

Critical use of large language models in teacher professional development

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Introduction

ChatGPT as the most famous Large Language Model (LLM) had the fastest uptake of new technology in the history of humankind

- Stakeholders in education can no longer ignore it
- Organisations like UNESCO provide first guidance (UNESCO, 2023)
- LLM can be beneficial to all stakeholders
- However, we need to be aware of potentialities, limitations, risks, and weaknesses involved

Educational Scenarios with LLM



Relevant Stakeholders



Learners



Teachers



Educational
Institutions



Teacher
Education



Society



AI Provider

Society 

Teacher Education 

Educational Institutions 

Teachers 

Learners 

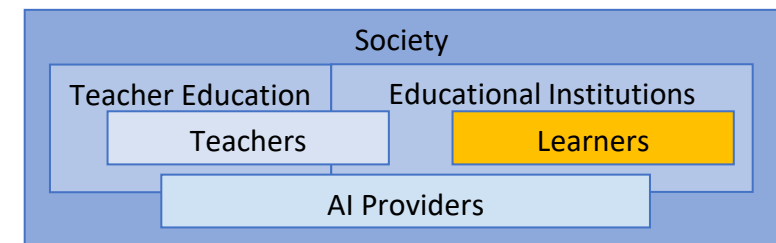
AI Providers 

Educational Scenarios with LLM (Learners)



Main question: how can individual learning best benefit from LLM?

- Exercise
- Request personalized support and explanations
- Summarise texts
- Proof-read

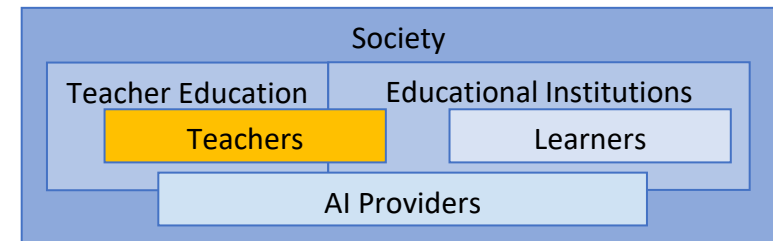


Educational Scenarios with LLM (Teachers)



Main question: which tedious teaching tasks can best be supported and simplified by LLM?

- Structure lesson plans
- Provide ideas for interactive methods and pedagogy
- Provide teaching assistance
- Prepare assignments
- Support assessment and grading of student work

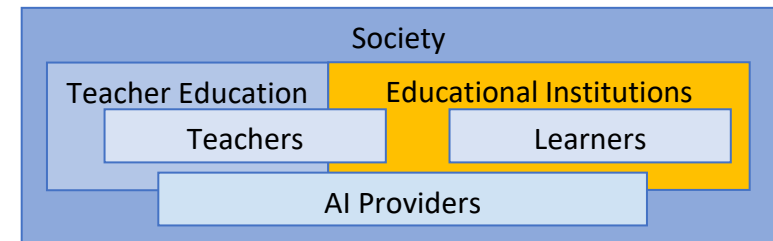


Educational Scenarios with LLM (Educational Institutions)



Main question: how do educational institutions need to react to LLM?

- Define regulations for LLM
- Define support for teachers
- Define ethical boundaries and requirements for LLM
- Support curriculum development

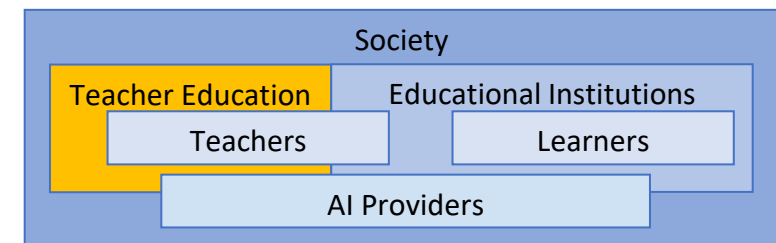


Educational Scenarios with LLM (Teacher Education)



Main question: how can we prepare teachers for an LLM-enriched world?

- Awareness of existence, critical use & getting acquainted
- Inclusion in teacher education independent of topic
- Ethics and legal aspects
- Technical aspects
- Limitations and issues
- What to teach to students?

