

High Performance Computing meets Adult Education

Competences Platform for Software Efficiency and Supercomputing

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1 Project Background

The project „hpc.bw – Competence Platform for Software Efficiency and Supercomputing“ has started in January 2021 and will run for a total of six years until December 2026. It is funded within the framework of [dtec.bw – Digitalization Center of the Armed Forces](#) and is part of the [KoDiA \(Skills for the digital world of work\) research cluster](#). The aim of hpc.bw is to strengthen innovative cross-location research in the field of **High Performance Computing (HPC)** and to promote the transfer of relevant expertise to a wide range of disciplines. In the following, the **key achievements** of the first phase of hpc.bw are listed.

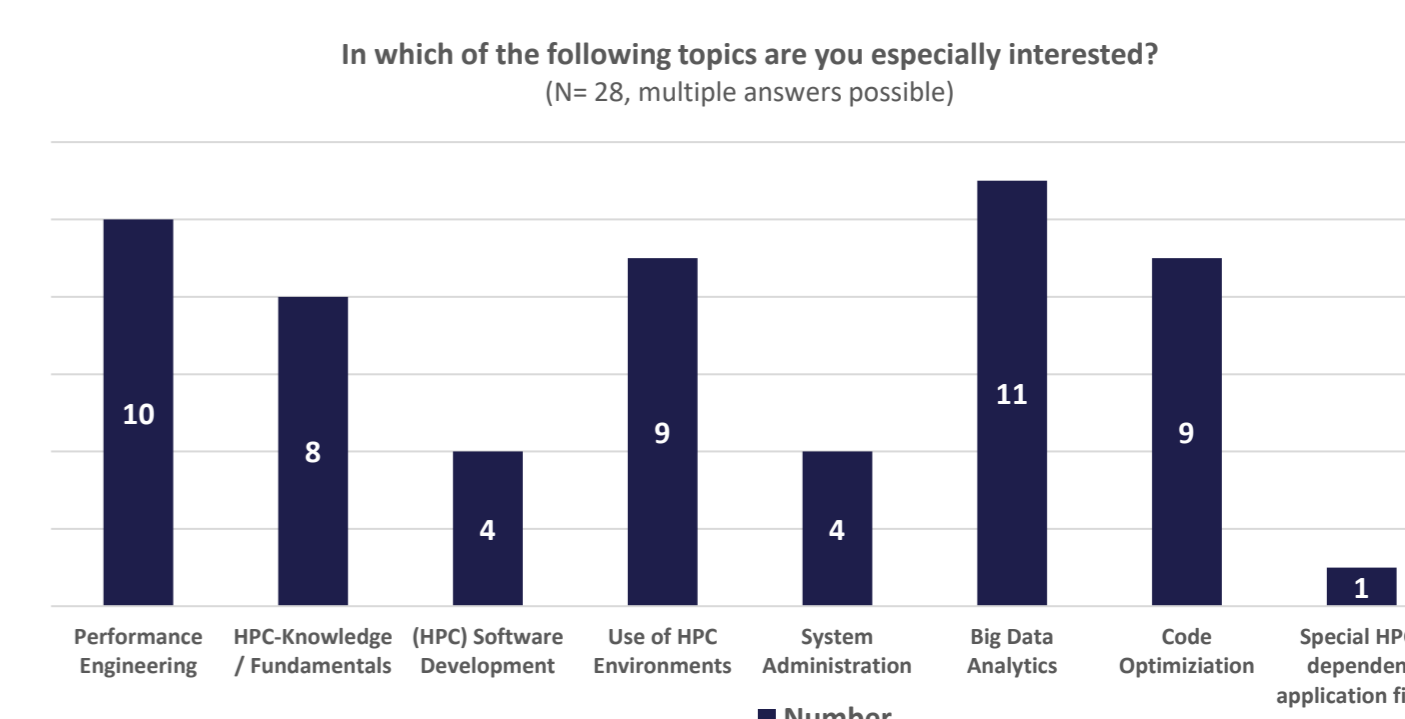
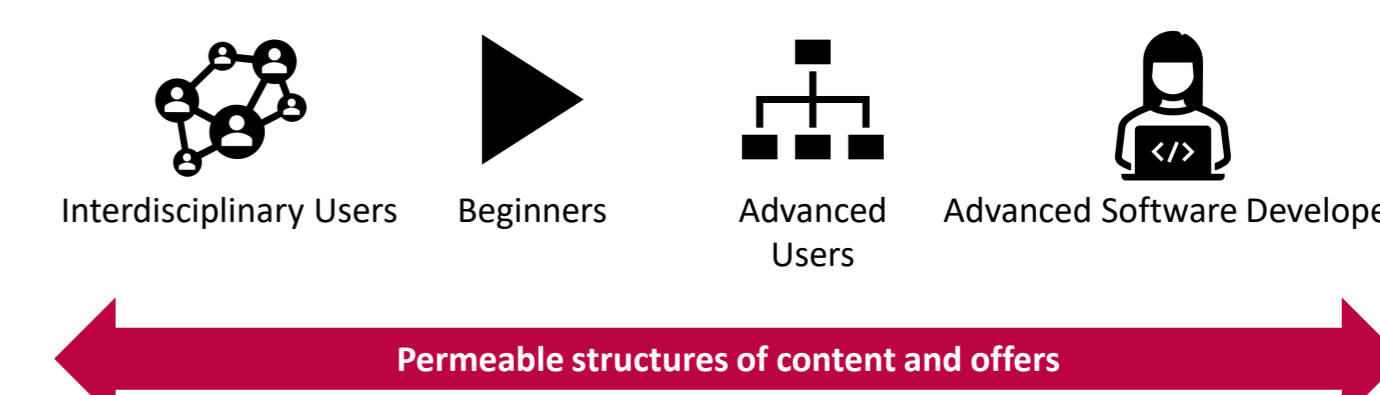
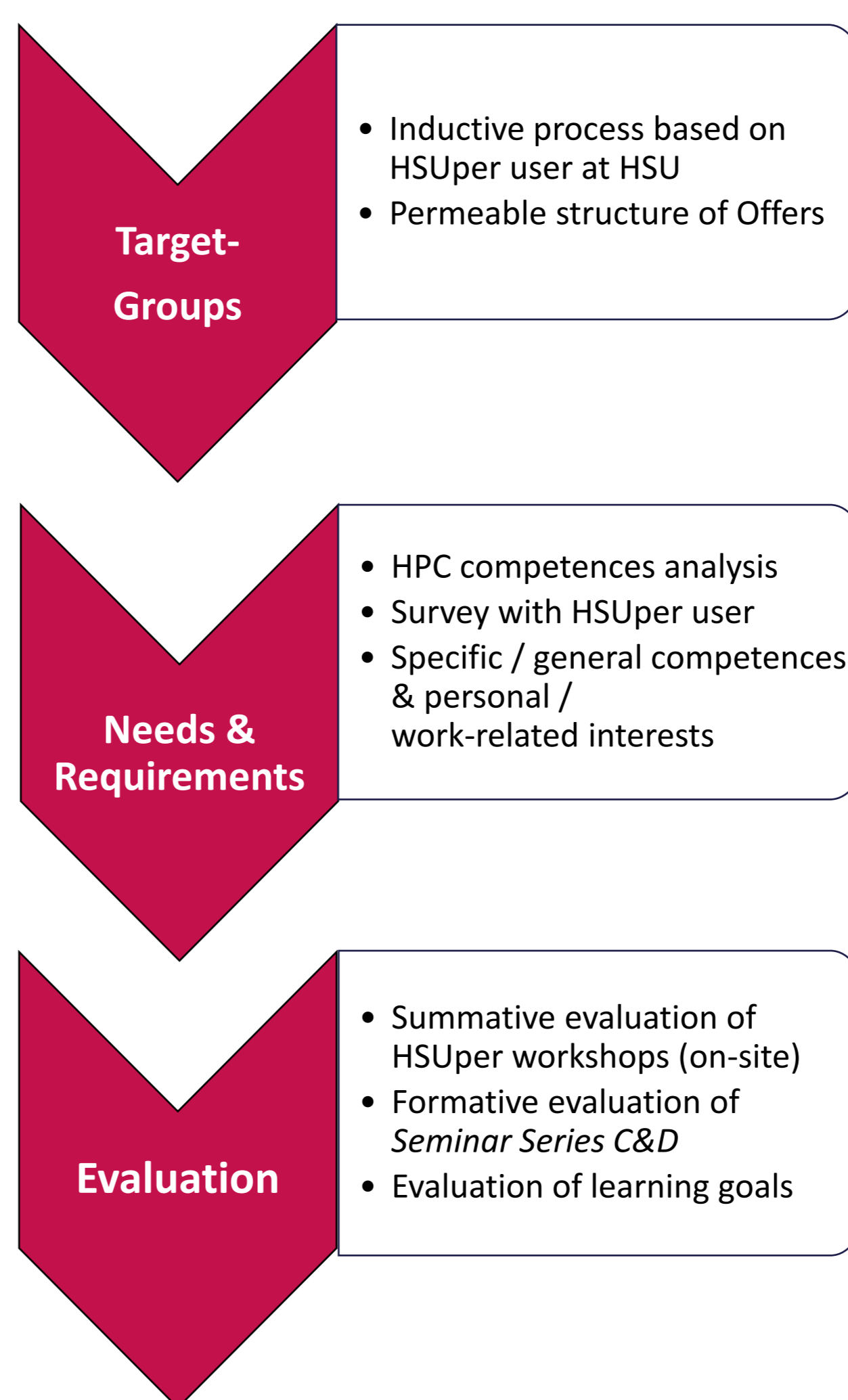
- 1 Container-based HPC center “CBRZ” with PetaFLOP cluster “HSUper”
- 2 Interactive Scientific Computing Cloud “ISCC”
- 3 Web-Based HPC Competencies Platform “HPC Portal”
- 4 > 31 supported performance engineering projects
- 5 > 100 journal papers empowered by hpc.bw
- 6 > 50 Talks from (young) researcher in the Seminar Series “Computation and Data”
- 7 Sustainable strengthening of innovative and interdisciplinary cross-sectional research in HPC
- 8 Transfer of relevant HPC knowledge across disciplines with multipliers from various disciplines
- 9 Promotion of interdisciplinary exchange between HPC related research questions



