BRIDGE

Performance Assessment of
Domain-specific and Generic Use
of Online Media by Young Professionals

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AGENDA

Online information is oftentimes incomplete, biased or erroneous and users feel overwhelmed by the amount of available information **("information overload")**.

Increasing Internet use does not automatically imply greater competence in dealing with online-media.

Young professionals increasingly **use online-media as information sources** in various domains

Especially for young professionals in the evidence-based fields of medicine, law and teaching, the **critical and effective use of online information** is a key competence facet which is relevant for professional practice.

However, university graduates often have difficulties in competently handling online media and feel overwhelmed.

(Bertelsmann Stiftung et al., 2019; Blömeke, 2017, Bäsler, 2020; McGrew et al., 2018; Maireder & Nagl, 2010; Wineburg & McGrew, 2018; McGrew et al., 2017, 2019; for an overview, see Zlatkin-Troitschanskaia et al., 2021)

Project for the investigation of **practical processes of vocational education and training** using **digital media**
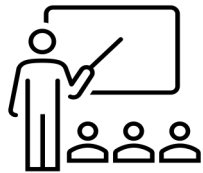
Target group: young professionals (Teaching, Medicine, Law)

We investigate this target group because the preparation and creation of professional, job-specific documents is becoming increasingly **digital**. A competent **handling of online information** is necessary.
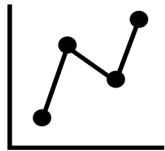
Developing a competent use of online information

We are investigating how the **use of online information** in vocational education and training processes is changing over time.

Promoting a competent use of online information

We are investigating how the use of online information can be effectively promoted through digital training to support professional decision-making and action based on high quality sources and information.

Teaching

- Lesson plans / subject matter
- Teaching methods
- Crafting of instructional material

Medicine

- Medical case reports / estimates, treatment plans
- Research on symptoms, medication, treatment methods

Law

- Legal reports / case presentation
- Verdicts according to supreme court jurisprudence

Use of online resources for job-specific documents

(Bäsler 2019; Kuhn et al. 2018; Rott, 2014; Basak & Schimmel, 2008)

Research Questions:

How do young professionals in the fields of law, medicine and teaching (subject: economics) use online media?

How do they use online information when working on practical **professional tasks** such as producing **professional, job-specific documents** (e.g. lesson plans)?

?

To what extent can an **online training** effectively improve the **generic use** of online information?

To what extent can an **online training** effectively improve the use of online information in the **production of professional, job-specific documents**?

Central Goals:

Analysis and promotion of **generic** and **domain-specific** use of online-information by young professionals

Analysis of the effectiveness of an innovative **digital concept for the effective promotion** of general use of online information (online training study) in professional practice

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Critical Online Reasoning (COR)

The ability to effectively "search, select, access, process and use online information to solve a given problem or build knowledge from this online information while critically distinguishing trustworthy from untrustworthy information and reasoning argumentatively based on trustworthy and relevant information from the online environment." (Molerov et al., 2020)

Three interconnecting facets:

(i)   Online Information Acquisition (OIA)

(ii) Critical Information Evaluation (CIE)

(iii) Reasoning based on Evidence, Argumentation, and Synthesis (REAS)

Main Facets of COR
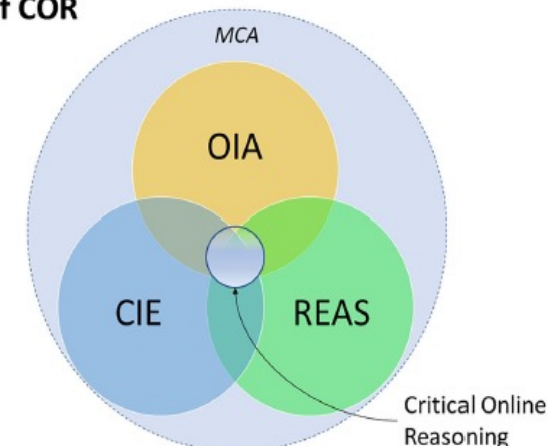
(Molerov et al., 2020)

Critical Online Reasoning (COR)

Generic (GEN-COR)

Critical Online Reasoning

Application of COR skills in tasks without specific domain reference

Focus on general indicators of source quality (e.g. credibility)
Example: Author qualifications
(McGrew et al., 2018)