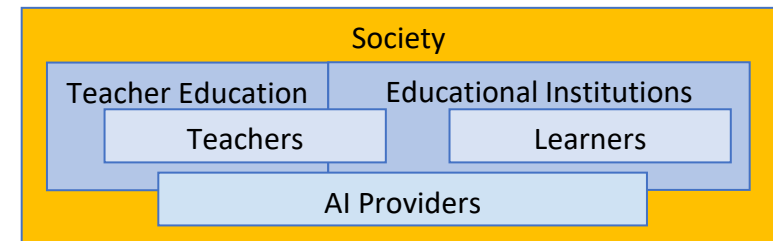


Educational Scenarios with LLM (Society)



Main question: what does society expect from future work force?

- Innovative, creative, knowledgeable persons
- People who drive and develop society and economy
- People who are internationally competitive
- Critical thinking

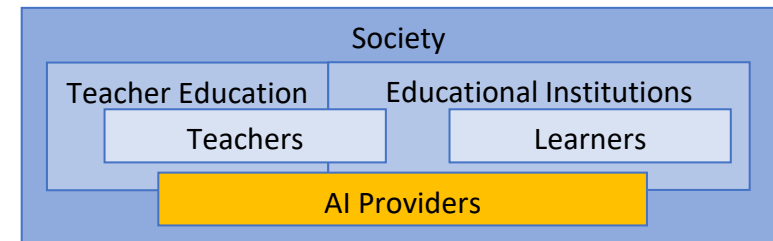


Educational Scenarios with LLM (AI Providers)



Main question: what does education expect from AI providers?

- Reliable service
- Factual responses
- Understandable results
- Specific AI models tailored for education





Issues of LLM in education

Issues of LLM in education



TECHNICAL
ISSUES



ETHICAL
ISSUES



DATA-RELATED
ISSUES



USER-RELATED
ISSUES

Technical Issues



Consequences due to the technological base of LLM

- **Hallucination:** nonsensical output
- **False facts:** inventing false facts (LLM does not equal to Google)
- **Inaccuracies:** due to loss of context in longer conversations

Ethical Issues



Problems in understanding and controlling the results produced by LLM

- **Explainability:** such as the explainability of how results are produced
- **Manipulation:** the possibility to control and manipulate these.
- **Ownership and authorship:** how to define and understand the ownership of the output

Data-related Issues



Aspects of ownership and control:

- **Ownership:** the ownership of source code, training data, and models;
- **Accessibility:** the accessibility of code, data, and models for independent review;
- **Contribution:** the possibility of contributing to the quality of code, training data and resulting models.

User-related Issues



Knowledge of how to use LLM effectively, critically and efficiently:

- **“Asking the right questions”**: the quality of prompts and how they are designed influences the quality of the resulting output
- **Overreliance**: a critical distance to results delivered by LLM is necessary to fight overly trusting these
- **Reflection**: the ability to reflect on results and to check their validity is crucial to gain high quality results.
- **Human judgment**: expert knowledge is still required to evaluate the quality of the results