Website HPCCP

2 Border Crossings – Adult Education and HPC

The aim of the research project is, on the one hand, to make the competences required for the use of HPC resources accessible to researchers from a wide range of disciplines and, on the other hand, to demonstrate the interdisciplinary perspectives on the expansion of discipline-specific processes, methods, research questions and knowledge processes in adult education and continuing education through the possible use of HPC resources.

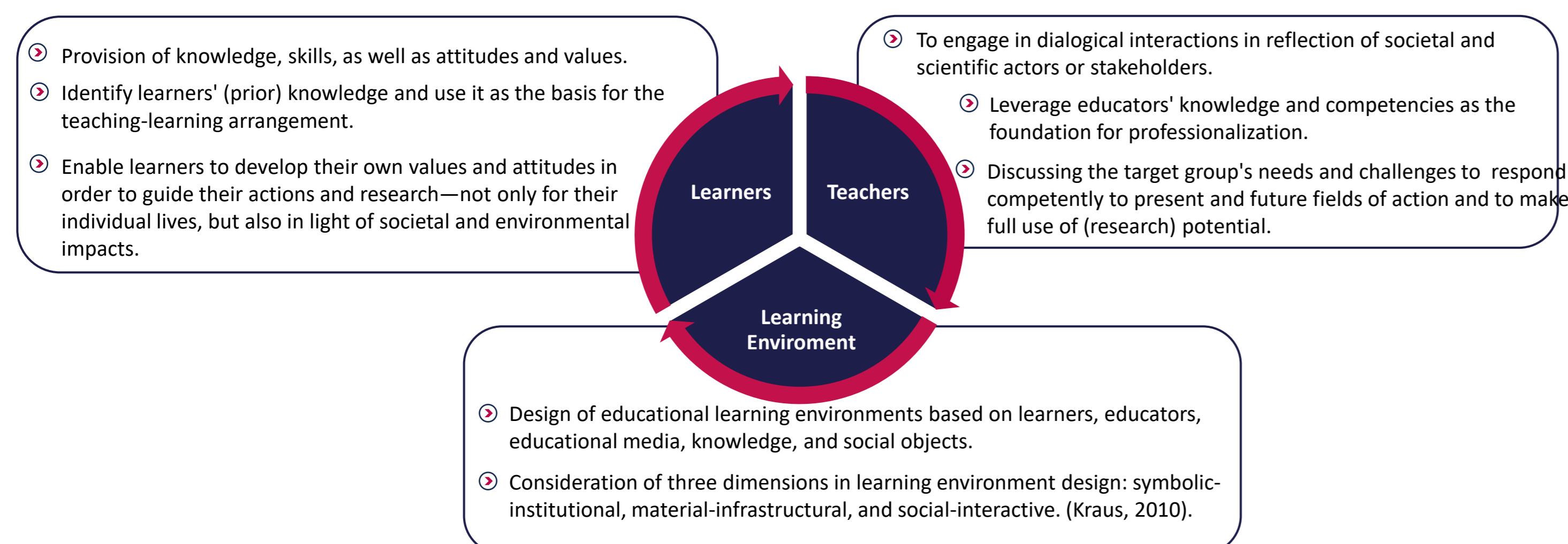


What is your type of media most likely to use for self-educational purposes? (n=20)