GEN-COR assessments are based on cross-domain tasks

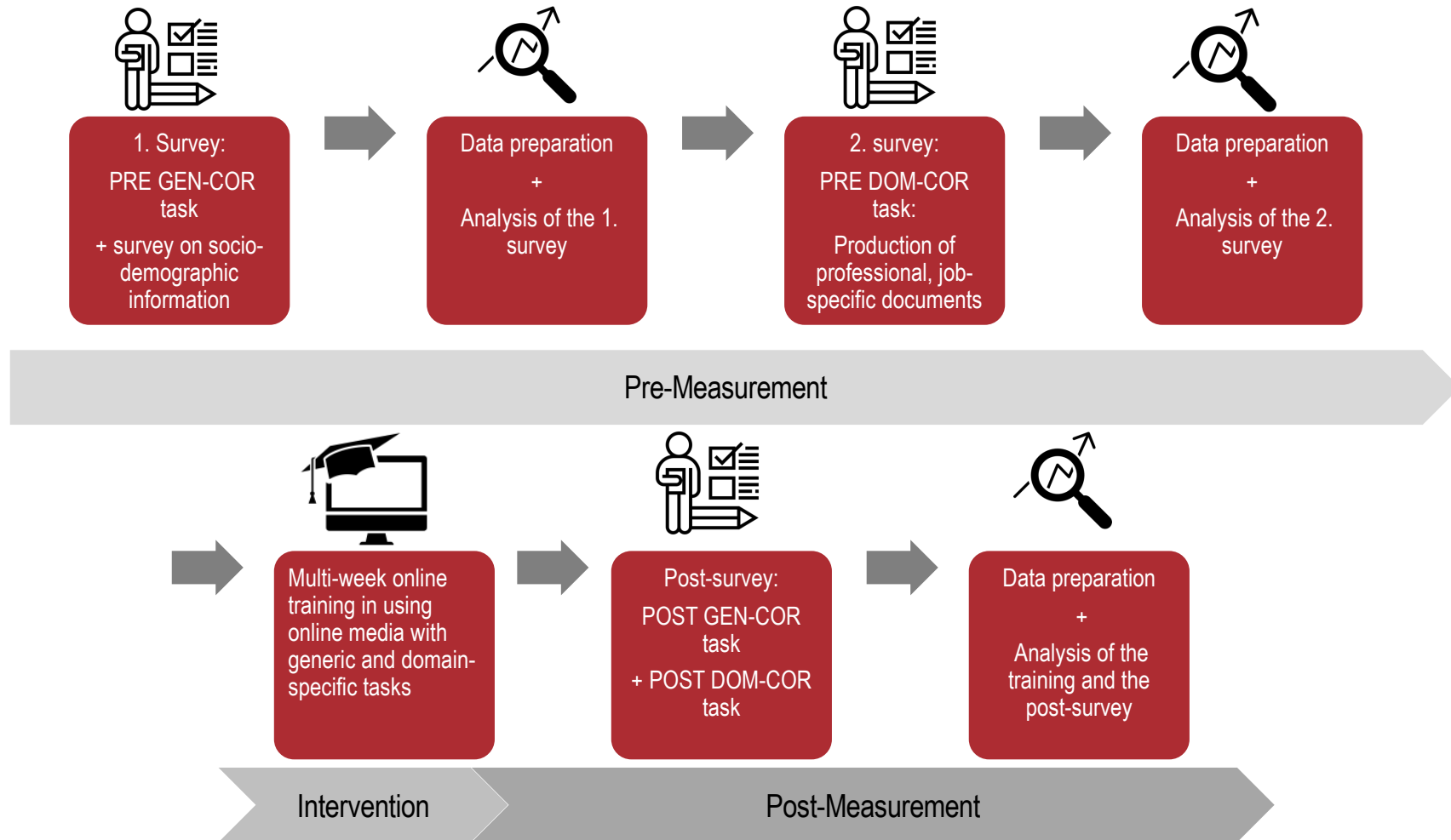### Domain-specific (DOM-COR)

Critical Online Reasoning

Use of COR-skills differs between professional and academic domains
(Toplak & Stanovich, 2002)

Additional inclusion of domain-specific aspects of source quality
Example: Topicality of didactic concepts

DOM-COR assessments are based on domain-specific tasks

5. Study Design

1. Survey: PRE GEN-COR task + survey on socio-demographic information → **Data preparation + Analysis of the 1. survey** → **2. survey:** PRE DOM-COR task: Production of professional, job-specific documents → **Data preparation + Analysis of the 2. survey**

Pre-Measurement

Multi-week online training in using online media with generic and domain-specific tasks → **Post-survey:** POST GEN-COR task + POST DOM-COR task → **Data preparation + Analysis of the training and the post-survey**

Intervention | **Post-Measurement**

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- Development of a new **COR Assessment (CORA)** in an evidence-based design (Mislevy, 2018) ➡ Captures research, evaluation and use of online information in a real online environment, i.e. Internet
- Usage of open web-searches and actual websites included in this performance assessment
- Collection of both process data (log files) and performance data (written answers)

Do e-bikes benefit health?

You are thinking about getting an e-bike for health benefits. To do this, you start researching the effects of e-bikes on health online.

Research on the Internet to answer the questions. Then, please check the reliability of the information of your online research. Please always indicate the internet sources (URLs) used.