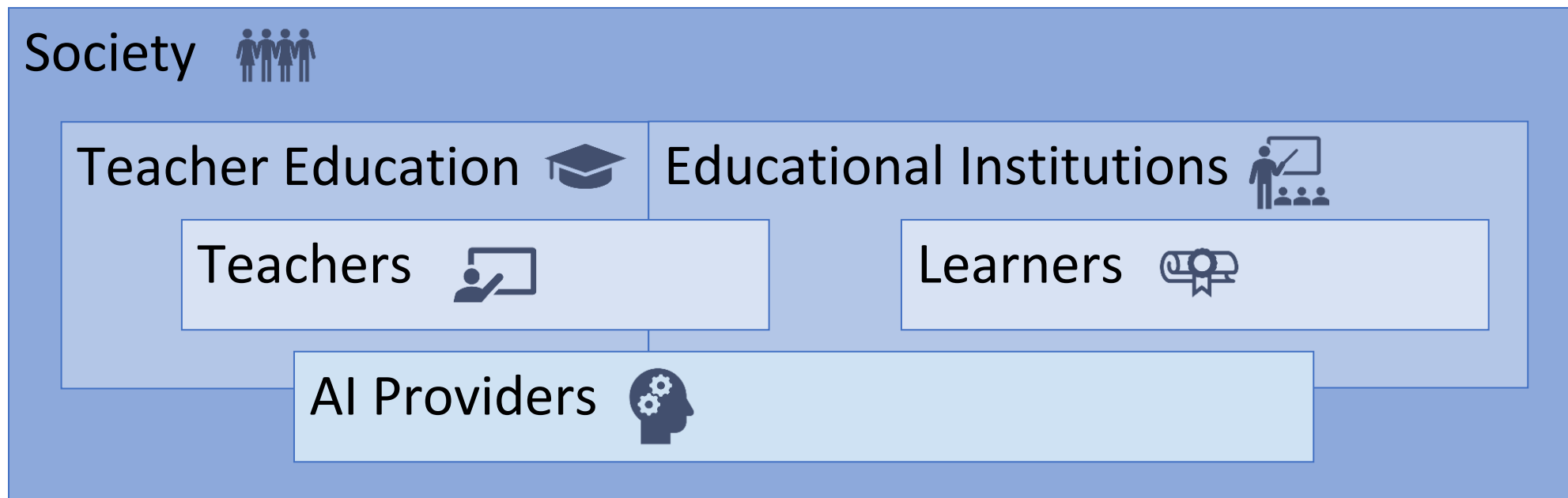


Multi-Stakeholder Model

How to prepare teachers better for an LLM-enhanced world?

Multi-Stakeholder Model

What are the roles of the different stakeholders?

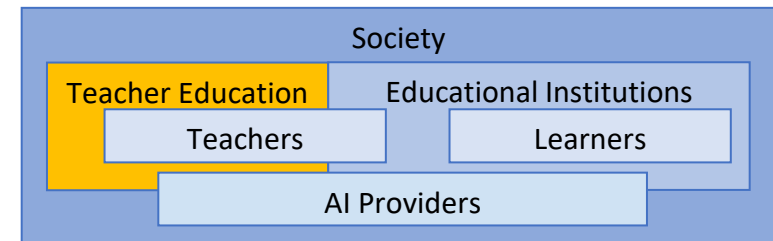




Teacher Education Institutions

Integrate LLM-oriented modules into the curriculum

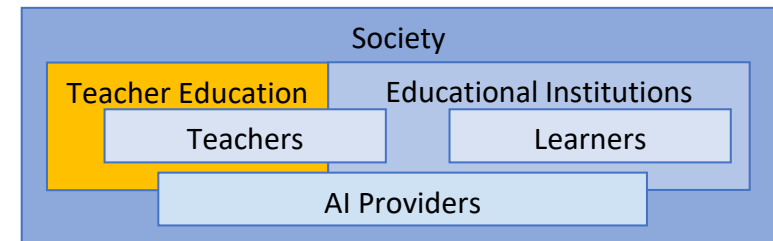
- Ethical and legal aspects
- Digital Literacy and Critical Thinking
- How to: content creation, assessment, feedback
- Continuous Development, Innovation, Resilience



Ethical and legal aspects



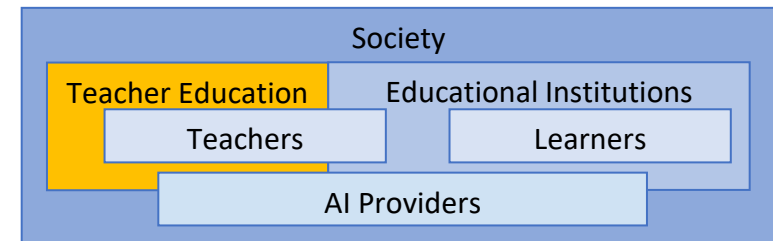
- Aspects of plagiarism, cheating
- Copyright
- Privacy
- Bias
- Automation and responsibility



Digital Literacy and Critical Thinking



- Value of sources and credibility
- Facts and fake
- Domain specific knowledge base
- Critical understanding of limits and possibilities of LLM