Var.	Media	Very rare [1]	Rare [2]	Sometimes [3]	Common [4]	Very Common [5]	x	Never/Not yet [1-2]
01	Video formats	2	2	5	8	9	3,272	1
05	Presentations	1	1	10	11	4	5,118	1
04	Documentation	0	2	0	16	9	5,118	0
09	Blog posts	0	6	5	12	3	3,46	2
10	Forum posts	1	7	4	8	6	3,56	3
03	Source code	2	7	4	8	6	3,35	0
07	Handouts	0	4	8	10	3	3,34	2
12	Books / Magazines	1	7	6	10	1	3,12	3
08	Learning nuggets	5	3	2	3	3	2,68	6

3 The Role of Adult Education

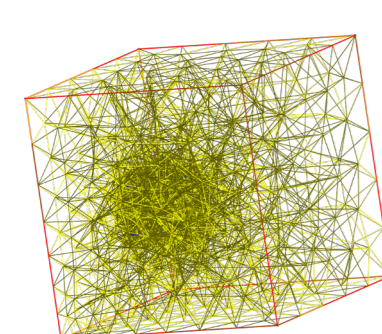
- Identifying **knowledge**, preparing **knowledge**, and determining **methods of knowledge transfer**.
- To enable **learning processes and Education** to respond to **growing complexity** and support **sustainable approaches in everyday life, societal development, and science**.
- Provide **didactic tools** to enable the discipline to **sustainably engage with societal impact** (Hof, 2010; Tippelt & von Hippel, 2018).



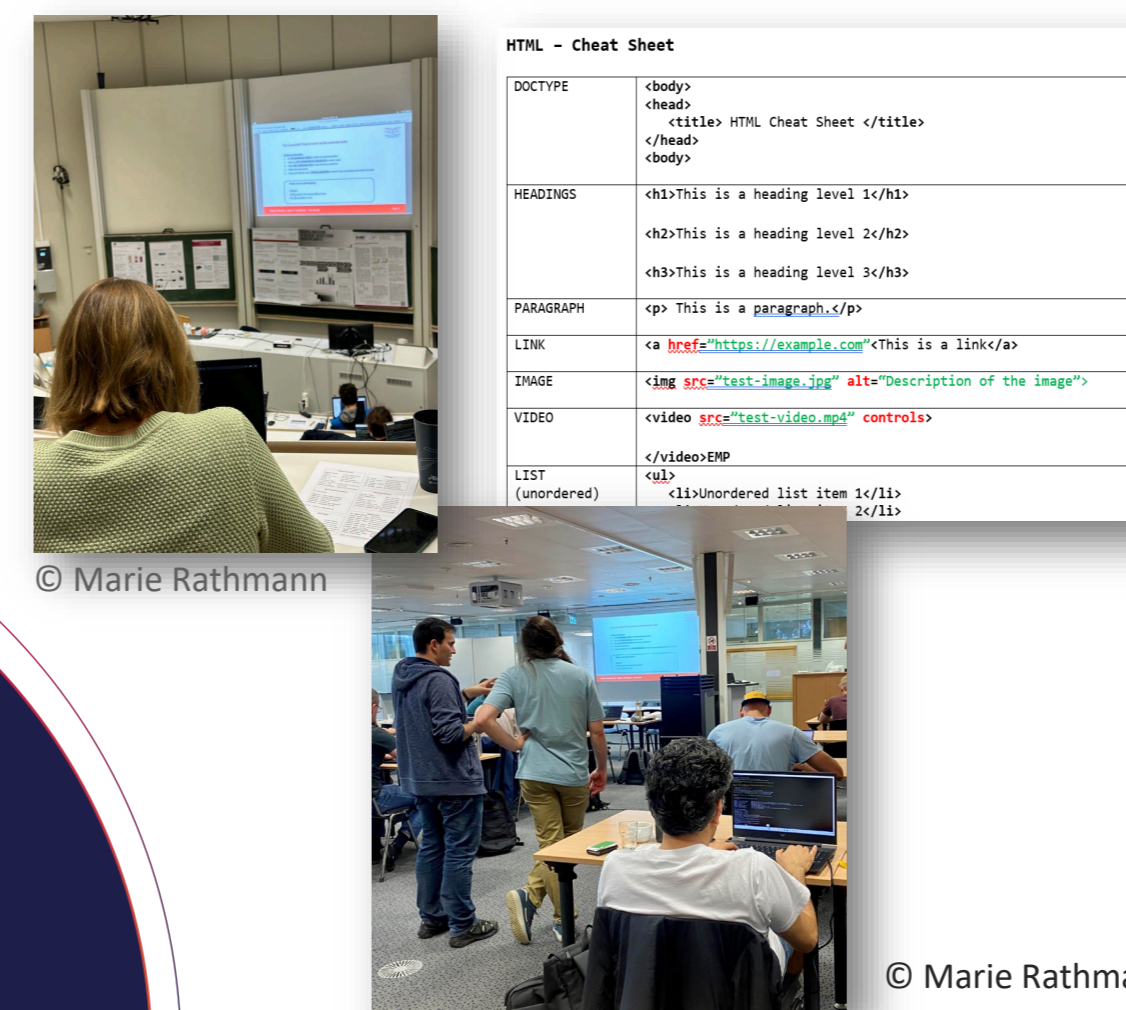
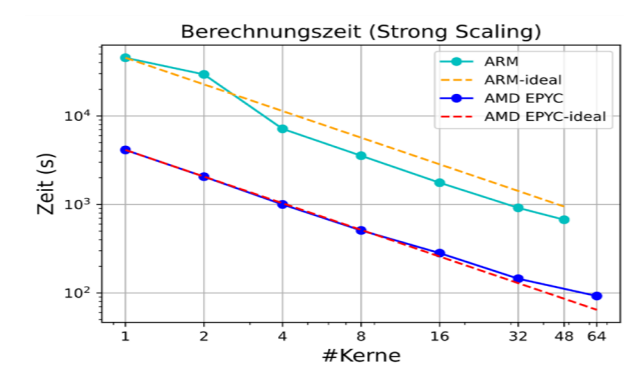
4 High Performance Computing Competences Platform [HPCCP]

