Arbeit geht es um die Frage, ob es **allgemein-didaktische Lehr-Lern-Theorien** zur Arbeit mit generativer Künstlicher Intelligenz (GenKI wie z.B. ChatGPT) gibt und wenn ja, welche Qualität diese aufweisen.

Drei Typen von Qualitäten werden in einem Modell integriert und repräsentieren einen **innovativen Bewertungsrahmen** für Research-and-Development-Vorhaben im Bereich der Unterrichtsforschung.

Methodik
Methodisch wird ein narrativer Literaturreview durchgeführt (vgl. Baumeister & Leary, 1997). Als Ergebnis dieses Literaturreviews sind eine Reihe von didaktischen Modellen identifiziert worden, die mit dem Bewertungsrahmen evaluiert werden. Dabei wird im Sinne einer **Expertenbewertung** eines sehr erfahrenen Reviewers festgestellt, ob ein bestimmtes Qualitätsmerkmal gegeben ist oder nicht.

IV. Attribute einer Lehr-Lerntheorie für Forschung und Praxis

Theoretisch	Empirisch	Praktisch
T1. Lernen unter Lehren	E1. Keine Evidenz: Subjektive /Wiss. Theorie	P1. Handlungsempfehlungen
T2. Lerneffekte/Entwicklungsziele	E2. Schwache Evidenz: Qualitative Studien, Befragungen	P2. Didaktikbeispiele
T3. Lehr-/Lernmethoden	E3. Mittelstarke Evidenz: (Quasi-)experimentelle Studien	P3. Unterrichtsmaterialien
T4. Bedingungen der Anwendung	E4. Starke Evidenz: Langzeittest im Feld/Metaanalyse	P4. Fortbildungsmaßnahmen

Reigeluth, C. M. (2013). What is instructional-design theory and how is it changing? In C. M. Reigeluth (Ed.), *Instructional-design theories and models* (pp. 5–29). Routledge.

John, K. S., & McNeal, K. S. (2017). The strength of evidence pyramid: One approach for characterizing the strength of evidence of geoscience education research (GER) community claims. *Journal of Geoscience Education*, *65*(4), 363–372.

Burke, L. A., & Hutchins, H. M. (2008). A study of best practices in training transfer and proposed model of transfer. *Human Resource Development Quarterly*, *19*(2), 107–128.

V. Resultate
V.1. Multidimensionales Engagement

Table 1. Instructional Strategies for Fostering Multidimensional Engagement

Levels	Goals	General Strategies in Elements of Learning
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Knowledge	Stimulating rehearsal/repetition and encoding	-Repeat knowledge to be learned in intervals -Use memory aids
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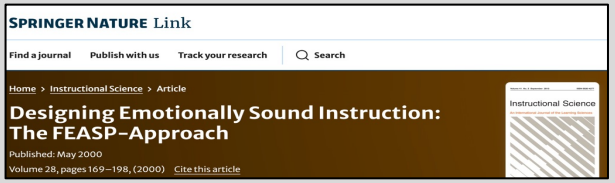
Erreichbarkeit



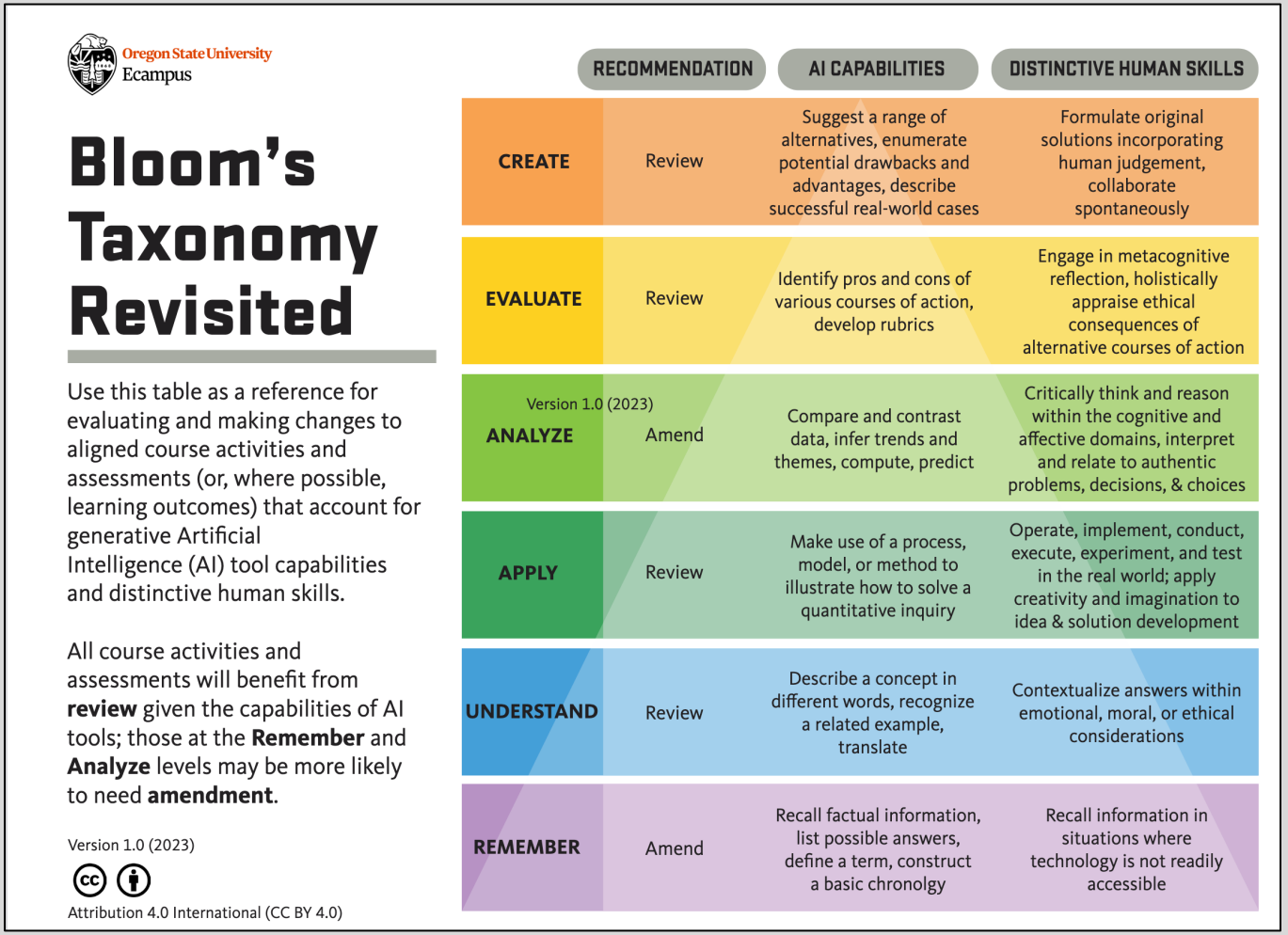
Astleitner, H. (2018). Multidimensional Engagement in Learning - An Integrated Instructional Design Approach. *Journal of Instructional Research*, *7*, 6–32.

Yuan, L., & Liu, X. (2025). The effect of artificial intelligence tools on EFL learners' engagement, enjoyment, and motivation. *Computers in Human Behavior*, *162*, 108474.

Bewertung

T1: Ja
T2: Ja
T3: Ja
T4: Nein
E1: Ja
E2: Nein
E3: Nein
E4: Nein
P1: Ja
P2: Ja
P3: Nein
P4: Nein

V. Resultate
V.2. Lehrzieltaxonomien



Oregon State University
Ecampus

Bloom's Taxonomy Revisited

Use this table as a reference for evaluating and making changes to aligned course activities and assessments (or, where possible, learning outcomes) that account for generative Artificial Intelligence (AI) tool capabilities and distinctive human skills.

All course activities and assessments will benefit from **review** given the capabilities of AI tools; those at the **Remember** and **Analyze** levels may be more likely to need **amendment**.

Version 1.0 (2023)

	RECOMMENDATION	AI CAPABILITIES	DISTINCTIVE HUMAN SKILLS
CREATE	Review	Suggest a range of alternatives, enumerate potential drawbacks and advantages, describe successful real-world cases	Formulate original solutions incorporating human judgement, collaborate spontaneously
EVALUATE	Review	Identify pros and cons of various courses of action, develop rubrics	Engage in metacognitive reflection, holistically appraise ethical consequences of alternative courses of action
ANALYZE	Amend	Compare and contrast data, infer trends and themes, compute, predict	Critically think and reason within the cognitive and affective domains, interpret and relate to authentic problems, decisions, & choices
APPLY	Review	Make use of a process, model, or method to illustrate how to solve a quantitative inquiry	Operate, implement, conduct, execute, experiment, and test in the real world; apply creativity and imagination to idea & solution development
UNDERSTAND	Review	Describe a concept in different words, recognize a related example, translate	Contextualize answers within emotional, moral, or ethical considerations
REMEMBER	Amend	Recall factual information, list possible answers, define a term, construct a basic chronolgy	Recall information in situations where technology is not readily accessible

Version 1.0 (2023)

https://ecampus.oregonstate.edu/faculty/artificial-intelligence-tools/blooms-taxonomy-revisited-v1-2023.pdf

https://www.iqesonline.net/unterrichten/aufgaben/werkzeuge-kompetenzrad-fragewuerfel-aufgabenmap/

Bewertung

T1: Ja
T2: Ja
T3: Ja
T4: Nein
E1: Ja
E2: Nein
E3: Nein
E4: Nein
P1: Ja
P2: Ja
P3: Ja
P4: Ja

V. Resultate
V.3. Self-Determination Theory

Best for submission – Kennen die Reviewer:innen!

Table 2 Learning activities using ChatGPT and their impact on the SDT needs and SRL phases derived through the participants' consensus

	Learning Activities	Autonomy	Competence	Relatedness	Forethought	Performance	Self-reflection
When teachers design learning activities, students use ChatGPT to …							
#1	Search information	X			X		
#2	Get examples	X			X		
#3	Check their answers		X				X
#4	Generate review questions to check for their understanding		X				X
#5	Create new problems for practice		X				X
#6	Create challenging problems		X				X
#7	Get insight into complex problems	X				X	
#8	Ask ideas for their improvement		X				X
#9	Make lists or outlines	X			X		
#10	Summarize their own work			X		X	
#11	Ask for definitions		X		X		
#12	Generate questions for discussions	X				X	
#13	Generate questions for essays	X				X	
#14	Get feedback for their work		X				X
#15	Practice peer feedback		X			X	
#16	Prepare for tough conversations		X			X	
#17	Visualize a problem			X		X	
	When teachers design learning activities, students are expected to …						
#18	Anticipate ChatGPT's outputs		X				X
#19	Grade ChatGPT's outputs		X				X
#20	Debate with ChatGPT	X				X	

Bewertung

T1: Ja
T2: Ja
T3: Ja
T4: Nein
E1: Ja
E2: Ja
E3: Nein
E4: Nein
P1: Ja
P2: Nein
P3: Nein
P4: Nein

Chiu, T. K. (2024). A classification tool to foster self-regulated learning with generative artificial intelligence by applying self-determination theory: a case of ChatGPT. *Educational Technology Research and Development*, 72(4), 2401–2416.