1) Please insert the sources you have found with their respective URLs and indicate behind them whether you have used them or not, then state whether you consider the source to be reliable and briefly explain why. *(10 minutes)*

2) Write a short statement in which you give a reasoned opinion on whether e-bikes contribute to health improvement based on your research from task 1. Please refer to the relevant information from your research and give the sources (URLs). Please include the sources (URLs). *(10 minutes)*

CORA task description:

- 20 minutes per task

✓ Perform an open web search
✓ Evaluate online information
✓ Write an open response

➡ Scoring by independent trained raters applying a rating scheme based on the COR-construct definition (Molerov et al., 2020; Nagel et al., 2020)

➡ Analysis of the log files regarding the number, type, and quality of used online sources

Evidence-centered assessment design (ECD) (Mislevy, 2017)

Student Model	Task Model	Interpretive Model
RQ1: - What student abilities and mental processes does the CORA cover? - How can the COR ability be described and operationalized in terms of its construct definition?	RQ2: - What kinds of situations (task prompts), with which psychological stimuli (i.e., test definition), are required to validly measure students' abilities and mental processes in accordance with the construct definition?	RQ3: - To what extent does the preliminary evidence support the validity claim that CORA measures the participants' personal construct-relevant abilities in the sense of the defined construct definition?

(Molerov et al., 2020; Troitschanskaia et al., 2021)

Excerpts from the COR Assessment rating scheme

COR facet	Description	List of criteria	COR construct	Score evaluation (highest possible score)	Grading Scale from 0 - 4:					Percentage weight
					0 Not fulfilled	1 Mostly not fulfilled	2 Partially fulfilled	3 Mostly fulfilled	4 Completely fulfilled	

1. Definite answer (in the sense of the task)	on the 2nd question: Is the answer definite and understandable? Has a clear judgement been made?		
2. Comprehension	• Was the content of the question addressed? • Was the content of the question missed?		Content reference is composed of: • Assessment of source credibility as well as • Judgement in the sense of the assignment
3. Quality of sources used	Use of additional sources Have additional sources been consulted? Is the number of sources used appropriate? (at least 2 sources)		[EXCERPT] Unreliability of a source • The linked websites of the tasks, newspaper articles and the sponsor websites behind them • Impressum of the linked websites
4a. (Task with link) Identify possible bias & draw conclusions	• Test person has (not) identified bias		• Identification of bias Examples of possible bias: • Promotion of other products, Corruption, Political influence, Lobbyism
	• Test person draws the right conclusions (connection between bias and reliability of the website)		• Drawing relevant conclusions (in relation to the credibility of the website)

Forms of collected data

Survey Results (Sociodemographic, Media Usage, etc.)

Process Data (Logfiles)

Performance Data (Written Answers)

Rated Scores

Categorization of Used Sources

Excerpts of collected data

	hash	timestamp	event	url
10352	A55SoscAifYMkBS	2021-04-02 11:42:57.7280000	Close Tab	https://www.pubmed.de/
10353	A55SoscAifYMkBS	2021-04-02 11:42:57.7320000	Switch active Tab	https://de.wikipedia.org/wiki/Cushing-Syndrom
10354	A55SoscAifYMkBS	2021-04-02 11:47:12.3610000	Switch active Tab	https://www.lecturio.de/magazin/hyperkortisolismus-un...
10355	A55SoscAifYMkBS	2021-04-02 11:05:38.3990000	Open new Website in active Tab	https://login.microsoftonline.com/common/oauth2/auth...
10356	A55SoscAifYMkBS	2021-04-02 11:05:39.0490000	Open new Website in active Tab	https://www.office.com/?from=PortalHome
10357	A55SoscAifYMkBS	2021-04-02 11:05:39.4600000	Open new Website in active Tab	https://www.office.com/?auth=2
10358	A55SoscAifYMkBS	2021-04-02 11:32:59.5080000	Switch active Tab	https://jguwipaed-my.sharepoint.com/personal/a55sosc...
10359	A55SoscAifYMkBS	2021-04-02 11:33:07.7170000	Switch active Tab	https://jguwipaed-my.sharepoint.com/personal/a55sosc...
10360	A55SoscAifYMkBS	2021-04-02 11:33:32.0620000	Paste Event	
10361	A55SoscAifYMkBS	2021-04-02 11:33:38.0550000	Switch active Tab	https://www.bayerisches-aerzteblatt.de/fileadmin/aerzte...
10362	A55SoscAifYMkBS	2021-04-02 11:33:42.2970000	Open new Website in active Tab	https://www.bayerisches-aerzteblatt.de/fileadmin/aerzte...
10363	A55SoscAifYMkBS	2021-04-02 11:33:42.4950000	Switch active Tab	https://www.bayerisches-aerzteblatt.de/inhalte/details/n...
10364	A55SoscAifYMkBS	2021-04-02 11:33:43.4220000	Scrolled up	
10365	A55SoscAifYMkBS	2021-04-02 11:33:44.9060000	Scrolled up	
10366	A55SoscAifYMkBS	2021-04-02 11:33:46.5470000	Scrolled up	
10367	A55SoscAifYMkBS	2021-04-02 11:33:49.4340000	Switch active Tab	https://www.awmf.or
10368	A55SoscAifYMkBS	2021-04-02 11:33:51.5450000	Scrolled up	
		2.8760000	Open new Website in active Tab	https://www.awmf.or
		8.7730000	Switch active Tab	https://jguwipaed-m
		0.1870000	Paste Event	

Gutachten

Die Klage des Herrn Leicht hat Erfolg, soweit sie zulässig und begründet ist.