Performance Engineering Projects

- Low-threshold application opportunity for support in performance engineering projects through an annual call
- A total of 31 interdisciplinary projects (e.g., materials science, law, civil engineering, education) were supported by 17 research staff members. Of these,
 - 12 were in the form of consulting engineering projects (e.g., setting up HPC workflows, software deployment).
 - 9 were in the form of classic performance engineering projects (e.g., intensive code optimization and parallelization tasks).
- Projects ranged from 400 to 75,000 lines of code in languages such as Python, Matlab, Fortran, or C++.
- Results were documented, and the developed code was made available as open access or shared through open community collaboration.



Molekular-Kontinuum-Simulation (Prof. Neumann)



HSUper Workshops

- HSUper Workshops for Beginners and Advanced Users (e.g., Introduction to HPC, installation of user software, use of GPU and GPU scheduler, module system, machine learning and deep learning, AI)

Over 75 participants in two HSUper Workshops, ranging from Master's graduates to professors interdisciplinary participants (including physics, materials science, data analysis, civil-engineering, empirical economics)

- Expert group work, poster sessions, lectures, and self-study
- Networking and community building.

User Meetings, Newsletter, HPC Café & Seminar Series Computation & Data

- Identification and feedback of HPC needs and hpc.bw project activities (including access to hardware and software, workshop offerings, performance engineering projects, etc.).
- Community building and networking through scientific presentations, user support, and peer-to-peer consulting in academia and industry.
- Support for (early-career) researchers from a wide range of disciplines in their scientific careers
- Documentation and publication of activities in research and development related to HPC.



