>Teacher training for Data Literacy & Computer Science competences // Report Round 3 // **Deliverable 4.6: Report on Third Evaluation Phase**

train-dl.eu

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Executive Summary

The TrainDL project aims to provide policy recommendations for integrating the subjects of data literacy (DL) and artificial intelligence (AI) into teacher university education, as well as professional development programmes for teachers. To achieve this, the project adopts an iterative approach to design, deliver and evaluate teacher trainings. The project comprises three intervention rounds targeting computer science (CS) teachers as well as teachers from other subjects at the primary and secondary levels. This report presents the evaluation results of the third round of interventions, focusing on the implemented training concepts targeting in-service computer science (CS) and STEAM teachers at the secondary level as well as primary teachers. The evaluated trainings included 11 trainings[1] conducted between April 2023 and January 2024 in Austria, Germany, and Lithuania. The evaluation involved 169 participants with 120 completing both the pre- and post-training surveys and 22 participating in qualitative interviews. The trainings were particularly geared towards accommodating the constrained schedules of teachers, with sessions ranging from 1.5 to 4 hours.

The feedback on the training content and its delivery was overwhelmingly positive, with 89% of participants indicating they would recommend the sessions to others. Training activities were well-received, indicating their relevance and suitability for the indicated target groups.

Despite the overall positive feedback, there was a noted desire for longer sessions to cover topics more in depth. The feedback varied with respect to the participants' confidence in applying the learned content independently, especially following a very

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[1] Two additional 2.5 day trainings were conducted for CS and STEAM teachers in November 2023 and January 2024. As the trainings were conducted later than the planned third round of interventions, the evaluation results for these workshops are reported on in the final evaluation report (D4.7).

short session of 1.5 hour. Additionally, there was a disparity in prior familiarity with DL and AI, with AI being more familiar to most teachers than DL. In addition, trained teachers report more recognition and preferences for AI topics when compared to DL. On average, participants across all the target groups acknowledged the societal and educational importance of integrating DL and AI into curricula. There was a strong belief in the future value of teaching these subjects, though AI was often seen as more immediately relevant than DL. This underscores a need for educational efforts to emphasize the fundamental role of DL for AI concepts and applications. The motivation among trained teachers across all the target groups to further their understanding of DL and AI was high, with nearly all respondents expressing a desire to continue learning about these topics.

Introduction

The TrainDL project aims to provide policy recommendations for integrating the subjects of data literacy (DL) and artificial intelligence (AI) into teacher university education, as well as professional development programmes for teachers. To achieve this, the project adopts an iterative approach to design, deliver and evaluate teacher trainings. The project comprises three intervention rounds targeting computer science (CS) teachers as well as teachers from other subjects at the primary and secondary levels. This report presents the evaluation results of the third round of interventions, focusing on the implemented training concepts targeting in-service computer science (CS) and STEAM teachers[2] at the secondary level as well as primary teachers. The evaluated trainings included 11 trainings conducted between April 2023 and January 2024 in Vilnius, Vilkaviškis region (Marijampolė county), Druskininkai (Alytus county), Berlin, Düsseldorf, Vienna, and Graz. The teams of Freie University and Vilnius University opted for the training durations between 3-4 hours, with one STEAM

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[2] STEAM teacher interventions refer to the interventions targeting teachers who teach non-CS subjects (specifically Science, Technology, Engineering, Arts, and Mathematics)

training in Berlin of 1.5 hours. The strategic decision to opt for short trainings was driven by the necessity to fit within the constrained schedules of teachers and the format of established teacher training events, where a lot of the teacher trainings were offered. In total, 81 primary, 61 STEAM, and 27 CS teachers were trained as a main target groups. In addition, 32 STEAM teachers, eight CS teachers, and five primary teachers participated in the trainings, designed for other target groups. In the evaluation report, we focus only on the participants who participated in the trainings designed for their target groups.