    I.   Zulässigkeit:

Die Klage des Herrn Armin Leicht müsste zunächst zulässig sein. Herr Leicht hat die Klage beim Amtsgericht Mainz erhoben. Dieses müsste für den Rechtsstreit sachlich und örtlich zuständig sein. Die sachliche Zuständigkeit richtet sich nach § 71, 23 GVG, wonach das Amtsgericht neben der begründeten ausschließlichen Zuständigkeit für Streitwerte unterhalb von 5000,00 Euro zuständig ist. Eine ausschließliche Zuständigkeit ist nicht gegeben. Der Gegenstandswert der Klage des Herrn Leicht beträgt 165,00 Euro, sodass dieser unter 5000,00 Euro liegt und das Amtsgericht sachlich zuständig ist. Die örtliche Zuständigkeit richtet sich nach der ZPO und richtet sich nach dem allgemeinen Gerichtsstand des Wohnsitzes des Beklagten, sofern kein ausschließlicher Gerichtsstand begründet ist. Ein ausschließlicher Gerichtstand greift nicht. Die Klage richtet sich gegen den in Wolfsburg wohnenden Beklagten Ferdinand Flug. Insoweit könnte auch das Amtsgericht Wolfsburg sachlich zuständig sein. Allerdings hat sich der Beklagte rügelos nach Belehrung gemäß § 504 ZPO verhandelt. Sodass das Amtsgericht Mainz gemäß § 39 ZPO aufgrund von rügeloser Verhandlung zuständig ist. Insoweit ist das Amtsgericht Mainz sachlich und örtlich zuständig.
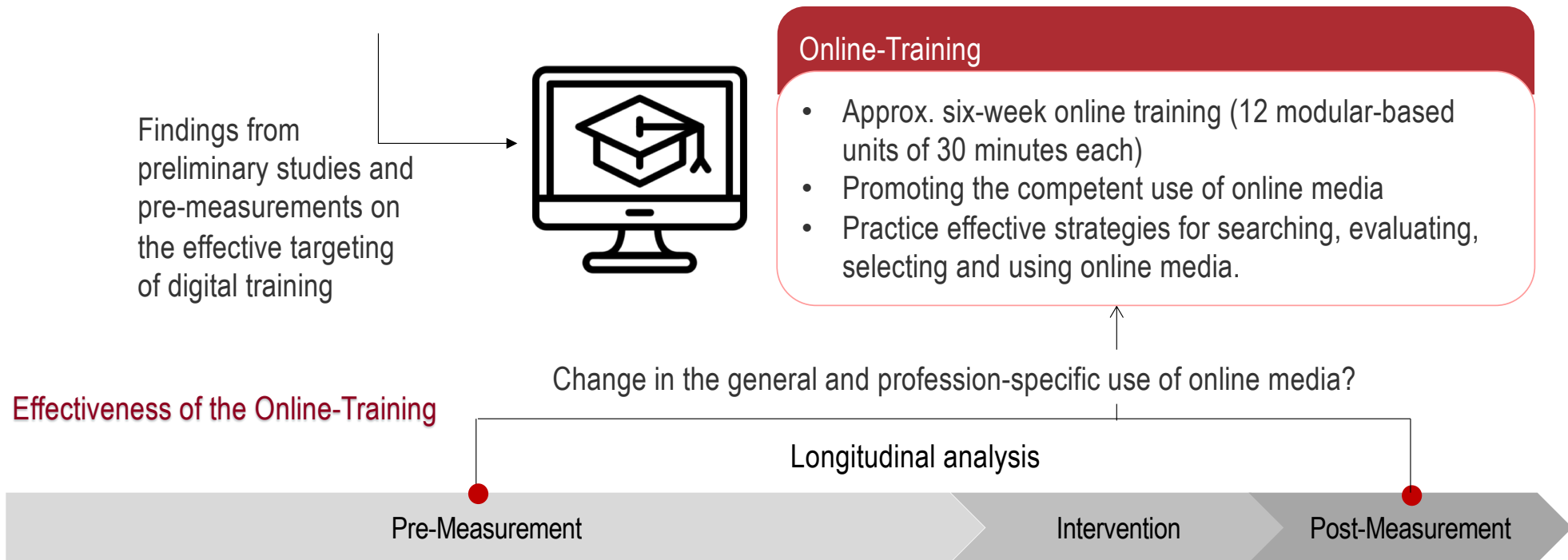
    II.   Begründetheit

Die Klage müsste zudem auch begründet sein. Die Klage ist begründet, soweit dem Kläger tatsächlich ein Anspruch gegen den Beklagten auf Zahlung der 165,00 Euro, sowie die 44,33 Euro außergerichtliche Rechtsanwaltskosten zusteht.