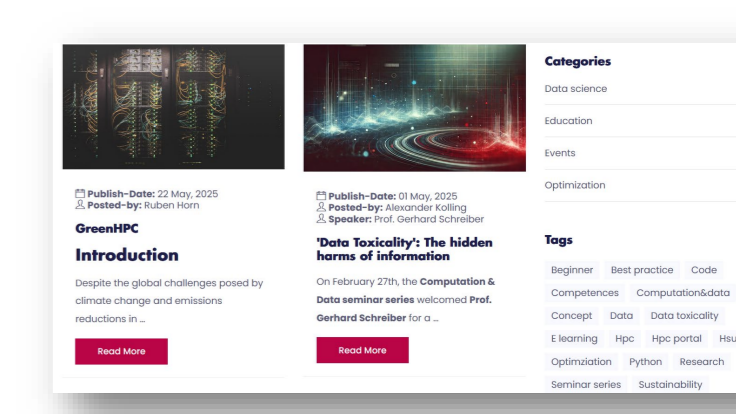
- On the HPC Portal, offers for building HPC expertise are made publicly available, tailored to different target groups.

- The formats offered through the HPC Portal are developed according to didactic principles and adult education theory, and they aim to stimulate informal learning processes related to HPC resources and applications.

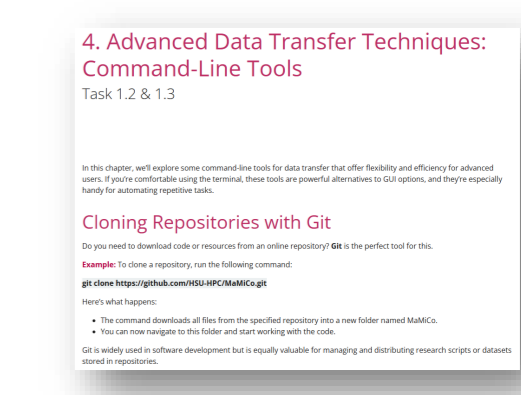
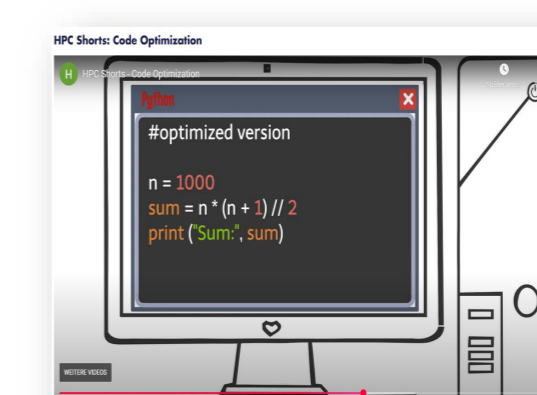
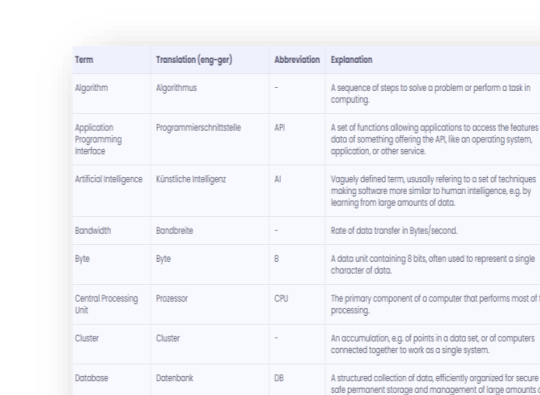
Learning opportunities and informational materials are provided in a low-threshold, web-based format via the digital platform, the HPC Portal (e.g. Glossary, Blog, Trainings, Documentation, Videos)

- To catalyze attitudes, opinions, and values related to specific research fields and their inherent challenges.

HPC Portal



Collaborative Blog



5 Outlook on HPCCP



References

Kraus, K. (2011). Aneignung von Lernorten in der Erwachsenenbildung. *DIE-Report*, 33(2), 46–55.

Hof, C. (2010). Kapitel 1: Theorien des Wissens und der Kompetenz. In T. Fuhr, P. Gonn, & C. Hof (Eds.), *Erwachsenenbildung – Weiterbildung. Handbuch der Erziehungswissenschaft* (Vol. 4, pp. 219–226). Ferdinand Schöningh. <https://doi.org/10.36198/9783838584485>

Tippelt, R., & von Hippel, A. (Eds.). (2018). *Handbuch Erwachsenenbildung/Weiterbildung* (6th ed.). Springer VS.

6 Outlook on Adult Education

- Strengthening community building and networking not only on a regional and national level but also internationally
- Open community for the development of offerings for the HPC Portal
- Licensing of teaching and learning materials as Open Educational Resources (OER)
- Identification of further interdisciplinary research needs and potentials, especially in non-technical disciplines (e.g., education, psychology, history, and law)
- Establishment of an HPC competence tree