V. Resultate
V.4. Selbstregulation

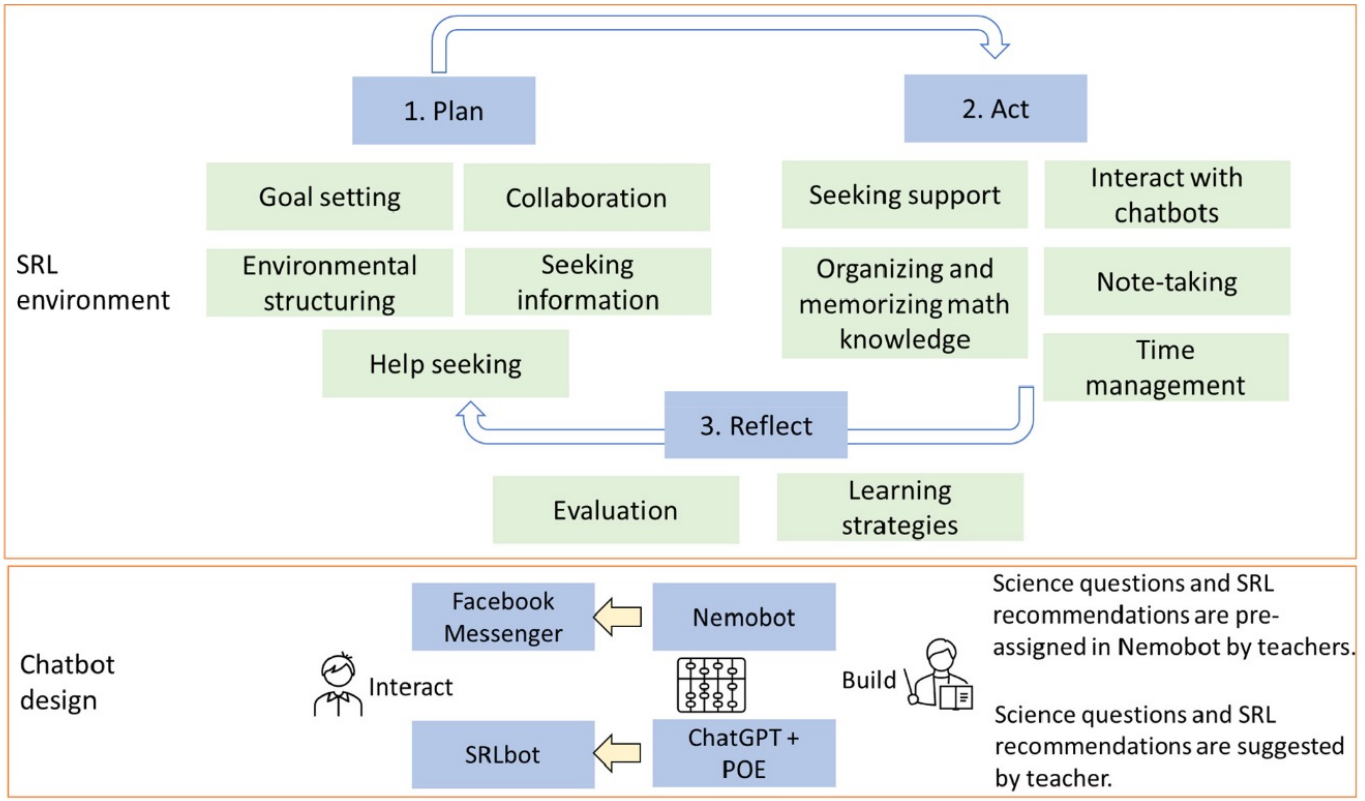


FIGURE 5 Zimmerman's (2002) three-cycle model adapted from Hsu et al. (2023).

Bewertung

T1: Ja
T2: Ja
T3: Nein
T4: Nein
E1: Ja
E2: Ja
E3: Nein
E4: Nein
P1: Ja
P2: Nein
P3: Nein
P4: Nein

Ng, D.T. K., Tan, C.W., & Leung, J. K. L. (2024). Empowering student self-regulated learning and science education through ChatGPT: A pioneering pilot study. British Journal of Educational Technology, 55(4), 1328–1353.

V. Resultate
V.5. Metakognition

TABLE 1 Metacognitive support framework.

Dimension of prompts	Examples
A. During the task initiation phase (planning)	
Identifying specific learning objectives	What is the main objective of this task?
Planning how to use the GenAI tools	What questions do I need to ask ChatGPT to get useful information?
Clarifying their prior knowledge	What prior knowledge will I rely on when interacting with GenAI?
B. During the task execution phase (monitoring and reflection)	
Assessing the relevance and accuracy of the AI responses	Is this information accurate and relevant to my task?
Summarizing their understanding of the content	Can I explain this concept in my own words?
Adjusting strategies as needed	Do I need to ask more specific questions or improve my methods?
C. Task completion phase (evaluation and reflection)	
Assessing the achievement of initial learning goals	Have I achieved my goals? What else can I improve next time?
Reflecting on GenAI tools' contribution to comprehension	How has ChatGPT helped me understand the topic?
Planning improvements for future learning	What strategies will I use next time to improve my learning outcomes?
[Participants can record their thoughts in the blank space.]	

Xu, X., Qiao, L., Cheng, N., Liu, H., & Zhao, W. (2025). Enhancing self-regulated learning and learning experience in generative AI environments: The critical role of metacognitive support. British Journal of Educational Technology, 56(5), 1842–1863.

Bewertung

T1: Ja
T2: Ja
T3: Ja
T4: Nein
E1: Ja
E2: Nein
E3: Nein
E4: Nein
P1: Ja
P2: Nein
P3: Nein
P4: Nein

V. Resultate
V.6. Instruktionale Interaktion

Table 5 Summary of the students' and instructors' perceptions of AI systems in online learning

Factor of learner–instructor interaction	The impact of AI systems	Students' perceptions	Instructors' perceptions
Communication	Quantity & Quality	(+) Students believe that the anonymity afforded by AI would make them less self-conscious and, as a result, allow them to ask more questions	(+) Instructors believe that AI could help answer simple, repetitive questions, which would allow them to focus on more meaningful communication with students
	Responsibility	(−) Students worry that AI could give unreliable answers and negatively impact their grades	(−) Instructors predicted conflicts between students and the instructor due to AI-based misunderstandings or misleadingness
Support	Just-in-time support	(+) Students believe that AI would support personalized learning experiences, particularly with studying and group projects	(+) Instructors believe AI could be effectively leveraged to help students receive just-in-time personalized support
	Agency	(−) Students perceived that canned and standardized support from AI might have a negative influence on their ability to learn effectively	(−) Instructors are wary of the fact that too much support from AI could take away students' opportunities for exploration and discovery
Presence	Connection	(+) Students believe that AI can address privacy concerns and support learner–instructor connections by providing social interaction cues without personal camera information	(+) Instructors believe that the addition of AI would help them become more aware of students' needs
	Surveillance	(−) Students are uncomfortable with the measurement of their unconscious behavior, such as eye tracking or facial expression analysis, because it feels like surveillance	(−) Instructors were negative about relying on AI interpretation to understand students' social interaction cues

(+) indicates perceived benefit and (−) indicates perceived concern

Seo, K., Tang, J., Roll, I., Fels, S., & Yoon, D. (2021). The impact of artificial intelligence on learner–instructor interaction in online learning. *International Journal of Educational Technology in Higher Education*, *18*, 1–23.

Bewertung

T1: Ja
T2: Nein
T3: Ja
T4: Nein
E1: Ja
E2: Ja
E3: Nein
E4: Nein
P1: Ja
P2: Nein
P3: Nein
P4: Nein

V. Resultate
V.7. Spielendes Lernen

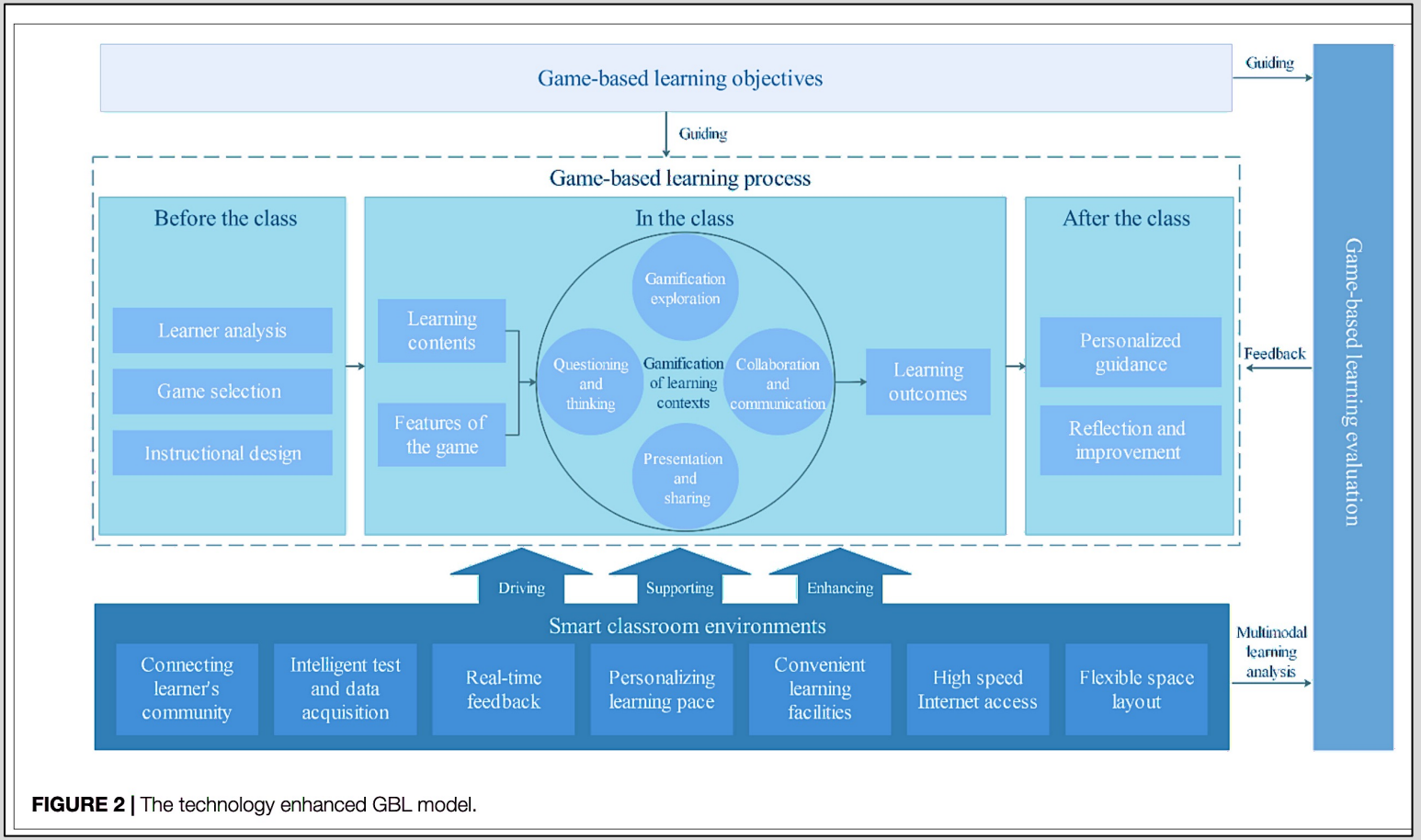


FIGURE 2 | The technology enhanced GBL model.

Bewertung

T1: Ja
T2: Ja
T3: Ja
T4: Nein
E1: Ja
E2: Nein
E3: Nein
E4: Nein
P1: Ja
P2: Nein
P3: Nein
P4: Nein

Pan, L., Tlili, A., Li, J., Jiang, F., Shi, G., Yu, H., & Yang, J. (2021). How to implement game-based learning in a smart classroom? A model based on a systematic literature review and Delphi method. *Frontiers in Psychology*, *12*, 749837.