A) Ein Anspruch Auf Rückzahlung der 165,00 Euro könnte sich aus einer schuldrechtlichen Verpflichtung ergeben. Der Kläger könnte mit dem Beklagten in eine rechtliche Leistungsbeziehung eingetreten sein, als er 03.07.2009 auf den Parkplatz des Beklagten in der Friedrich-Ebert-Straße 73,

Category	Credibility Score
Government Entity	5
University Online-Catlogue	5
Subject of International Law	5
Scientific Journal / Technical Book	5
Scientific Research Institute	5
(Professional) Databases	5
Lecture Material	5
Professional Journal / Publisher	4
Funding Organization	4
Google Books	4
Google Scholar	4
Statistics Portal	4
Association	3
News Page	3
Encyclopedia	2
Party	2
Non-scientific Research Institute	2
Online-Shop	1
Social Media	1
World Wide Web	1
Search Engine	0

Online Training *(with collection of log data and process data):*

Development of a web-based learning and assessment environment for **training** and **direct process-related recording** of the critical handling of online information (including via log, event and search histories).

Findings from preliminary studies and pre-measurements on the effective targeting of digital training

Online-Training

- Approx. six-week online training (12 modular-based units of 30 minutes each)
- Promoting the competent use of online media
- Practice effective strategies for searching, evaluating, selecting and using online media.

Change in the general and profession-specific use of online media?

Effectiveness of the Online-Training

Longitudinal analysis

Pre-Measurement | Intervention | Post-Measurement

Sample: *Frequency Statistics.*

Variables	Abs. n (%) (N=67)		
Gender	Female 43 (64.18%)	Male 24 (35.82%)	Diverse 0 (0%)
Domain	Teaching 30 (44.77%)	Law 15 (22.39%)	Medicine 22 (32.84%)

Mean Statistics.

Variables	Min	Max	Mean	Std. Dev.
Age	24	46	27.4	3.705
First State Exam Grade				
Teaching [a]	1.3	2.7	1.95	.407
Law [b]	2	10	6.25	3.22
Medicine [a]	1.0	4.0	2.41	1.08
Final Degree Grade[a]	1	3.4	1.851	.668

a 1 being the highest and 6 being the lowest possible grade.
b 18 being the highest and 0 being the lowest possible grade.

GEN-COR Scores across all three domains

Pre GEN-COR Task				
Task-Scores	N	Min	Max	Mean
Total	**67**	**0,9**	**4**	**3,29**
Teaching	29	0,9	4	3,09
Medicine	22	2,07	4	3,37
Law	16	2,77	4	3,54

Post GEN-COR Task				
Task-Scores	N	Min	Max	Mean
Total	**79**	**1,9**	**3,9**	**3,24**
Teaching	32	2,15	3,85	3,19
Medicine	31	2,02	3,9	3,33
Law	16	1,9	3,75	3,19

Ongoing Analyses – Example I

DOM-COR Process Indicators

Domain	Page Visits		ø Length of Stay per Website (in seconds)	ø Number of Search Queries (per participant)
	Min	Max		
Medicine	2	398	24,42	7,76
Law	6	474	112,68	9,8
Teahing	1	931	178,63	14,94

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Ongoing Analyses – Example II

Process Mining (example: teaching)
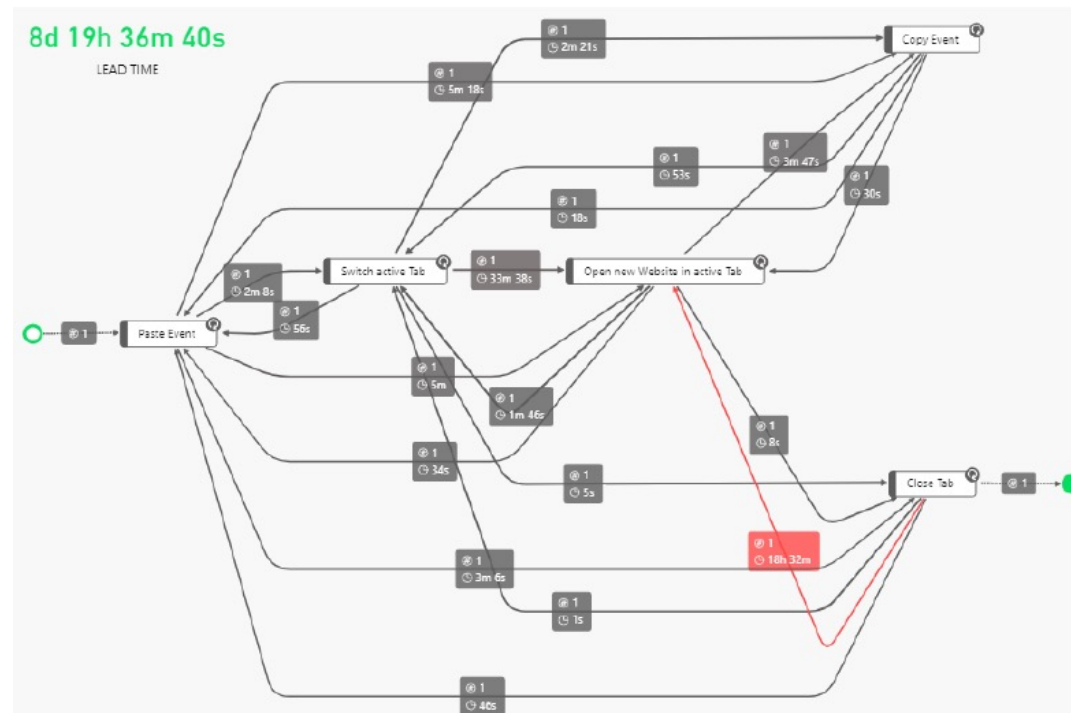
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Ongoing Analyses – Example III