The evaluation of the all three rounds of interventions focuses on teachers' capacity to integrate the acquired content on DL and AI into their teaching, as measured immediately after the trainings. As Table 1 shows, the CS training was conducted only in Germany and differed from the initial rounds in terms of content, the STEAM and primary trainings were conducted in all the countries, albeit some content was different. This report will respectfully acknowledge these variations in the forma, location, and target groups, focusing on providing a descriptive overview of each training. We aim to present the unique characteristics of each session without emphasizing comparisons, appreciating the distinct contexts as well as content of each training. As the content of the three Lithuanian primary trainings was identical, the data for these three trainings was analysed together, to increase a sample size.

To evaluate the training sessions, the following instruments were used:

- **The evaluation survey** administered before and immediately after the training;
- **The DL and AI self-assessment and knowledge test,** which includes knowledge questions on DL and AI, administered before and immediately after the training;
- **The semi-structured personal and online interviews** administered right after the training.

Table 1 presents an overview of the evaluated training sessions and the evaluation instruments used.

Date	Location	Target group	Duration	Evaluation instruments used	Number of participants
11.04.2023 18.04.2023 21.04.2023	Vilnius, Vilkaviškis region, Druskininkai, Lithuania[3]	Primary teachers	4 hours	• (Pre- and post-) evaluation survey • (Pre- and post-) DL and AI knowledge test • Semi-structured personal interviews	50[4]
25.04.2023	Vienna, Austria	Primary teachers	3 hours	• (Pre- and post-) evaluation survey • (Pre- and post-) DL and AI knowledge test • Semi-structured personal interviews	8[5]
13.09.2023	Düsseldorf, Germany	Primary teachers	4 hours	• (Pre- and post-) evaluation survey • (Pre- and post-) DL and AI knowledge test • Semi-structured personal interviews	12
10.10.2023	Vienna, Austria	Primary teachers	3 hours	• (Pre- and post-) evaluation survey • (Pre- and post-) DL and AI knowledge test	11

[3] As the primary trainings in Lithuania were identical, for the evaluation report their data were pooled together and analysed as one sample, to address the problem of small sample sizes.

[4] While Freie Universität Berlin and OCG offered teachers trainings for which teachers had to register, the Vilnius university for the primary trainings reached out to the three schools directly and conducted their trainings in these schools. In addition to the 50 primary teachers (the main target group), 32 STEAM and 4 CS teachers participated in the training.

[5] Three participants also (in addition to primary subjects) teach STEAM subjects at the secondary level

				• Semi-structured personal interviews	
23.08.2023	Düsseldorf, Germany	STEAM teachers	4	• (Pre- and post-) evaluation survey • (Pre- and post-) DL and AI knowledge test • Semi-structured personal interviews	7[6]
05.09.2023	Berlin, Germany	STEAM teachers	1.5	• (Pre- and post-) evaluation survey • (Pre- and post-) DL and AI knowledge test • Semi-structured personal interviews	28[7]
23.10.2023	Graz, Austria	STEAM teachers	3	• (Pre- and post-) evaluation survey • (Pre- and post-) DL and AI knowledge test • Semi-structured personal interviews	11[8]
09.01.2024	Vilnius, Lithuania	STEAM teachers	4	• (Pre- and post-) evaluation survey • (Pre- and post-) DL and AI knowledge test • Semi-structured personal interviews	15
18.09.2023	Berlin, Germany	CS teachers	4	• (Pre- and post-) evaluation survey • (Pre- and post-) DL and AI knowledge test	27

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[6] In addition, 2 CS and 3 primary teachers participated in the training.