V. Resultate
V.8. Computational Thinking

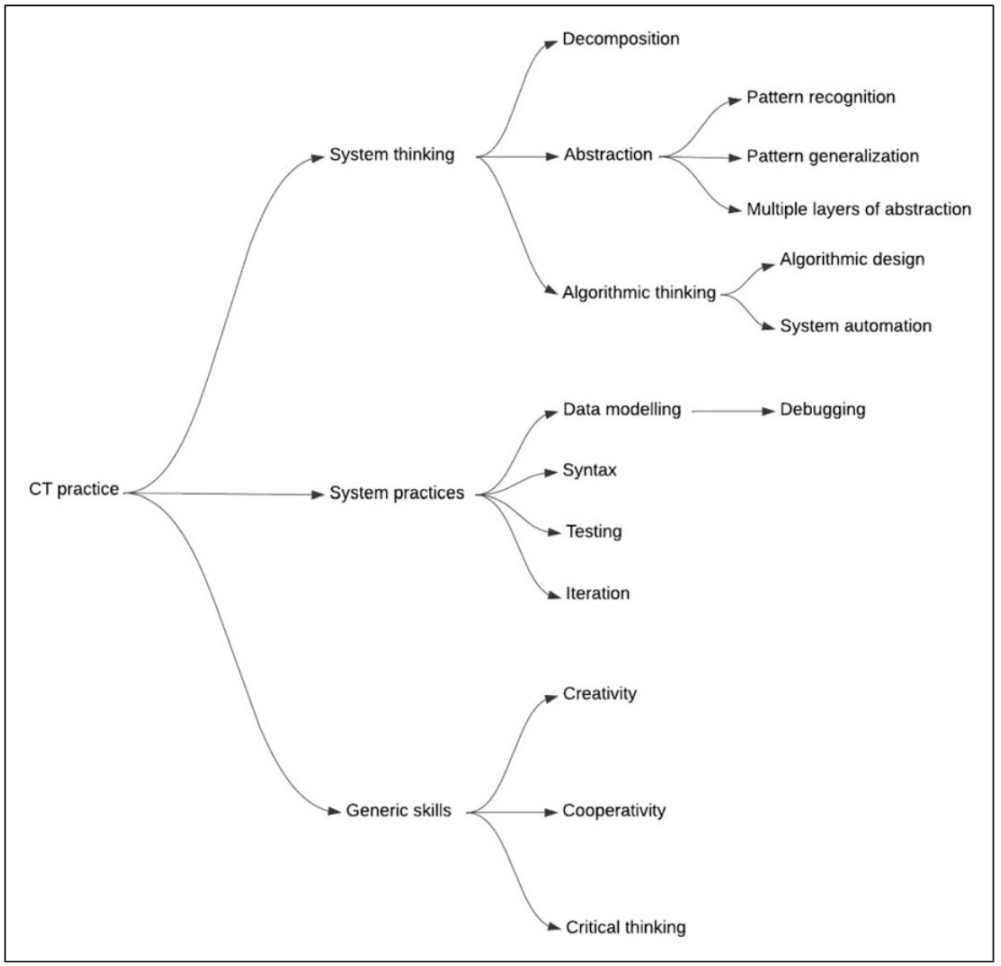
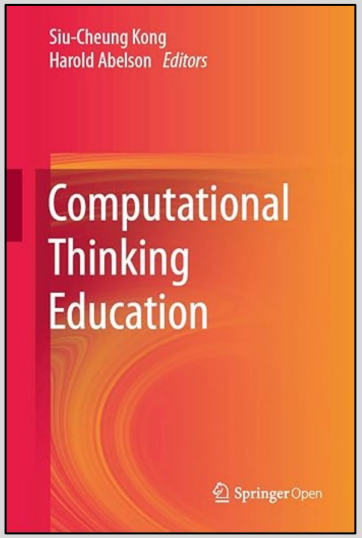


Figure 3. Diagram of CT practices.

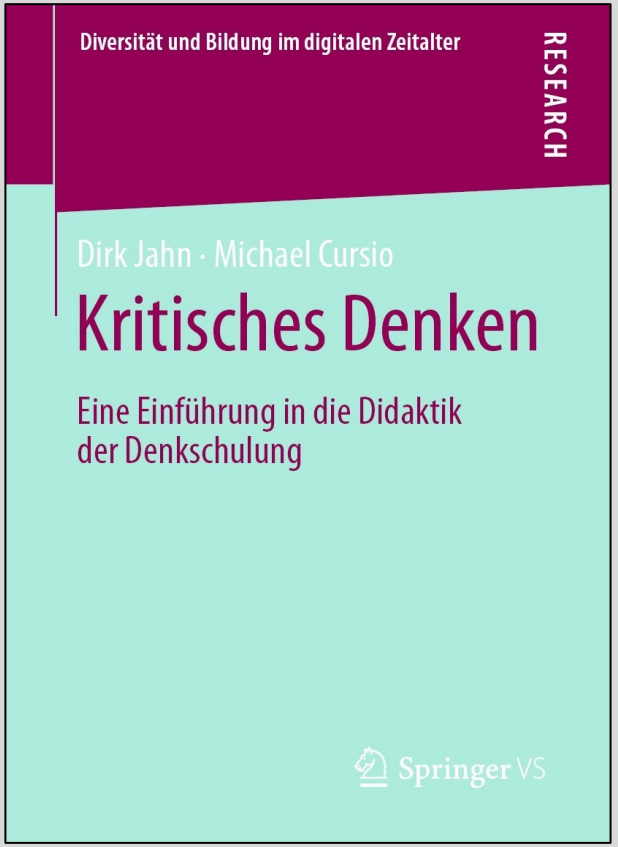
Weng, X., Ye, H., Dai, Y., & Ng, O. L. (2024). Integrating artificial intelligence and computational thinking in educational contexts: A systematic review of instructional design and student learning outcomes. Journal of Educational Computing Research, 62(6), 1420–1450.



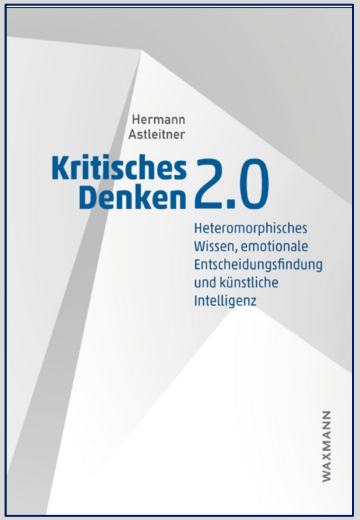
Bewertung

T1: Nein
T2: Ja
T3: Nein
T4: Nein
E1: Ja
E2: Nein
E3: Nein
E4: Nein
P1: Ja
P2: Nein
P3: Nein
P4: Nein

V. Resultate
V.9. Denkschulung: Der am besten bewertete Ansatz



Jahn, D. (2024). CT goes ChatGPT - Kritisches Denken mit dem Chatbot fördern und einen souveränen Umgang damit kultivieren. In T. Köhler (Hrsg.), *Handbuch E-Learning. Expertenwissen aus Wissenschaft und Praxis* (106. Ergänzungslieferung Februar 2024. Beitrag 4.88). Fachverlag Deutscher Wirtschaftsdienst.



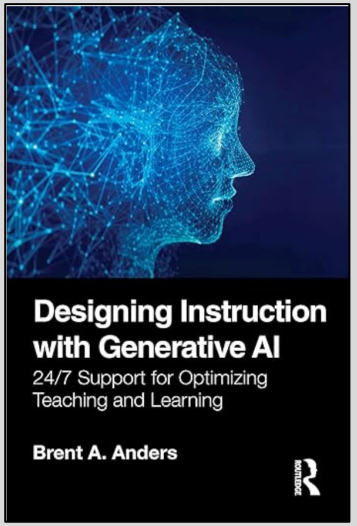
Bewertung

T1: Ja
T2: Ja
T3: Ja
T4: Ja
E1: Ja
E2: Ja
E3: Nein
E4: Nein
P1: Ja
P2: Ja
P3: Ja
P4: Ja

VI. Diskussion/Implikation: R & D-Toolbox für reflektierten GenKI-Einsatz

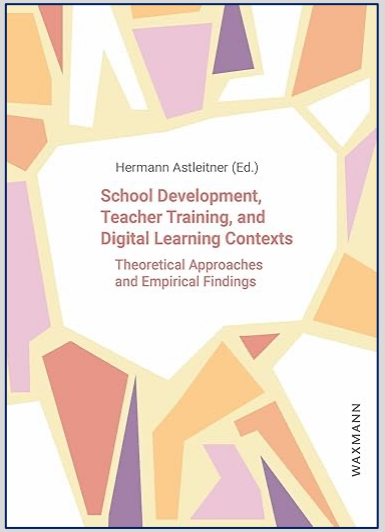
Tabelle 4: Theorien in unterschiedlichen Entwicklungsphasen

Phase	Phase 1	Phase 2	Phase 3
Zustand	„Naive" Annahmen Alltagstheorien Einschätzungen	Sammlung von Arbeitshypothesen	Theorie in einer ersten Version
Grundlage	Subjektive Ansichten	Explorationen von wissenschaftlichem Wissen	Literaturbasierte und kriterienorientierte Entwicklung
Phase	**Phase 4**	**Phase 5**	**Phase 6**
Zustand	Wenig geprüfte Theorie	Stark geprüfte Theorie	Weiterentwicklungen einer Theorie
Grundlage	Beschreibende und Zusammenhänge klärende empirische Prüfungen	Kontrollierte Prüfungen von Ursache-Wirkungs-Beziehungen	Reformulierungen aufgrund empirischer und theoretischer Erkenntnisse



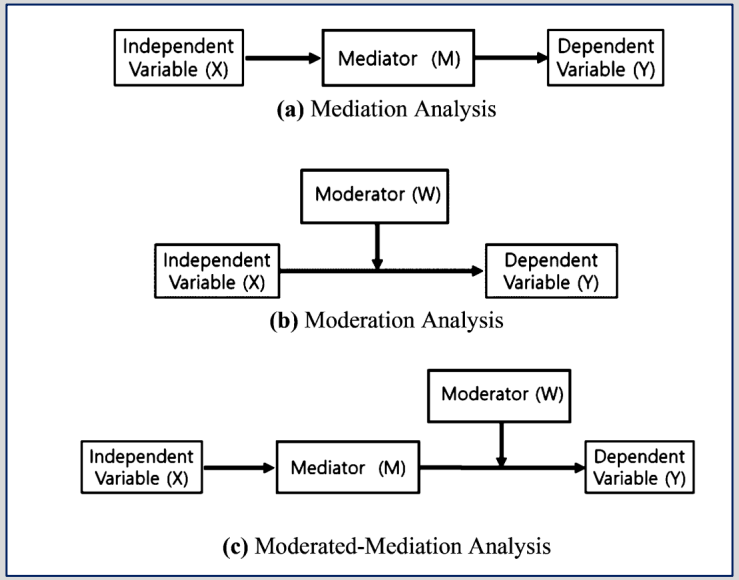
+

ABER: Umsetzungs-kontext in der Bildung



VI. Diskussion/Implikation: Warum ist der Kontext relevant?

Kontext als Mediator oder/und Moderator



Yoon, J. H. (2020). Fuzzy Moderation and Moderated-Mediation Analysis: H. Yoon. *International Journal of Fuzzy Systems*, 22(6), 1948-1960.

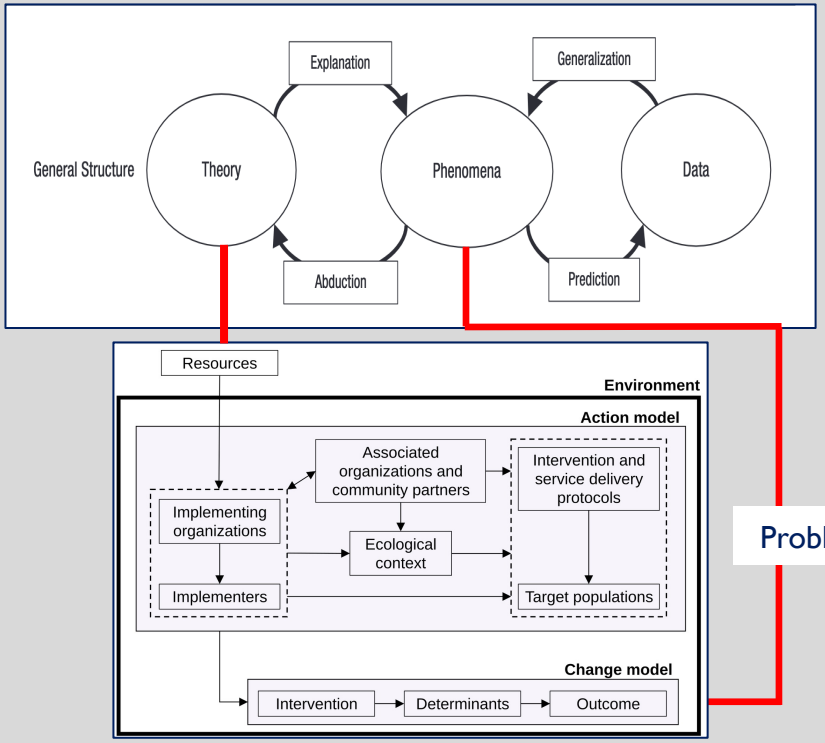
Borsboom, D., van der Maas, H. L., Dalege, J., Kievit, R. A., & Haig, B. D. (2021). Theory construction methodology: A practical framework for building theories in psychology. *Perspectives on Psychological Science*, *16*(4), 756-766.

Chen, H. T. (2015). Practical Program Evaluation: Theory-Driven Evaluation and the Integrated Evaluation Perspective. SAGE.