DOM-COR: AUTOMATIC TEXT ANALYSIS

From Texts to Target Variables

Predicting

- text cohesion

- text quality

- artificiality

- ...

→ test outcomes of students in higher education

→ medical diagnoses (clinical NLP)

- ...

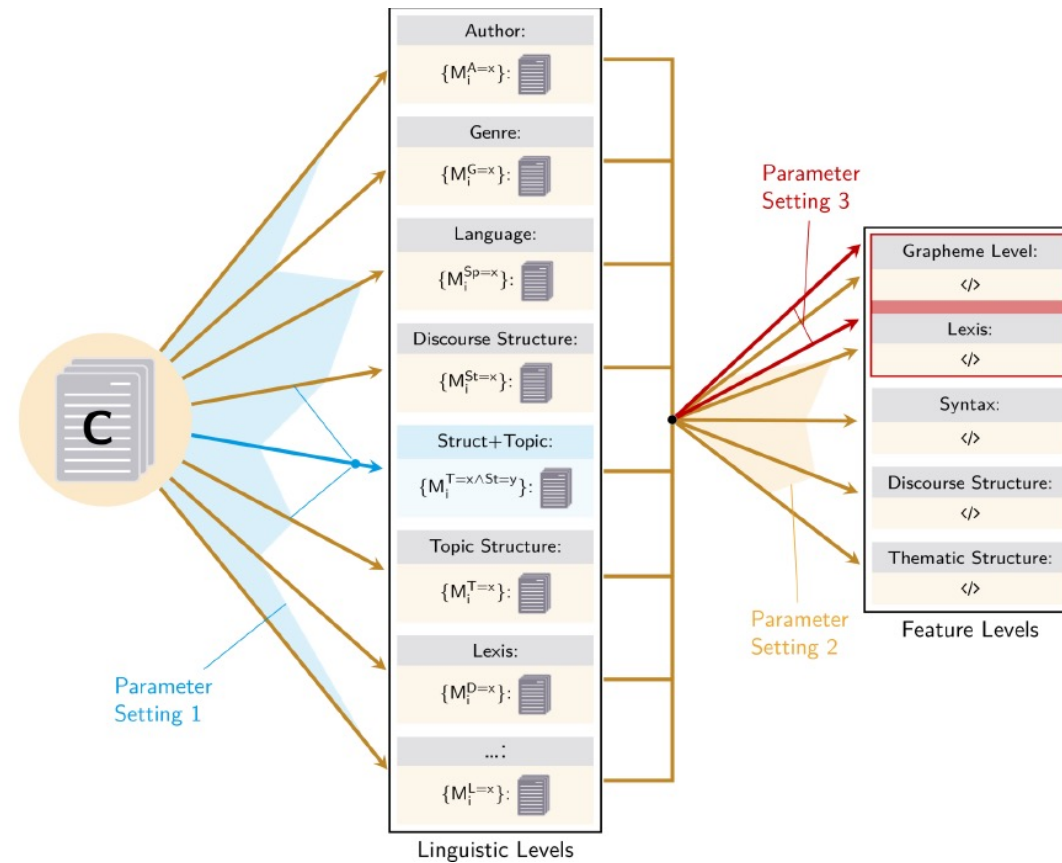as a function of quantified features of the texts involved at various linguistic levels.

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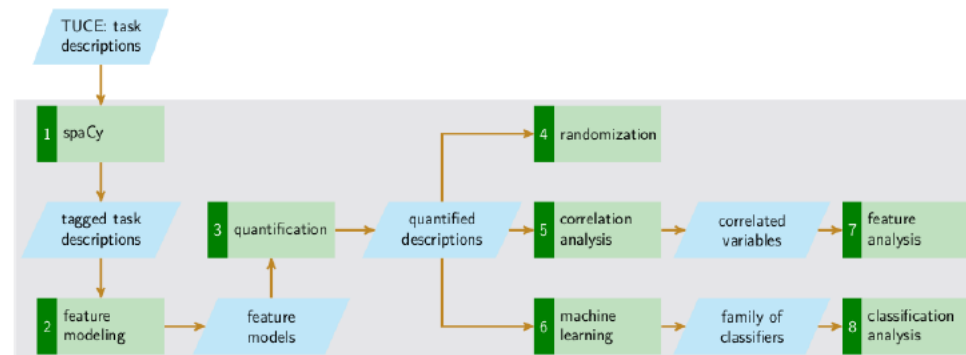
Ongoing Analyses – Example III

DOM-COR:
AUTOMATIC
TEXT ANALYSIS

Linguistic Levels

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7. Next Steps

- Additional Surveys (Eye-Tracking)

- Further Analyses of Process Data / Linguistic Data
- Analysis of Training Data

- Collaborative Research and Analyses

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Obrigado!