[7] In addition, 1 CS and 2 primary teachers participated in the training

[8] In addition, 1 CS teachers participated in the training

				• Semi-structured per-sonal interviews	

Table 1 Overview of the evaluated trainings of the third intervention round: date, location, target group, duration, evaluation instruments used, number of participants

1. Methodology

Deliverable 4.3 includes a detailed description of the methodology and research questions and hypotheses used for all three intervention cycles. The project uses an action research methodology (Baskerville and Wood-Harper 1996; Burns 2010), characterized by its iterative nature, involving multiple rounds of designing, implementation, observation, feedback, and reflection. This report specifically addresses the research questions related to the third round of interventions designed for secondary CS, non-CS (STEAM) in-service teachers, as well as primary teachers. To evaluate the trainings, we followed the procedure outlined in Figure 1. To gain a more nuanced understanding of the trainings' impact, we employed a mixed methods approach following a concurrent nested design suggested by Creswell and Plano Clark (2018). This design allowed us to enrich and clarify our quantitative findings using qualitative data. The quantitative data were primarily used for the examination of the participants' characteristics and changes or lack thereof in teachers' perceived competences on how to use DL and AI in class as well as their understanding of these concepts introduced during the training. The focus of the project constituted qualitative interviews, where the teachers provided insights into their experiences and perspectives on the training effectiveness. They also highlighted the teachers' expectations for future training content and identified barriers to DL and AI integration into the classroom. Additionally, participants offered suggestions for policy changes that could better facilitate the inclusion of DL and AI into their teaching. The follow-up data collection (reported in 4.7) captured the ability to integrate DL and AI into the teaching.

before the training	during the training			ca. 6 months after
pre-self-assessment and knowledge test	at the start	| at the end	| directly after	**follow-up evaluation survey**
	pre-evaluation survey	**post-self-assessment and knowledge test**	**personal interviews**	**follow-up online interviews**
		post-evaluation survey		
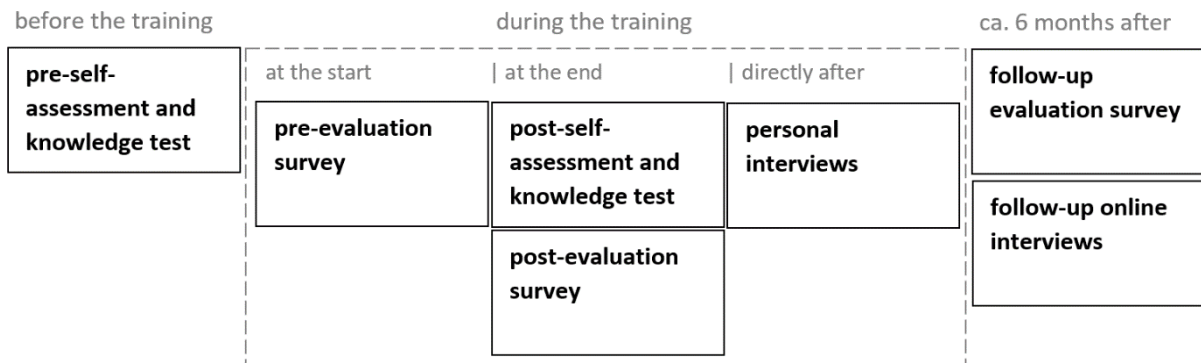
Figure 1 Overview of the evaluation process for each training in the third intervention round

To ensure the privacy of participants while still enabling the linkage of pre-, post- and follow-up datasets, participants were requested to create a unique pseudonymisation code, which they were required to enter or recreate during each subsequent round of data collection. This approach allowed for the protection of participants' privacy while maintaining the ability to connect and analyse the various datasets. Both the survey data and interview data were collected following informed consent, which included comprehensive information about anonymization, data storage, retention period, potential publication of anonymized data, and the option for participants to withdraw their consent and have their data deleted. The project did not require any personal data from the teachers, so no questions pertaining to personal information were included. Any personal information present in the interview transcript (such as place of work or names) was removed. Contacting potential respondents for the follow-up data collection is being done via local partners, eliminating the need to collect and store contact information.

The following definitions of DL and AI were used in the project and shared with the training participants, particularly in the evaluation surveys:

- DL is the ability to systematically handle data and consciously utilize and question them in the respective context. This includes the competences to collect,

explore, manage, analyse, visualize, interpret, contextualize, evaluate, and apply data (Ridsdale et al. 2015).