Kontext als Forschungs-Praxis-Problem

Forschung

Praxis



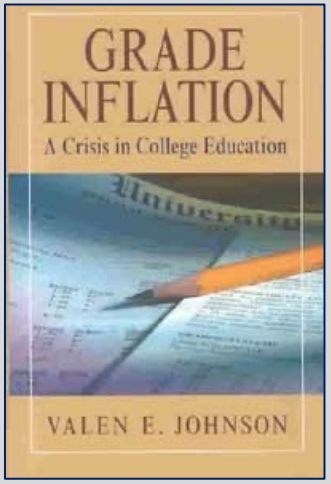
Forschungs-Praxis-Problem =
Wissenschaftliches Phänomen,
das eng mit Problemen in der Praxis verknüpft ist

VII.0. Exploration: Subjektive Probleme des Bildungskontextes

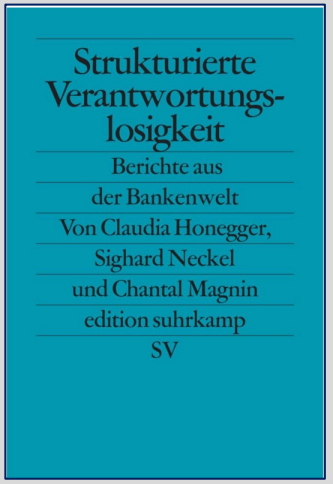
Exkurs und Präambel: Die vier apokalyptischen Reiter

Inkompetenz

Leistungs-inflation

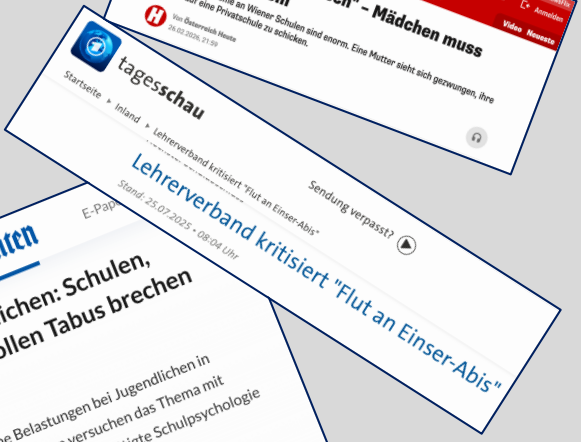


Verantwortungs-losigkeit



Gier

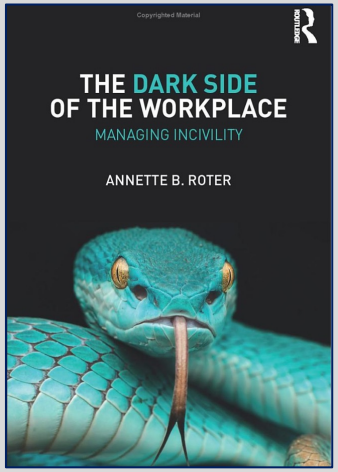
VII.0. Exploration: Subjektive Probleme des Bildungskontextes



VII. 0. Exploration: Probleme des Bildungskontextes aus wissenschaftlicher Sicht

Euphemisieren

Seidel, T. (2014). Angebots-Nutzungs-Modelle in der Unterrichtspsychologie. *Zeitschrift für Pädagogik*, *60*(6), 850-866.

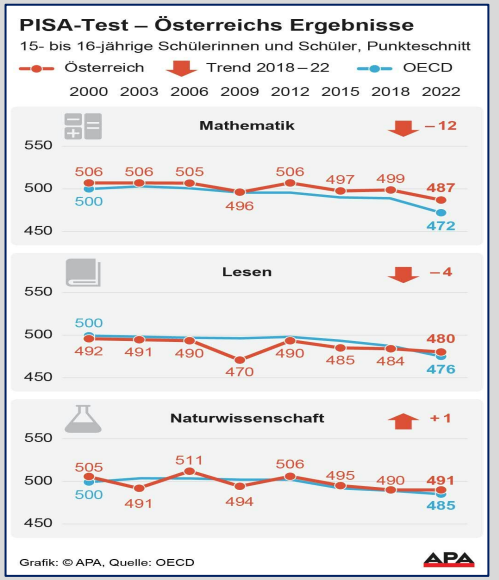


Ineffektivität und Selbstreferentialität

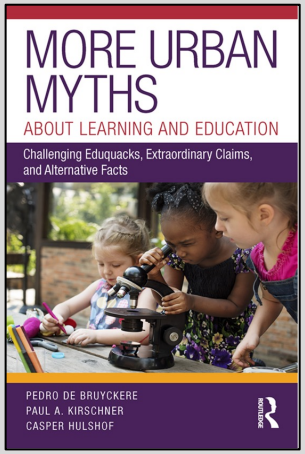
Hattie-μ
ES = 0.34
R^2 = 2.8 %

https://doi.org/10.1037/bul0000385
We identified 60 meta-analyses that tested many of the propositions of SDT.

Stagnation

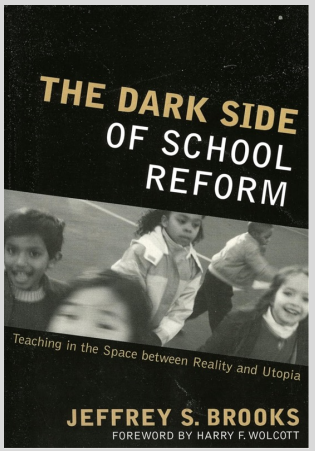


Mythen

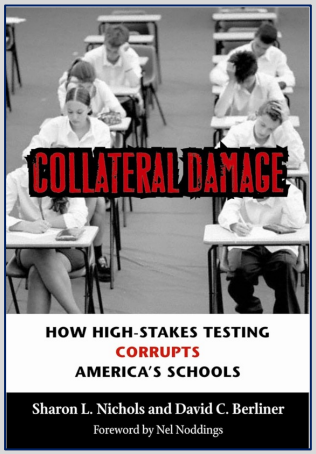


Implizites

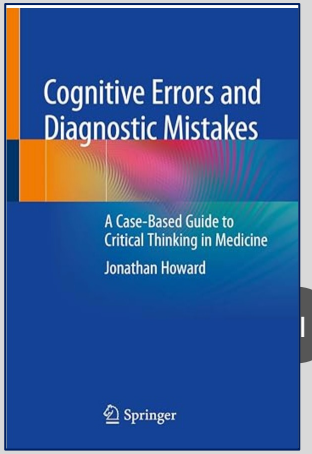
Sinisterität



Kollateraleffekte

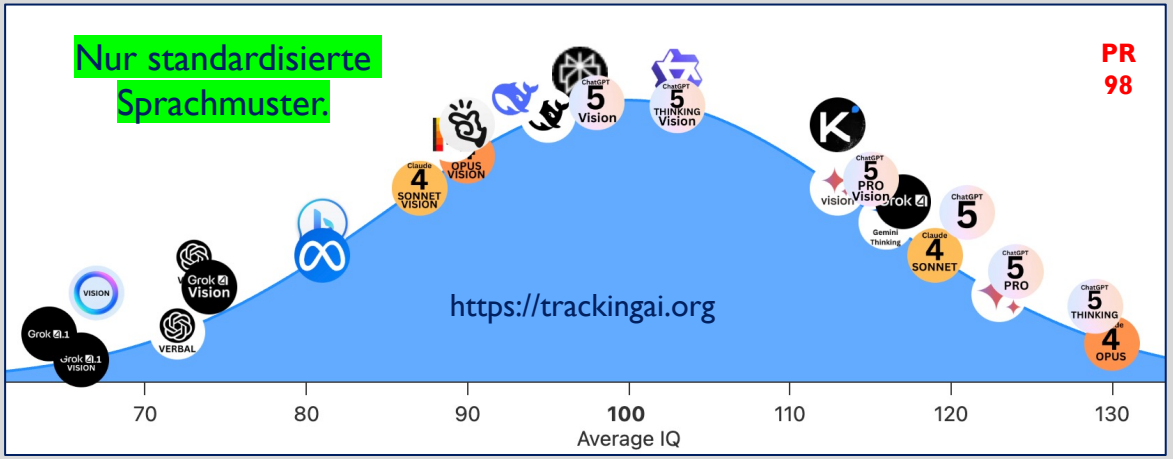


Defizienz



VII. 0. Exploration: Generative Künstliche Intelligenz (GenKI) als Problem in der Bildung

Wissenschaftliches Denken ist nicht Denken der Künstlichen Intelligenz



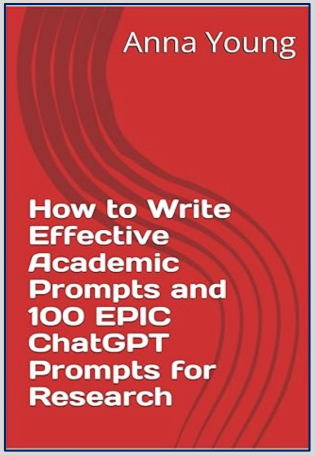


TABLE 1: Overall results of LLMs' answer correctness across the zero-shot, one-shot and three-shot logical reasoning settings. The notations *De.*, *In.*, *Ab.* and *Mix* correspond to deductive, inductive, abductive and mixed-form reasoning, respectively (as in the following tables and figures). *Gen.* indicates whether the task is a generation one. The percentage signs (%) of performance values are omitted for simplicity in the paper.

	Dataset	Gen.	text-davinci-003			ChatGPT			BARD			SOTA
			0-shot	1-shot	3-shot	0-shot	1-shot	3-shot	0-shot	1-shot	3-shot	
De.	bAbI-15	✓	85.00	76.00	75.00	38.40	46.40	39.70	79.00	80.00	88.00	100 [42]
	EntailmentBank	✓	93.00	88.00	89.00	83.82	82.06	77.94	96.00	97.00	97.00	100 [35]
	RuleTaker		64.00	60.00	62.00	42.00	38.00	40.20	64.00	57.00	70.00	≈100 [43]
	FOLIO		48.00	53.00	52.00	50.00	50.98	54.41	52.00	43.00	49.00	62.11 [36]
	Leap-Of-Thought		82.00	90.00	87.00	72.61	74.01	61.21	79.00	72.00	79.00	99.7 [37]
In.	bAbI-16	✓	84.00	81.00	74.00	17.10	24.70	12.90	73.00	44.00	52.00	100 [42]
	CLUTRR	✓	6.00	23.00	20.00	21.99	19.55	12.83	23.00	26.00	24.00	95.0 [47]
Ab.	α-NLI		74.00	70.00	74.00	80.90	80.00	79.10	75.00	74.00	77.00	68.90 [44]
	α-NLG	✓	9.00	10.00	12.00	21.90	23.40	25.90	10.00	12.00	15.00	45.00 [44]
	AbductiveRules	✓	75.00	42.00	35.00	23.30	35.10	29.80	71.00	49.00	22.00	100 [45]
	D*-Ab	✓	8.00	21.00	23.00	11.60	2.50	1.80	11.00	0.00	0.00	≥95 [46]
Mix	ReClor		53.00	53.00	55.00	58.80	56.00	58.80	56.00	55.00	56.00	75.00 [13]
	LogiQA		41.00	35.00	39.00	40.25	39.48	40.86	48.00	46.00	47.00	46.10 [13]
	LogiQA 2.0		43.00	42.00	41.00	54.60	50.80	54.80	53.00	46.00	47.00	72.25 [41]
	LogiQA2NLI		59.00	55.00	58.00	57.83	53.83	57.00	48.00	50.00	47.00	≈80 [41]

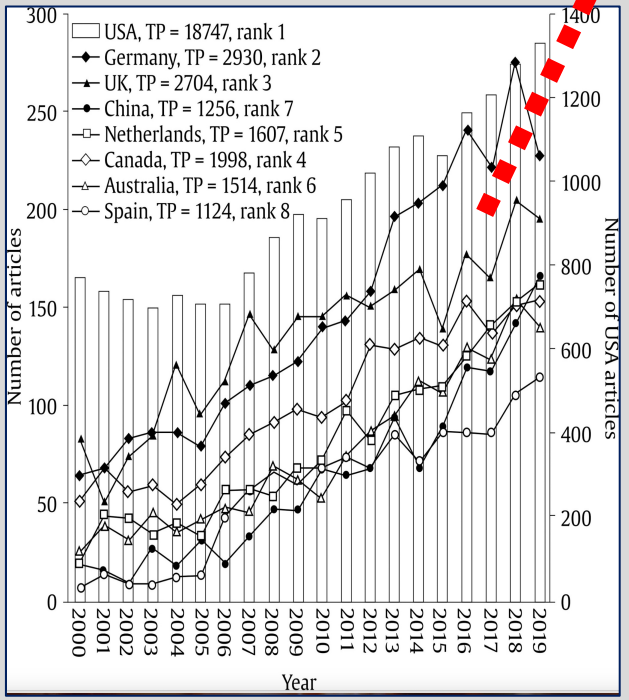
Xu, Fangzhi, Lin Qika, Han Jiawei, Zhao Tianzhe, Liu Jun, and Cambria Erik. 2025. "Are Large Language Models Really Good Logical Reasoners? A Comprehensive Evaluation and Beyond." *IEEE Transactions on Knowledge and Data Engineering37(4), 1620–1634.*

VII. 0. Exploration: Generative Künstliche Intelligenz (GenKI) als Problem in der Bildung

Künstliche Intelligenz in Forschung und Praxis mit Transformationseffekten

mit KI: Hyper-Wettbewerb, Paper Mills, Review-Krise, Mainstream-Primat+Erhöhung Theorie-Praxis-Kluft, Selbstabschaffung?