We're happy about any questions, remarks and ideas ☺

APPENDIX

BRIDGE DATA

- 2 measurement occasions: pre-training & post-training

- 143 students (law, education & medicine master students)

- Informed consent from all participants was received

- 3 raters scoring the student performance on open-ended question according to the theoretically-grounded criteria (criteria and tasks are different for pre- and post-test)

- Generic (GEN-COR) & Domain-Specific (DOM-COR) Critical Online Reasoning tasks

- Large amount of context questionnaires: psychological traits, information processing habits, self-report of higher-order thinking skills, demographic variables, learning outcomes, etc.

PROCESS DATA

- Students' behavior while searching for the online sources was tracked and recorded

- > 12,000 events in total

- Timestamp of the event as well as its type are recorded

- The content of the visited web-pages is also saved for the analysis

- The data is analyzed in (Schmidt, et al., 2020)
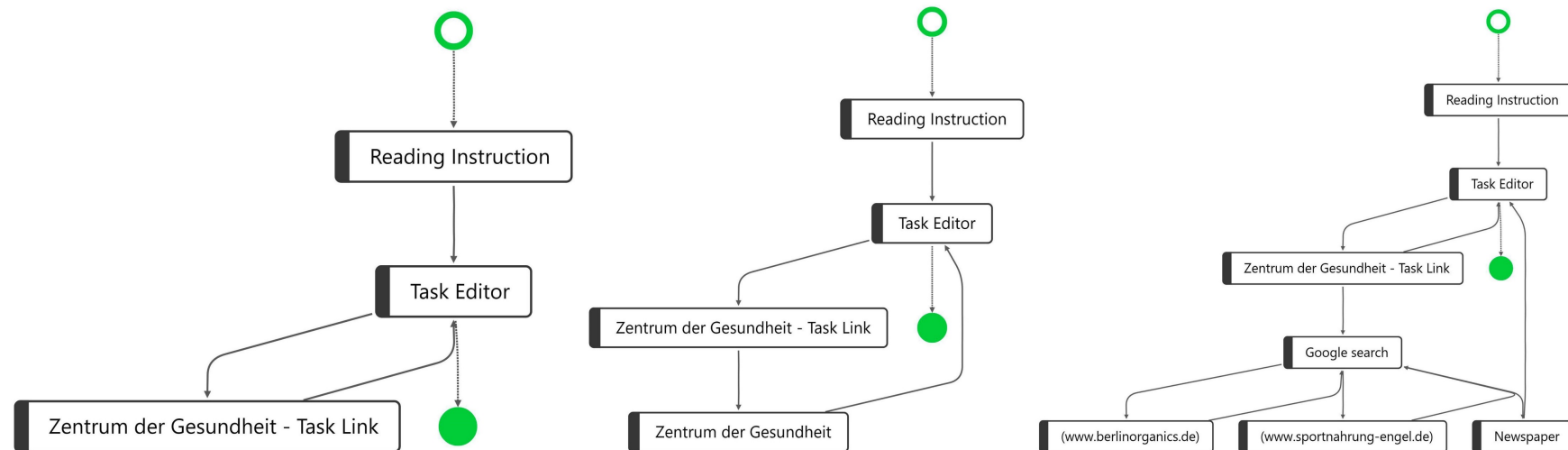
PROCESS MINING ANALYSES

32 (9 medical, 9 law, 14 education) students took part in in-depth eye-tracking study

Explorative process mining analysis was applied to the data
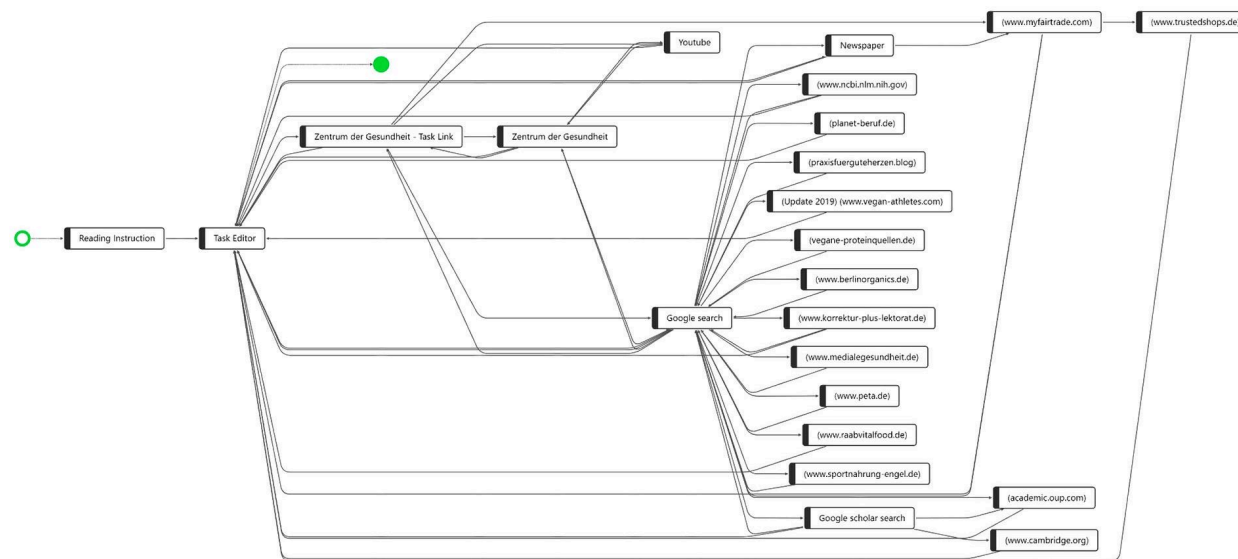
INDIVIDUAL PROCESS MINING RESULTS