- AI encompasses various technologies and methods that deal with the automation of intelligent behaviour such as decision-making, problem-solving and machine learning.

1.1 Quantitative data: research questions, instruments, and analysis

The quantitative data of the third intervention cycle was primarily used to address the following research questions:

1). *What is the effect of the designed DL and AI training on the ability of teachers to integrate DL and AI into their classes?*

2). *What is the effect of the designed DL and AI training on teachers' awareness of the significance that DL and AI have for their subjects?*

3). *How does the level of motivation to acquire DL and AI competencies vary between computer science teachers and STEAM/primary teachers?*

The first question deals with teachers' ability to incorporate DL and AI into their teaching. Specifically, we looked at perceived ability to integrate DL and AI into the classroom measured immediately after the training. This assessment specifically targeted aspects related to both pedagogical content knowledge and content knowledge:

- (pedagogical content knowledge) teachers' perceived competences on how to use DL and AI content in class, and
- (content knowledge) teachers' understanding of DL and AI concepts introduced in the trainings.

Additionally, we have looked at in more details at teachers' feedback on the learned content and format of the trainings (measured via both quantitative and qualitative instruments) that can clarify and complement the main findings:

The quantitative data were also used to collect information on the socio-demographic characteristics of the participants. Each country's partner was tasked with internally advertising the training sessions, aided by local partners. As random assignment to trainings was not possible, understanding the participants' characteristics was crucial for interpreting the findings and addressing potential selection bias.

To collect quantitative data, we have used two instruments:

- the pre- and post-evaluation survey developed by the University of Potsdam (Appendix 8.1-8.3[9]), and
- the DL and AI knowledge test, developed by the Freie Universität Berlin and Vilnius University

To analyse the pre- and post-data, we employ descriptive statistics. Based on the data provided, employing the Wilcoxon signed-rank test for the analysis was deemed inappropriate due to the significant number of ties across several intervention groups (no variation in differences for pre- and post-scores, which is partly linked to small sample sizes). To visualise the data we mostly use boxplots (that display the median, IQR, and possible outliers), which are very useful in comparing distributions between groups. It is important to note that since samples are very small, results should be interpreted with caution. While small sample sizes notably limit the generalizability of the study, they provide indications of trends within the sample and can be valuable when combined with the qualitative results of the interviews.

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[9] The Appendix includes the original questionnaires used in Germany. In Austria and Lithuania only minor changes were implemented, in order to take into account regional aspects of educational system.

The evaluation survey:

The questionnaires included information on demographics (e.g., gender and age), educational background, type of the school where in-service teachers are employed, teaching hours and subjects, experience with DL and AI as well as attitudes towards these topics, expectations and the perceived ability to generate student interest. Also included are: teachers' feedback on the learned content and format of the training, and most importantly teachers' perceived competences on how to use DL and AI in class.

The perceived competences on how to use DL and AI in class were measured via the following pre- and post-survey items. For each item, teachers were asked, "How much do you agree with the following statements?" and were given a scale from 1 ("not at all") to 6 ("definitely"):

- [measured in the pre- and post-survey] "I know how to use content about DL in the classroom."
- [measured in the post-survey] "I know how to use content about AI in the classroom."

The post-evaluation survey included a series of questions to assess participants' reactions to the topics and materials/exercises covered in the training:

- [measured in the post-survey] How suitable did you find the practical examples from the workshop for your teaching? (1-not suitable at all – 6 very well suited)

For the second research question, the following item was used, "How much do you agree with the following statements?" and were given a scale from 1 ("not at all") to 6 ("definitely")

- [measured in pre- and post-survey] "I believe that the integration and teaching of DL/AI in the [respective subject] is very important" (1-not suitable at all – 6 very well suited):

For the third question on motivation, the following post-survey item was used, " I would like to continue learning in the field of DL & AI" (yes, no).