EdPsyc-Publikationen



Forschungstransfermodelle

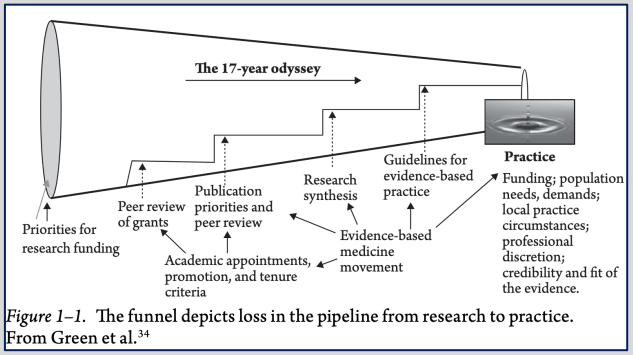


Figure 1–1. The funnel depicts loss in the pipeline from research to practice. From Green et al.[34]

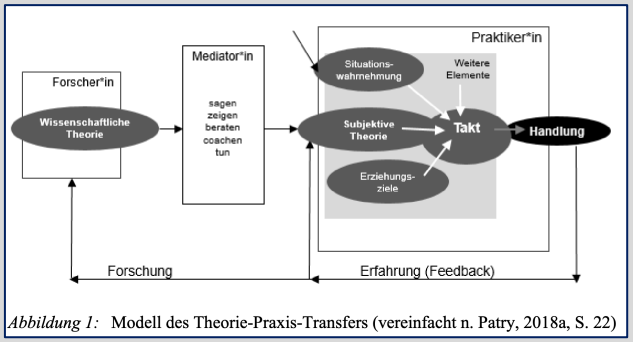
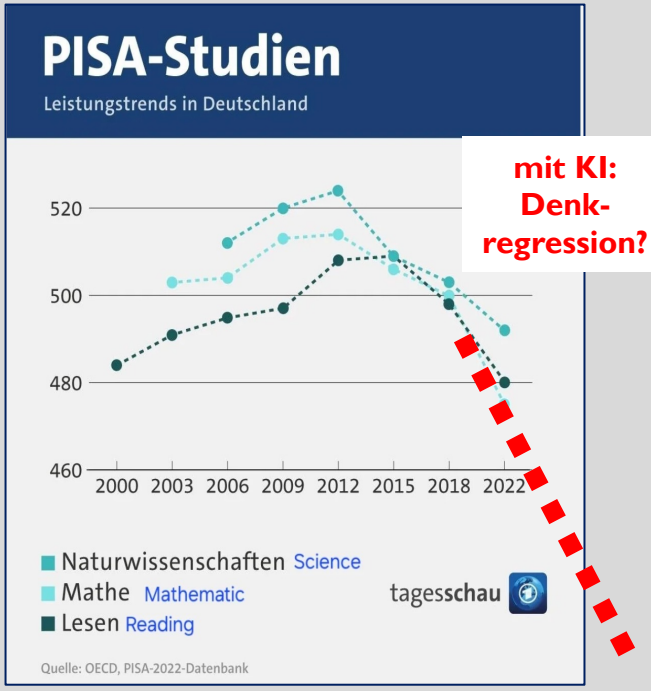
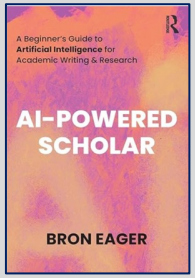


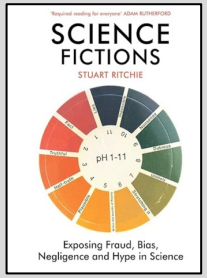
Abbildung 1: Modell des Theorie-Praxis-Transfers (vereinfacht n. Patry, 2018a, S. 22)

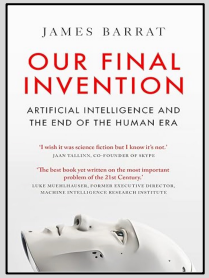
Bildungspraxis

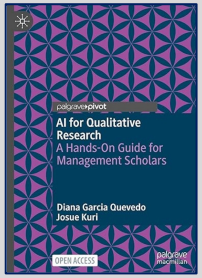


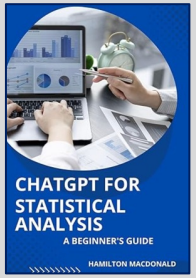
mit KI: Denk-regression?











VII.1. Ein Kernproblem: Overreliance GenKI

1.

NZZ

GASTKOMMENTAR

Klaus Zierer

Im Zeitalter von KI kommt es mehr denn je auf die Tugend des Selberdenkens an

2.

Armitage, R. (2025). Your brain on ChatGPT. *British Journal of General Practice*, *75*(758).

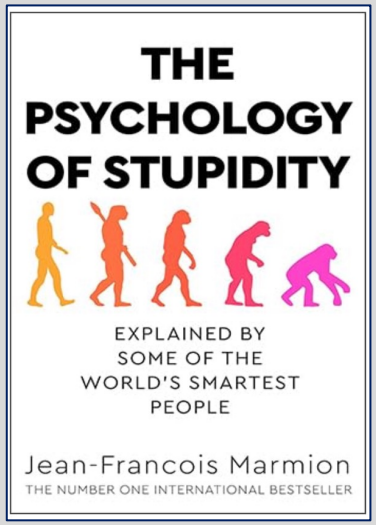
The MIT-study suggests that early reliance on LLMs may impair the development of essential cognitive skills.

3.

Konsequenzen sind gravierend:

- Lernende prüfen Expert:innen, was mit einer Abwertung von Expertise verbunden ist.
- Wissen wird sekundär, weil es allzeit verfügbar ist.
- Unterricht ist nicht mehr Wissensvermittlung, sondern etwas anders, vielleicht: Denkschulung, Motivations- und Emotionsförderung ...

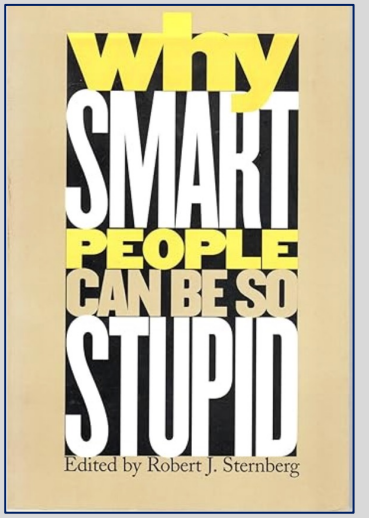
VII.1. Ein Kernproblem: Overreliance GenKI



Definition: Übermäßiges Vertrauen in GenKI

- "excessive dependence on automated systems ...
  - without human review or validation ...
  - leading to errors and loss of expertise."

https://lifestyle.sustainability-directory.com/area/over-reliance-on-ai-tools/



Problemausmaß

Zhai, C., Wibowo, S., & Li, L. D. (2024). The effects of over-reliance on AI dialogue systems on students' cognitive abilities: a systematic review. *Smart Learning Environments*, *11*(1), 28.

... users prefer ... cognitive shortcuts ...

Puppart, B., & Aru, J. (2025). ... intervention does not reduce over-reliance on incorrect ChatGPT ... *arXiv preprint arXiv:2503.10556*.

Al-Obaydi, L. H., & Pikhart, M. (2025). Artificial intelligence addiction. *AI & SOCIETY*, 1-17.

VII.1. Ein Kernproblem: Overreliance GenKI : Messinstrumente

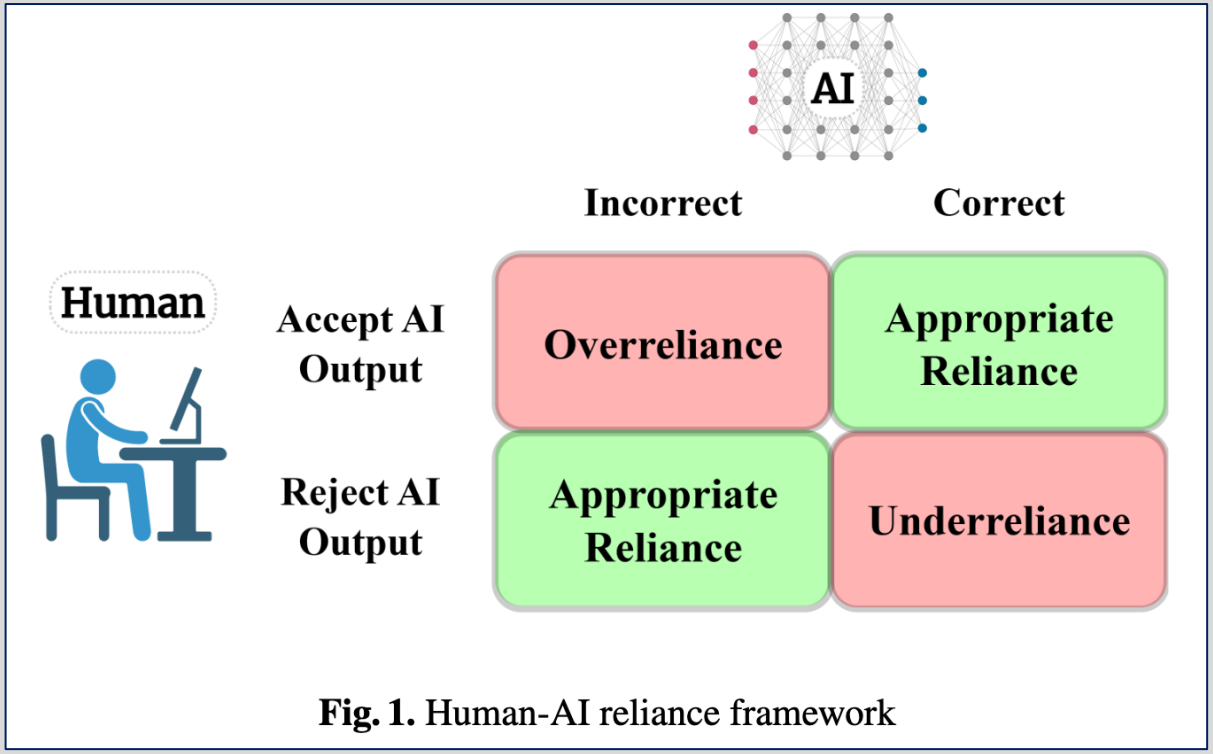


Fig. 1. Human-AI reliance framework

- accepting suggestions without understanding them,
- questioning recommendations before accepting them,
  - habitually using AI suggestions immediately, and
  - verifying AI answers with their own knowledge

Pitts, G., Rani, N., Mildort, W., & Cook, E. M. (2025, June). Students' reliance on ai in higher education: identifying contributing factors. In *International Conference on Human-Computer Interaction* (pp. 86-97). Cham: Springer Nature Switzerland

VII.1. Ein Kernproblem: Overreliance GenKI : Messinstrumente

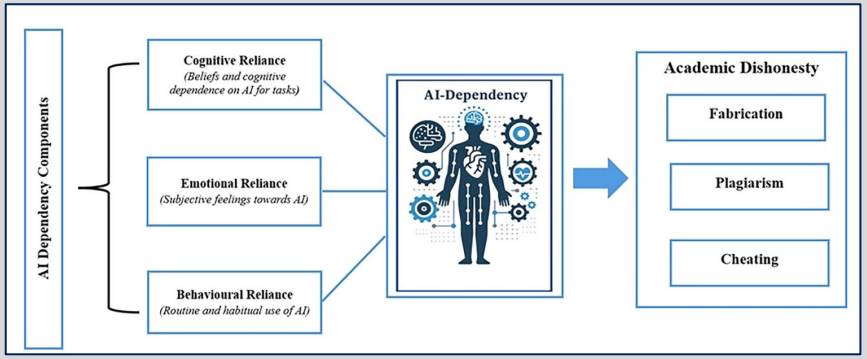


Table 3. Results of exploratory factor analysis for AI dependency scale.