Investigation of individual behavioral sequences revealed that all 32 students navigated the task differently

References

Bäsler, S.-A. (2020). Medienbildung in der ersten Phase der Lehrkräftebildung und die Bedeutung des medialen Habitus von Lehramtsstudierenden. In Hochschulforum Digitalisierung (Hrsg.), *Digitalisierung in Studium und Lehre gemeinsam gestalten* (S. 431-453). Springer.

Eppler, M.J., & Mengis, J. (2004). "The Concept of Information Overload: A Review of Literature from Organization Science, Accounting, Marketing, MIS, and Related Disciplines. *The Information Society, 20*(5), 325-344.

Hahnel, C., Kroehne, U., Goldhammer, F., Schoor, C., Mahlow, N., and Artelt, C. (2019). Validating process variables of sourcing in an assessment of multiple document comprehension. The British Journal of Educational Psychology, 89(3), 524–537.

Kuhn, S., Müller, N., Kirchgässer, E., Ulzheimer, L., and Lucia Deutsch, K. (2020). Digital skills for medical students – qualitative evaluation of the curriculum 4.0 "Medicine in the digital age". Journal for Medical Education, 37(6), Doc60. https://doi.org/10.3205/zma001353

Maireder, A. & Nagl, M. (2010). Internet in der Schule, Schule im Internet. Schulische Kommunikationskultur in der Informationsgesellschaft. In *mediamanual. Texte 2010*, 1. http://www2.mediamanual.at.

Maurer, M., Quiring, O. & Schemer, C. (2018). Media Effects on Positive and Negative Learning. In O. Zlatkin-Troitschanskaia, G. Wittum & A. Dengel (Hrsg.), *Positive Learning in the Age of Information. A Blessing or a Curse?* (1. Aufl., S. 197–208). Springer.

McGrew, S., Breakstone, J., Ortega, T., Smith, M., and Wineburg, S. (2018). Can students evaluate online sources? Learning from assessments of civic online reasoning. Theory & Resarch in Social Education, 46, 165–193. https://doi.org/ 10.1080/00933104.2017. 1416320

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References

McGrew, S., Ortega, T., Breakstone, J., and Wineburg, S. (2017). The challenge that's bigger than fake news. Civic reasoning in a social media environment. The American Educator, 41, 4–9.

Molerov, D., Zlatkin-Troitschanskaia, O., Nagel, M.T., Brückner, S., Schmidt, S. & Shavelson, R. Mislevy. (2020). Assessing University Students' Critical Online Reasoning Ability: A Conceptual and Assessment Framework with Preliminary Evidence. *Frontiers in Education, 5*, 1-29. https://doi.org/10.3389/feduc.2020.577843

Nagel, M.-T., Schäfer, S., Zlatkin-Troitschanskaia, O., Schemer, C., Maurer, M., and Molerov, D. (2020). How do university students' web search behavior, website characteristics, and the interac-tion of both influence students' critical online reasoning? Frontiers in Education, 5(1). https://doi.org/ 10.3389/feduc.2020.565062

Schmidt, S., Zlatkin-Troitschanskaia, O., Roeper, J., Klose, V., Weber, M., Bültmann, A. K., & Brückner, S. (2020). Undergraduate students' critical online reasoning—Process mining analysis. Frontiers in Psychology, 11, 576273.

Wineburg, S., and McGrew, S. (2018). Lateral Reading and the Nature of Expertise: Reading Less and Learning More When Evaluating Digital Information. Stanford History Education Group Work-ing Paper No. 2017-A.

Zlatkin-Troitschanskaia, O., Brückner, S., Nagel, M.-T., Bültmann, A.-K., Fischer, J., Schmidt, S., & Molerov, D. (2021). Performance Assessment and Digital Training Framework for Young Professionals' Generic and Domain-specific Online Reasoning in Law, Medicine, and Teacher Practice. *Journal of Supranational Policies of Education, 13*, 9-36.

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