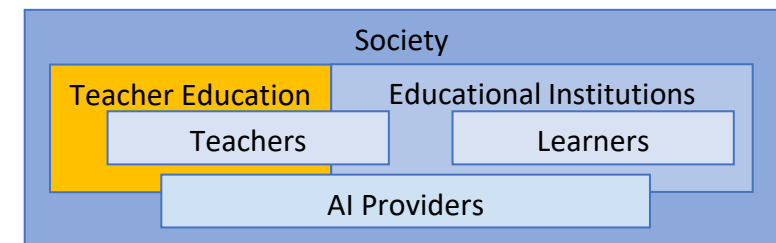


How to: content creation, assessment, feedback



Hands on practical guidance

- Creation of storified learning content
- Creation of assessment tasks and grading criteria
- Assessing student submissions
- Review of LLM outcomes

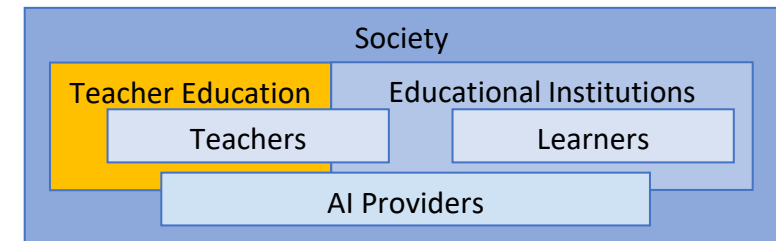


Continuous Development, Innovation, Resilience



Preparation for continued innovation

- Link to research on LLM
- Ability to identify relevant innovations
- Critical evaluation of impact

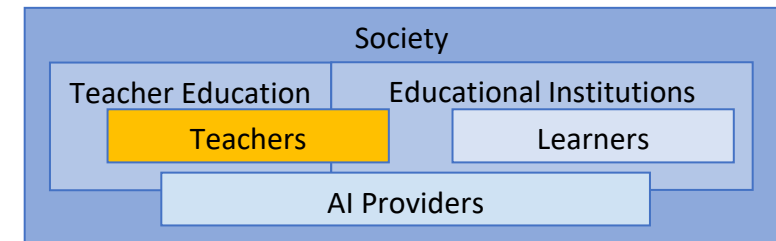


Future/Existing Teachers



Also the future teachers have to take some responsibility

- Continuously keep developing yourself
- Find your teaching position despite LLM
- Stay open to new developments
- Don't just ban but critically embrace

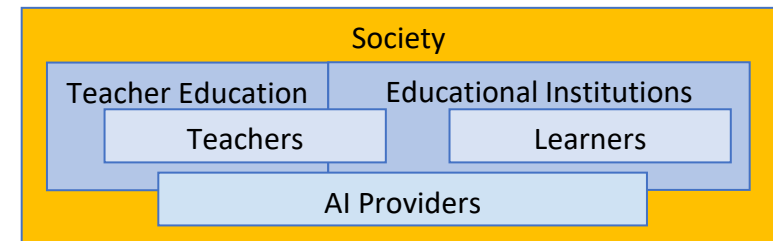


Societies



Societies need to define the boundary conditions for LLM in education

- What is considered to be good use?
- What are unethical uses?
- What are requirements towards providers?

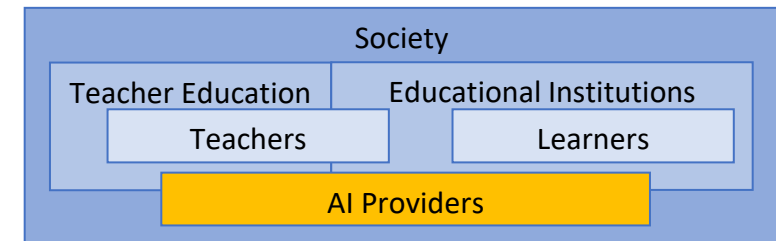




AI Providers

AI Providers need to subscribe to ethical behaviour, openness and transparency according to societal requirements

- Independent review and control of models & data
- Explainability of results
- Transparent processes of data gathering and quality control



Conclusions

Conclusions

- Progress in LLM and other AI approaches is a game changer
- The potential for education is large but not systematically explored
- Likewise, are the impact and the risks not yet clear
- It requires coordinated action of multiple stakeholders on various levels to understand