Factor extracted	Item code	Items	Factor loading
Cognitive Reliance	COG1	I struggle to organize my research thoughts and ideas without AI assistance.	0.797
	COG2	I depend on AI to generate creative solutions to challenges I face in research.	0.762
	COG3	I often rely on AI to help me interpret complex research data.	0.800
	COG4	I often prefer using AI to assist in the report writing process rather than structuring it myself.	0.801
	COG5	I struggle to formulate research questions without input from AI tools.	0.797
Emotional Reliance	EMO1	I feel disappointed when I cannot find an AI tool for my task.	0.876
	EMO2	Become irritable if restricted from using AI tools.	0.736
	EMO3	I feel more confident in my research decisions when they are supported by AI data.	0.905
	EMO4	I get depressed when I realize that AI isn't contributing significantly to my project.	0.889
	EMO5	I would rather discuss my problems with AI (e.g., ChatGPT) than with my mentor or colleagues.	0.771
Behavioral reliance	BEHV1	I feel a strong urge to use AI even when it isn't necessary for the research task.	0.831
	BEHV2	Even when I decide to reduce my use of AI in research, I struggle to follow through.	0.867
	BEHV3	I have trouble stopping myself from using AI for research tasks I could do on my own.	0.760
	BEHV4	I rely on AI to verify research information, even when I already know the answers.	0.788
	BEHV5	I use AI tools daily for conducting research activities.	0.841

Sultana, A., Abdu Kaid Saleh, M., Sellami, A., & Ahmad, Z. (2026). A Multidimensional Psychometric Scale for Measuring AI Dependency in Academic Research. *International Journal of Human–Computer Interaction*, 1-24.

Table 2. Definition of possible reliance patterns based on Cabitza et al. (2023) and percentages of cases in study I.

Human decision	AI advice	Final decision	Reliance pattern	Percentage of cases (%)
0	0	0	Detrimental reliance	10.16
0	0	1	Beneficial under-reliance	0.00
0	1	0	Detrimental self-reliance	20.88
0	1	1	Beneficial over-reliance	9.14
1	0	0	Detrimental over-reliance	3.59
1	0	1	Beneficial self-reliance	7.09
1	1	0	Detrimental under-reliance	0.17
1	1	1	Beneficial reliance	48.98

Note. In the decision and advice columns, 0 signifies an incorrect decision point, and 1 represents a correct decision point.

Küper, A., & Krämer, N. (2025). Psychological traits and appropriate reliance: Factors shaping trust in AI. *International Journal of Human–Computer Interaction*, *41*(7), 4115-4131

Over-reliance of AI, a = 0.769
I rely on AI tools for completing assignments rather than using my own knowledge.
AI-generated content reduces my engagement in critical thinking.
AI use in learning decreases my motivation to read and analyze study materials.
I frequently use AI-generated responses without verifying their accuracy.
AI assistance reduces my ability to independently solve academic problems.
My dependency on AI has negatively affected my problem-solving skills.

Abubakar, S., Jeilani, A., & Yusuf, M. (2025). The role of over-reliance on AI in the negative consequences of student learning: The moderating effects of ethical concerns and institutional policies. *Cogent Education*, *12*(1), 2591503

VII. 2. Arbeitshypothese: Zusammenhang von Overreliance GenKI und Denkregression?

Google - Wissen

A-SM-Sucht - Aufmerk.

GenKI over - Denken

X

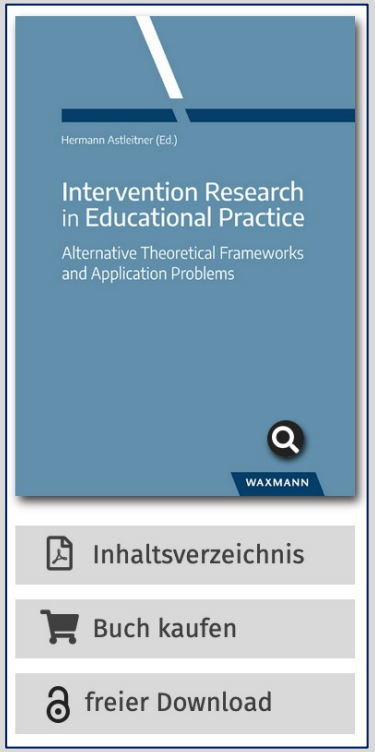
Fehlfunktionen im Unterricht oder antiquiertes Lehren

=

Denk-regression

= eine Rückkehr zu einem früheren, niedrigeren Zustand der kognitiven ... Funktionsfähigkeit.
(https://dictionary.apa.org/regression)

Probleme, bei der die Medienpädagogik versagt hat!



Giebl, S., Mena, S., Sandberg, R., Bjork, E. L., & Bjork, R. A. (2023). Thinking first versus googling first: Preferences and consequences. *Journal of Applied Research in Memory and Cognition, 12*(3), 431–442.

Augner, C., Vlasak, T., & Barth, A. (2023). The relationship between problematic internet use and attention deficit, hyperactivity and impulsivity: A meta-analysis. *Journal of Psychiatric Research*, *168*, 1-12.

VII. 3. Denkregression: Definition

Funktionale Stupidität = "Unfähigkeit und/oder der Unwille, kognitive und reflektierende Fähigkeiten über einen engen und vorsichtigen Rahmen hinaus einzusetzen. Sie beinhaltet mangelnde Reflexionsfähigkeit, eine Abneigung gegen die Forderung oder Bereitstellung von Begründungen sowie die Vermeidung substanzieller Argumentation".

Alvesson, M. and A. Spicer (2012) 'A stupidity-based theory of organizations', *Journal of Management Studies*, 49(7): 1194-1220.

Anomie = "Zusammenbruch sozialer Normen, Werte und Erwartungen innerhalb einer Gesellschaft. Sie tritt auf, wenn sich Individuen von gesellschaftlichen Normen entfremdet oder abgeschnitten fühlen, was zu Gefühlen der Ziellosigkeit, Desorientierung und sogar moralischer Verwirrung führt".

https://oxford-review.com/the-oxford-review-dei-diversity-equity-and-inclusion-dictionary/anomie-definition-and-explanation/

https://dorsch.hogrefe.com/stichwort/anomie

= Einschränkung des Denkens und seiner Standards

(= Funktionale Stupidität + Anomie)

VII. 3. Denkregression: Ähnliche Phänomene - Konstruktvalidierung

- Negative Flynn-effect
(IQ-Rückgang)

- Cognitive decline hypothesis
(Rückgang kognitiver Fähigkeiten)

- Reverse cohort effects
(jüngere Geburtsjahrgänge sind kognitiv schlechter als ältere)

- Digital offloading effect
(kognitive Entlastung führt zur Reduktion kognitiver Fertigkeiten)

- Hate to think
(Vermeidung mentaler Anstrengung)

- Goblin mode
(Selbstgefällig, faul, schlampig, gierig, ohne Normen)

David, L., Vassena, E., & Bijleveld, E. (2024). The unpleasantness of thinking: A meta-analytic review of the association between mental effort and negative affect. *Psychological Bulletin*

Aversive mentale Anstrengung

Yousef, A. M. F., Alshamy, A., Tlili, A., & Metwally, A. H. S. (2025). Demystifying the new dilemma of brain rot in the digital era: A review. *Brain Sciences*, *15*(3), 283.

Der sogenannte **Hirnfäule** führt zu emotionaler Desensibilisierung, kognitiver Überlastung und einem negativen Selbstbild. Er ist mit negativen Verhaltensweisen wie exzessivem Scrollen in sozialen Medien und Sucht verbunden, die wiederum mit psychischer Belastung, Angstzuständen und Depressionen einhergehen. Diese Faktoren beeinträchtigen exekutive Funktionen wie Gedächtnis, Planung und Entscheidungsfindung. Die allgegenwärtige Präsenz digitaler Medien, angetrieben durch dopamingesteuerte Rückkopplungsschleifen, verstärkt diese Effekte.

Shallow learning

Bauer, E., Greiff, S., Graesser, A. C., Scheiter, K., & Sailer, M. (2025). Looking beyond the hype: Understanding the effects of AI on learning. *Educational Psychology Review*, *37*(2), 45.

VII. 3. Denkregression: Messinstrumente

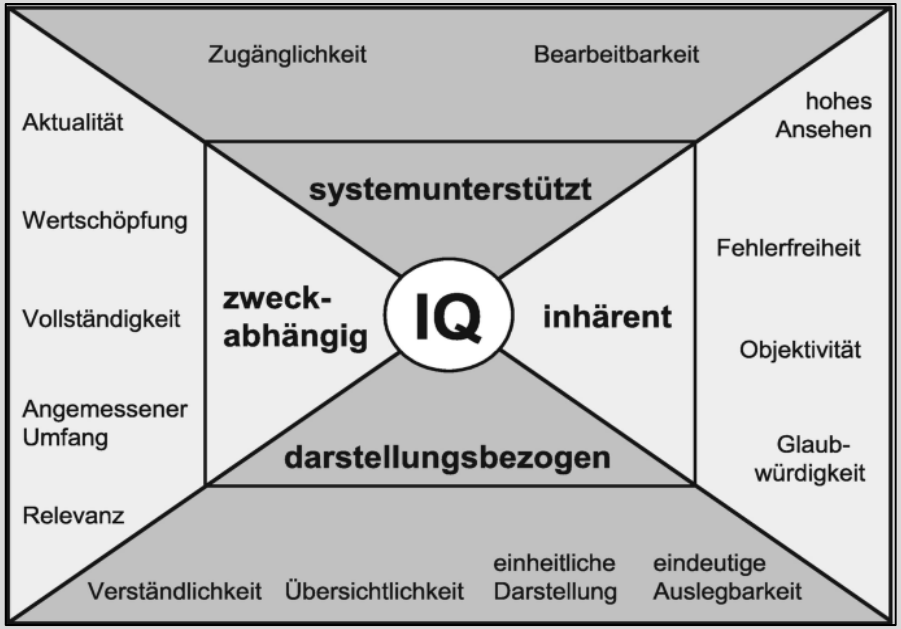
Funktionale Stupidität

Howell, J. L., & Shepperd, J. A. (2016). Establishing an information avoidance scale. *Psychological Assessment*, *28*(12), 1695.

Sexton, K. A., & Dugas, M. J. (2008). The cognitive avoidance questionnaire: validation of the English translation. *Journal of anxiety disorders*, *22*(3), 355-370.

Immanuel, E. U., & Ike, O. O. (2025). Development and validation of the laziness assessment scale. *Social Sciences & Humanities Open*, *12*, 101852.