The web-based surveys were programmed in QUAMP survey software (versions 4.4.4-4.4.5). Table 3 provides an overview of the response rates for the pre-, post-, and the follow-up versions of the evaluation survey for each training sessions:

Training	Number of participants	Number of participants completed the survey (%)		
		Pre	Post	Both
11.04.-21.04.2023, primary, Lithuania	50	38	30	30
25.04.2023, primary, Austria	8	8	8	7
13.09.2023, primary, Germany	12	10	9	9
10.10.2023, primary, Austria	11	9	8	8
23.08.2023, STEAM, Germany	7	8	4	4

05.09.2023, STEAM, Germany	28	27	26	26
23.10.2023, STEAM, Austria	11	8	8	8
09.01.2024, STEAM, Lithuania	15	12	8	8
18.09.2023, CS, Germany	27	21	20	20

Table 2 Response rates for the evaluation survey for each of the trainings: number and % of participants, who completed the test prior to the training, after the training, and both the pre- and post-versions.

The DL and AI knowledge test:

The content of the knowledge test varied across the trainings. Table 3 summarises response rates for the pre- and post-test for each of the trainings.

Training	Number of partici-pants	Number of participants completed the test		Number of partici-pants completed both pre- and post-tests
		Pre	Post	
11.04.-21.04.2023, primary, Lithuania	50	38	30	30
25.04.2023, primary, Austria	8	8	8	7
13.09.2023, primary, Germany	12	10	9	9
10.10.2023, primary, Austria	11	9	8	8
23.08.2023, STEAM, Germany	7	8	4	4
05.09.2023, STEAM, Germany	28	27	26	26
23.10.2023, STEAM, Austria	11	8	8	8

09.01.2024, STEAM, Lithuania	15	12	8	8
18.09.2023, CS, Germany	27	21	20	20

Table 3 Response rates for the AI and DL knowledge test for each of the trainings: number of participants, who completed the test prior to the training, after the training, and both the pre- and post-test versions.

1.2 Qualitative data: research questions, instruments, and analysis

The research questions for the qualitative part of the evaluation included:
1). *How did participants perceive the training, and what suggestions do they have for enhancing the efficiency and effectiveness of future sessions?*
2). *How has the training influenced the integration of DL and AI into teaching, if at all?*
3). *How do participants evaluate the difficulties of conveying DL and AI concepts to students?*
4). *How can DL and AI be effectively integrated into the classroom, and what potential challenges could hinder this integration?*

The trainings were followed up by the qualitative interviews right after the training using a semi-structured interview guide developed by the University of Potsdam (Appendix 8.4). The interviews were conducted in person by the evaluators or/and by the instructors with the help of the evaluators.

The interview guide:

The questions in the interview guide administered right after the training focused on teachers' perception of the respective workshop, experiences in integrating the DL and AI content into their classroom and barriers for such integration. Teachers were also asked about the importance of both topics for teacher training and for framework curricula, as well as their wishes for policymakers. Table 4 includes an overview of the number of interviewed participants for each training.

Training	Number of participants	Number of participants who took part in the qualitative interviews (%)
11.04.-21.04.2023, primary, Lithuania	50	5
25.04.2023, primary, Austria	8	2
13.09.2023, primary, Germany	12	4
10.10.2023, primary, Austria	11	0^{10}
23.08.2023, STEAM, Germany	7	1
05.09.2023, STEAM, Germany	28	4
23.10.2023, STEAM, Austria	11	1
09.01.2024, STEAM, Lithuania	15	1
18.09.2023, CS, Germany	27	4

Table 4 Number and % of participants, who took part in the qualitative interviews right after the training.

The interviews were analysed with the help of the focused interview analysis approach (Kuckartz and Rädiker 2020). We have used both deductive and inductive coding. While the former codes were developed based on the interview guide and applied to all the interviews, within them, an inductive code captured new information that emerged directly from the data.