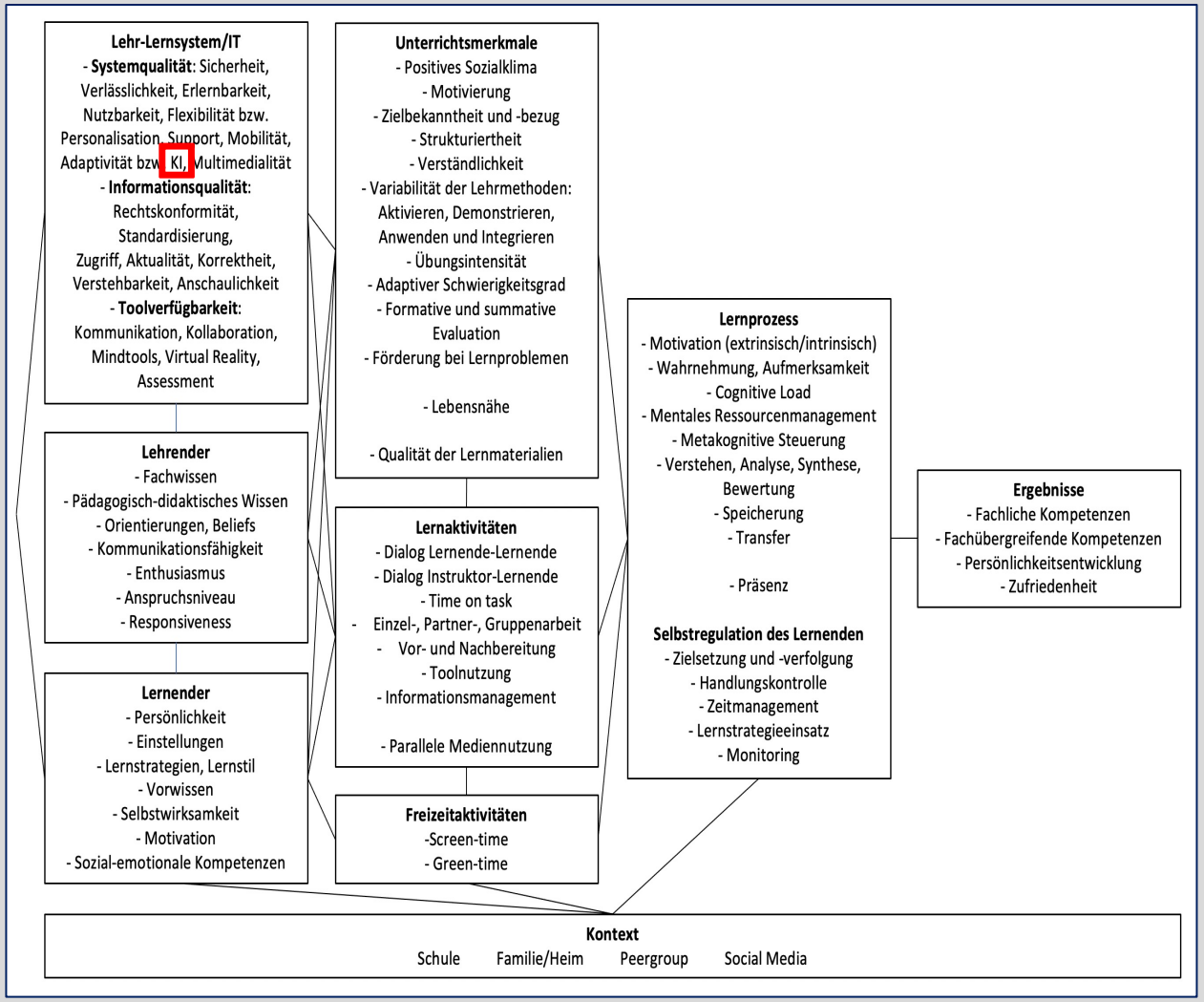
Anomie / Denkstandards

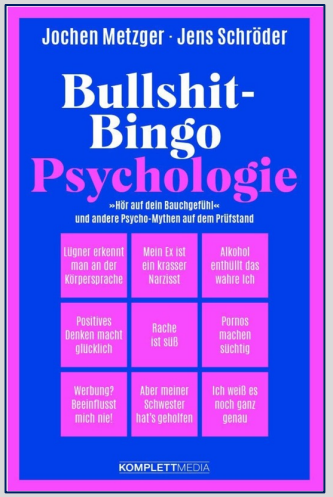


Rohweder, J.P., Kasten, G., Malzahn, D., Piro, A., Schmid, J. (2021). Informationsqualität – Definitionen, Dimensionen und Begriffe. In: Hildebrand, K., Gebauer, M., Mielke, M. (eds) *Daten- und Informationsqualität.* Springer Vieweg, Wiesbaden.

Hennigan, P. J., & Cohn, E. S. (2022). Breaking rules for moral reasons: Development and validation of the Prosocial and Antisocial Rule-Breaking (PARB) scale. *Law and Human Behavior*, *46*(4), 290.

VII. 4. Hypothetisches Wirkmodell einer diminuierbaren Denkregression (Mainstream)

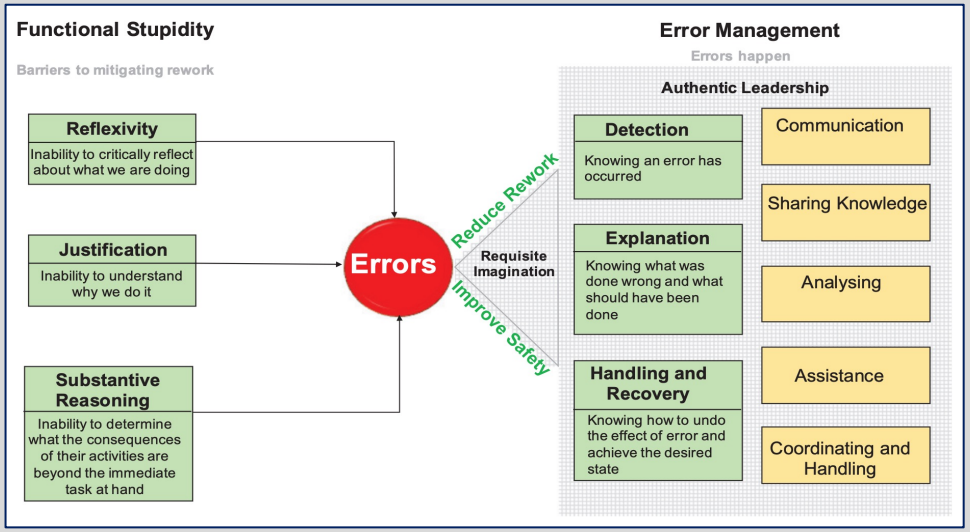




Mainstream als mitverschuldete Unwissenheit?

Astleitner, H. (2023). Hybrides Lernen. In J. Zumbach, L. von Kotzebue, C. Trültzsch-Wijnen, I. Deibl (Hrsg.), Digitale Medienbildung (S. 200-213). Waxmann.

VII. 5. Hypothetisches Wirkmodell einer eskalierenden Denkregression (heterodox)



Alvesson, M., & Spicer, A. (2012). A stupidity-based theory of organizations. *Journal of management studies*, *49*(7), 1194-1220.

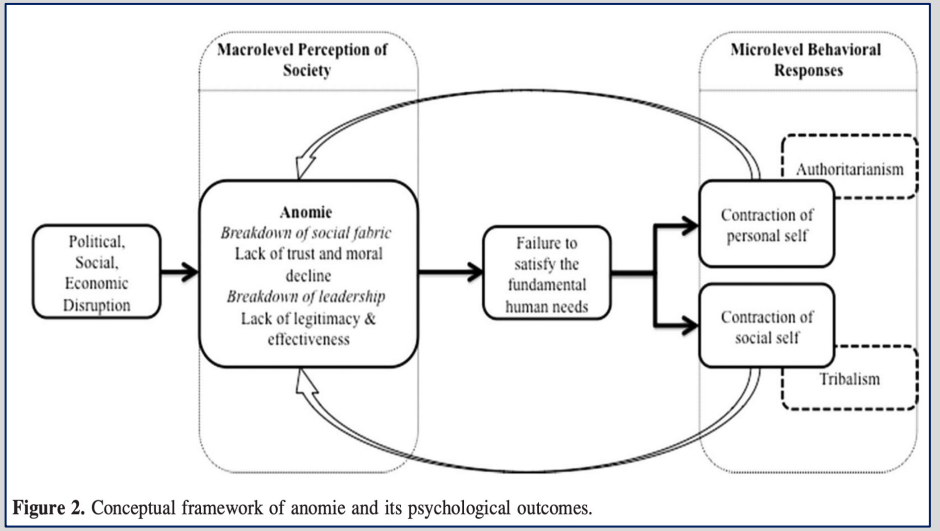
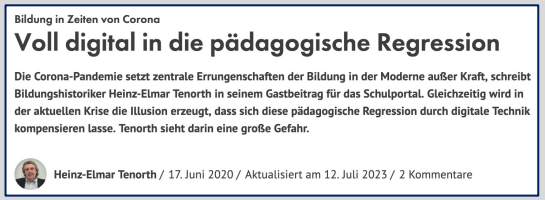


Figure 2. Conceptual framework of anomie and its psychological outcomes.

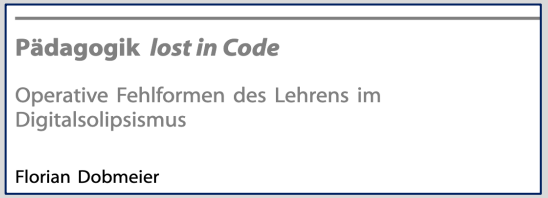
Teymoori, A., Bastian, B., & Jetten, J. (2017). Towards a psychological analysis of anomie. *Political Psychology*, *38*(6), 1009-1023.


Bildung in Zeiten von Corona

Voll digital in die pädagogische Regression

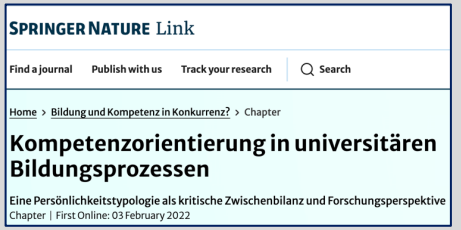
Die Corona-Pandemie setzt zentrale Errungenschaften der Bildung in der Moderne außer Kraft, schreibt Bildungshistoriker Heinz-Elmar Tenorth in seinem Gastbeitrag für das Schulportal. Gleichzeitig wird in der aktuellen Krise die Illusion erzeugt, dass sich diese pädagogische Regression durch digitale Technik kompensieren lasse. Tenorth sieht darin eine große Gefahr.

Heinz-Elmar Tenorth / 17. Juni 2020 / Aktualisiert am 12. Juli 2023 / 2 Kommentare


Pädagogik *lost in Code*

Operative Fehlformen des Lehrens im Digitalsolipsismus

Florian Dobmeier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Home › Bildung und Kompetenz in Konkurrenz? › Chapter

Kompetenzorientierung in universitären Bildungsprozessen

Eine Persönlichkeitstypologie als kritische Zwischenbilanz und Forschungsperspektive

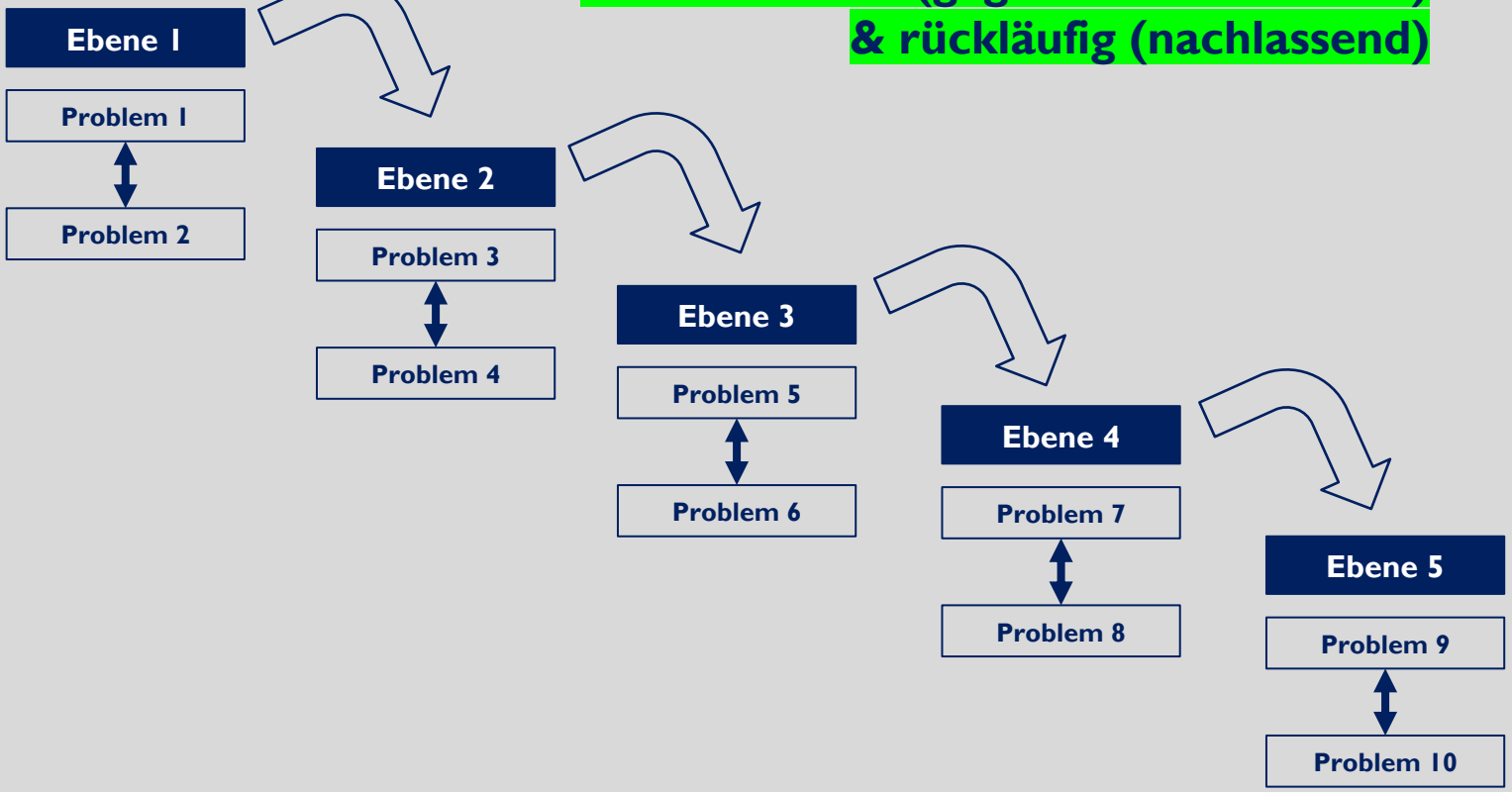
Chapter | First Online: 03 February 2022

VII. 5. Hypothetisches Wirkmodell einer eskalierenden Denkregression

Synergistisch-eskalierende Progressionskaskaden: Regressive Bildung

rückschrittlich (gegen den Fortschritt)
& rückläufig (nachlassend)

1. Forschung
2. Entwicklung
3. Unterricht
4. Schüler/in: Konativ-affektiv
5. Schüler/in: Kognitiv



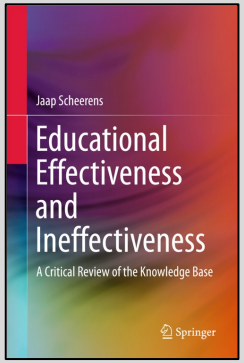
Masten, A. S., & Cicchetti, D. (2010). Developmental cascades. *Development and Psychopathology*, *22*(3), 491-495.