The qualitative results of the analysis in this report are presented according to the structure of the interview guide (see Appendix 8.4). The primary questions from the

[10] No interviewees could be recruited for the interview after the trainings

interview guide serve as the main themes under which inductively generated categories are presented. The related sub-questions align with the respective sub-themes.

Themes used in the qualitative analysis:

Below is a brief description of both deductive top-level- and sub-themes derived from the research questions and interview guide:

A. **Themes for interviews immediately after the training:**

- **Training:** In this category, some fundamental aspects related to the training are clarified. Firstly, we explore the participants' expectations and the factors that led to their participation in the training. Secondly, we delve into their personal perspectives on the difficulty level of the topics. Furthermore, we examine the alignment between the training content and participants' prior familiarity with the concepts of DL and AI, which includes their previous knowledge and experience.

- **Teaching DL and AI & difficulties conveying DL and AI concepts:** In this category, our focus lies on exploring the integration of DL and AI topics into teaching practices prior and after the training. When it comes to the aspect of integration after the training, our objective is to assess participants' readiness and confidence in effectively incorporating DL and AI into their teaching. Furthermore, our interest extends to evaluating the challenges associated with conveying knowledge about DL and AI to students.

- **Establishment and steps to integrate DL and AI:** This category is dedicated to exploring the integration of DL and AI topics into teaching, specifically within the context of school classrooms. It encompasses the following key aspects: participants' perspectives on the integration of DL and AI topics within the framework curriculum; identification of effective steps or strategies for embedding both topics into classroom and school curriculum; teachers' opinions regarding the integration of DL and AI topics in teacher education programs;

lastly the exploration of any anticipated barriers that may hinder the successful integration of DL and AI.

- **(Possible) changes through the integration of DL and AI in the framework curricula:**
  This category centers on potential changes resulting from the incorporation of DL and AI into framework curricula. Specifically, we query teachers about anticipated changes concerning students, school authorities, and other school-related aspects, as well as the broader societal implications.

- **Training feedback and potential for improvement:** This category primarily focuses on training feedback. Specifically, we focus on participants' feedback on the length, content (topics and exercises), format (in-person event), and participant interaction (such as the balance between frontal and interactive parts). Alongside positive feedback, we are particularly interested in suggestions or criticisms that can be used to inform improvements for future trainings.

- **Wishes for education policy:** This category describes teachers' wishes or suggestions for education policies concerning the topic of DL and AI in school education.

B. Themes for follow-up interviews:

- **Training:** This category focuses on how the training is retrospectively perceived with some time elapsed and to what extent (if at all) the participants have benefited from it.

- **Integration after the training:** The category describes if there has been any integration of DL or AI into teaching CS after the training. In addition, in the case of integration, we are interested in the experiences during the process and details such as the duration of implementation, grade level, topics covered, etc. In the case of non-integration, we are interested in the reasons behind it or what would facilitate future integration.

- **Training feedback and potential for improvement:** With this category, we identify possible improvements that we could implement in the future. Additionally, we are interested in general suggestions related to the DL and AI in the context of teacher training.

2. Quantitative results

2.1 Description of the sample

Out of 171 participants, 141 participants took part in the pre-evaluation survey with no notable differences of non-response over the trainings. As Table 5 shows, most participants reported being between 30 and 59 years old. The share of women varied for the target groups and partly countries (see Table 6). While in Lithuania and Germany, almost all the primary training participants were women, in Austria the share of participants who identified as women or men were equal, albeit the sample size of eight participants is very small. Such a high share of female teachers is consistent with the reported 2022 OECD statistics on gender composition of primary teachers: 87% for Germany (OECD 2023a), 92% for Austria (OECD 2023c) and 96% for Lithuania (OECD 2023b). For the STEAM trainings, the share of reported gender identity was mostly equal. Based on the 2022 indicators released by the OECD, the share of women for all subjects at the lower and upper secondary level in both Germany and Austria is about 65% (OECD 2023c). The overall share of women teaching at the lower and upper secondary levels in Lithuania, is one of the highest among the OECD countries, at 82.4% and 78.4% respectively (OECD 2023b). For the CS training in Germany, only six out of 21 participants reported being women, which is consistent with the 2022 data on CS teaching in Germany: Schröder et al. (2022) report that depending on the federal state, the percentage of female computer science teachers ranges from 24 to 45%.