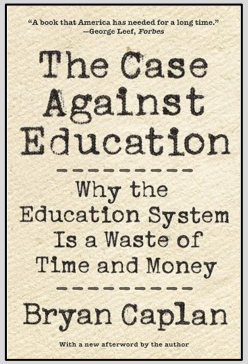
Dong, H. (2025). A study of the synergistic effects of teacher support and learning engagement on academic achievement in EFL learning. *Psychology in the Schools*.

VII. 5. Adhoc-Hypothetisches Wirkmodell einer eskalierenden Denkregression

Synergistisch-eskalierende Progressionskaskaden mit rückschrittlichen und rückläufigen Effekten im Bildungsbereich = Regressive Bildung

- Algo/Idiokratie
- Immaterielle Atrophie
- Kultur der Inkompetenz
- Devaluation/Extinktion von Bildung
- Denkregression





Shaib, C., Chakrabarty, T., Garcia-Olano, D., & Wallace, B. C. (2025). Measuring AI "Slop" in Text. *arXiv preprint arXiv:2509.19163*

Aphasien
Schlafstörungen
Epistemic Bubbles
Epidemische pathologische Mediennutzung

Work-life-blending (Von der Leistungs- zur Anspruchsgesellschaft)
Performance-Noten-Inflation
Affektstörungen: hater - new horror
Kultur der Negligenz

Zieldiffusion (Störungen, geheimer Lehrplan, Supplieren ...)
Inhaltsmüll (AI Slop, Mis-/Des-/Malinformation)
Kontrollverlust (Alle sind Experten, instruktionale Inkohärenz)
Volatilität (Kompetenzabbau, saisonales Vergessen)

Praxisirrelevante Diskursmetaphysik
Autopoietische empirische Forschung
Problemferne Lehrer:innen-Bildung
Ineffektive Fortbildungskultur

- Kognitiv
- Konativ-affektiv
- Unterricht
- R & D

GenKI over reliance

Negatives
Werte, Emotionen, Verhalten

Gier
Geld, Macht, Sex
Dunkle Persön.
Machiavellismus
Narzissmus
Psychopathie
Destruktive P.
Inkompetenz
Einfallslosigkeit
Feigheit
Aggression
Intoleranz
Illoyalität
Faulheit
...

VII. 5. Adhoc-Hypothetisches Wirkmodell einer eskalierenden Denkregression

Digital-regressive Bildung als Problemkatalysator

Dysfunktionalität (rückschrittlich)

synergistisch

Erosion (rückläufig)

Stufen des (un)reflektierten KI-Einsatzes

1. Co-Konstruktion	Innovation
2. Kusorisch	Stagnation
3. Passiv	Regression

Stufen der Mis-/Des-/Malinformation

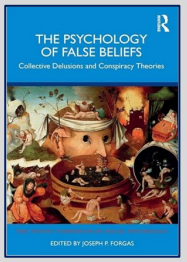
1. Expertise	Innovation
2. Fragmentwissen	Stagnation
3. Falschwissen	Regression

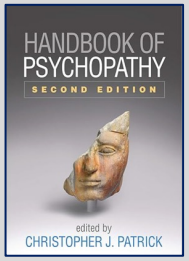
Stufen der Medien-Pathologien

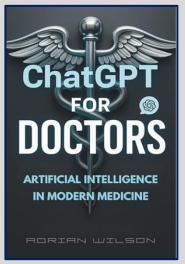
1. Kontroll. Nutzung	Innovation
2. Suchtgefährdung	Stagnation
3. Pathologische Sucht	Regression

Stufen der pädagogischen Anomie

1. Intervention/Präv.	Innovation
2. Notfallhandeln	Stagnation
3. Ignoranz	Regression







Regression

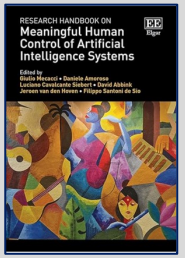
Leistungsinflation
Wie verändert sich die Leistungs-bewertung, wenn KI (teil-)leistet?

Kontrollverlust durch KI
Wie geht Bildung und Erziehung bei Bildungsversagen und Kontrollverlust durch hybride KI-Systeme?

Abbau von Erreichbarkeit
Wie kann man Menschen bilden und erziehen, die ein digitales Selbst haben und nur mehr teilweise "erreichbar" sind?

Abbau von humaner Expertise
Was ist menschliche Expertise noch wert bzw. welche menschliche Expertise wäre wertvoll?

Koltun, V., & Hafner, D. (2021). The h-index is no longer an effective correlate of scientific reputation. *PLo S One, 16*(6), e0253397.



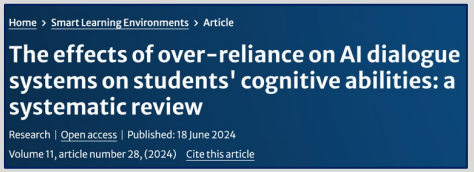
VII. 5. Adhoc-Hypothetisches Wirkmodell einer eskalierenden Denkregression

Zielbereiche der Bildung	Akteure	Stand/Beispiel
Deklaratives Wissen	KI	schon realisiert / Studierende fragen ChatGPT und prüfen Professor
Prozedurales Wissen	Mensch + KI	teilweise realisiert / KI hilft beim Lösen von Statistikproblemen
Kritisches Denken	Mensch + KI	Dirk Jahn / ChatGPT als Werkzeug zum kritischen Denken, das starker Reflexion bedarf
Mentaler Modellbau/Kreativität	Mensch + KI	derzeit mit Grenzen / KI kann kreative Theoriebildung noch nicht (Astleitner)
Persönlichkeitsentwicklung	Mensch + KI	erprobt / Therapie-Chatbots zu affirmativ
Learning flows (in der Cloud)	KI	Peter Fisk als Visionär / Meta-KI-Systeme in Entwicklung
Learning on Demand	KI	Udacity: erfolgreichste Weiterbildung, KI als Thema
Lernen als Wissensarbeit	KI + Mensch	schon realisiert / Paper Mills in der Wissenschaft
Smarte Lernumgebungen	KI	Adaptive Lehrsysteme / www.knewton.com oder https://feedbook.schule • https://online-schule.saarland/unterrichten/digitale-bildungsmedien/area-9/ • https://area9lyceum.de/#
Informelles Lernen	KI	schon realisiert / ChatGPt als Lernpartner
Monitoring	KI	machbar /KI kann mit Big Data aus der Bildungsforschung verbunden werden
Instructional Design	KI	machbar / KI kann ganze Unterrichtseinheiten planen

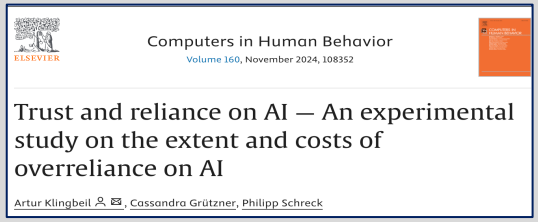
VII. 6. Ausblick: Projektinitiative: Digital-rEgressive BILdung

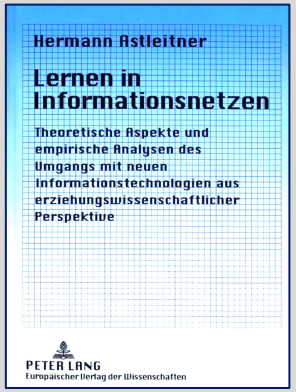
Mainstream-Forschung

(Mixed-Method-)Befragungen



Sequentielle (Quasi-)Experimente





+

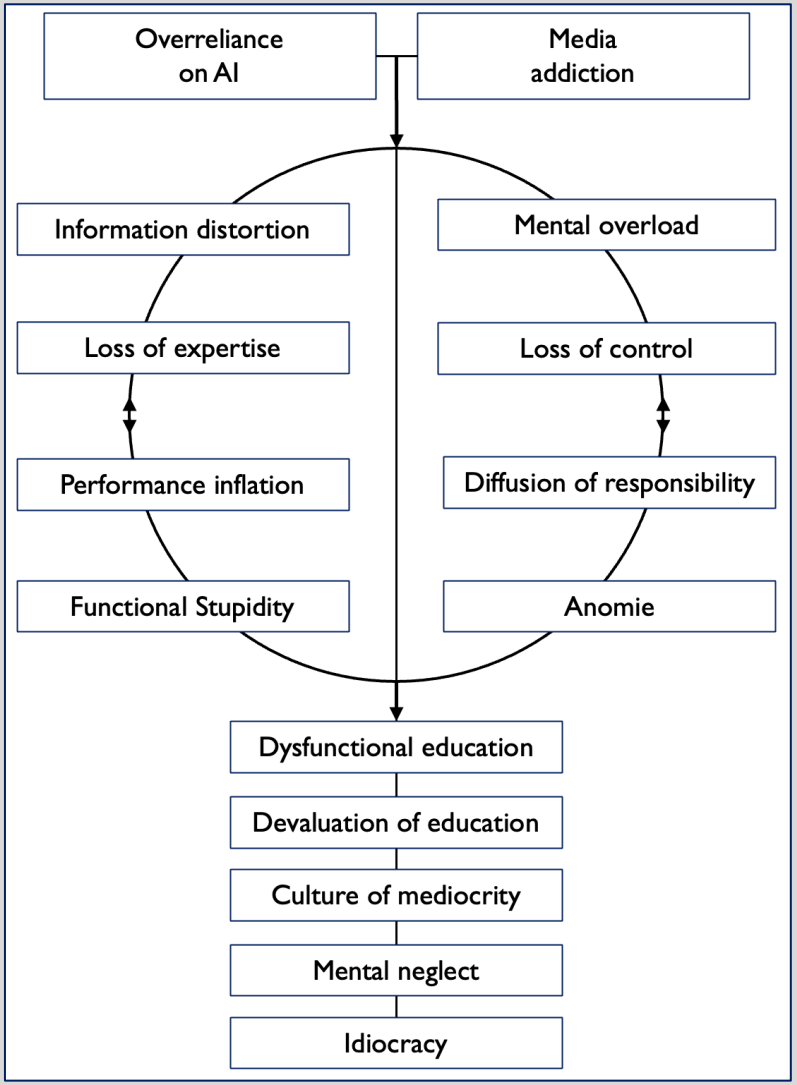
Heterodoxer FOKUS: Wirkfaktoren regressiver Bildung

- Overreliance (Gen)KI
- Denkregression
- Mis-, Des- und Malinformation
- Leistungsinflation
- Medienpathologien
- Verantwortungsdiffusion
- Kontrollverlust
- Pädagogische Anomie
- Entfremdung
- De-Humanisierung

Lilienfeld, S. O. (2020). Embracing unpopular ideas: Introduction to the special section on heterodox issues in psychology. *Archives of Scientific Psychology, 8*(1), 1–4. https://doi.org/10.1037/arc0000072

VII. 6. Ausblick: Projektinitiative: Digital-rEgressive BILdung

*A **Starting Model** on Overreliance on AI, Media Addiction, Cognitive Regression Cycle, and Idiocracy*



Limitations: "Aktionskunst"

Theorie aber solange gültig, bis sie eine bessere ablöst!

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[Fotonachweis: www.pexels.com, wikipedia commons]