Training	Number of respondents	20-29	30-39	40-49	50-59	60-69
11.04.-21.04.2023, primary, Lithuania	38	1	10	7	17	3
25.04.2023, primary, Austria	8	0	3	3	1	1
13.09.2023, primary, Germany	10	0	6	3	1	0
10.10.2023, primary, Austria	9	0	4	2	3	0
23.08.2023, STEAM, Germany	8	0	2	4	1	1
05.09.2023, STEAM, Germany	27	1	8	9	3	6
23.10.2023, STEAM, Austria	8	1	2	2	3	0
09.01.2024, STEAM, Lithuania	12	1	4	3	4	0
18.09.2023, CS, Germany	21	2	5	5	8	1

Table 5 Number of survey respondents according to their reported age group for each training based on the pre-evaluation survey results.

Training	Number of responded	Women	Men	Other gender	No reply
11.04.-21.04.2023, primary, Lithuania	38	38	0	0	0
25.04.2023, primary, Austria	8	4	4	0	0
13.09.2023, primary, Germany	10	9	1	0	0
10.10.2023, primary, Austria	9	6	2	1	0
23.08.2023, STEAM, Germany	8	3	5	0	0
05.09.2023, STEAM, Germany	27	13	14	0	0
23.10.2023, STEAM, Austria	8	2	6	0	0
09.01.2024, STEAM, Lithuania	12	4	7	0	1
18.09.2023, CS, Germany	21	6	14	0	1

Table 6 Number of survey respondents according to their reported gender identity for each training based on the pre-evaluation survey results

Most CS and STEAM teachers (between 41 and 72%) reported that they teach students ranging from grade seven to grade 12. Grade 13 was frequently reported by the STEAM teachers (41%), yet only 24% of the CS teachers in Germany reported teaching in the 12th grade. The most frequently reported second subjects for CS teachers constituted Mathematics (38%), languages (14%), physics and biology (10%). Among STEAM teachers in Austria and Lithuania 50% and 42% respectively had CS as one of their subjects. While for Austria and Germany, most STEAM teachers were teaching mathematics, languages, and sports, in Germany the top subjects included mathematics, languages, physics, chemistry, and biology. Most primary teachers reported teaching in grades 1-4. Across all the countries, most frequent subjects included mathematics and languages.

As Figure 2 shows, that respondents in all the countries and target groups differed in the level of their familiarity with DL and AI. In the survey question, for DL and AI, respondents were asked to select the option that best describes your experience: I have never heard of it; I have heard of it, but cannot remember/ don't know what it is; I have some idea of it, but it's not very clear; I know what it is and how it could be used/ what it could be used for; I am familiar with its application and know how it can be implemented in teaching. With an exception of the primary trainings Lithuania, all the target groups reported higher level of familiarity with AI compared to DL. In all the interventions, there were participants who reported that they never heard of data literacy. For AI, the category "I have never heard of it" was selected only in the primary trainings in Lithuania.

Figure 2 Self-reported familiarity with DL/AI per target group and location, pre-evaluation survey, n=136

2.2   Feedback on the learned content and format

The overall feedback was positive: 89% of the trained participants would recommend the workshops further. The post-survey included a series of questions to assess participants' reactions to the suitability of the exercises presented in the training using an instructional strategy that allowed teachers to try out the activities designed for their students. Participants were asked to assess a level of perceived suitability of the activities for their teaching. As activities presented in the trainings varied, it is difficult to compare the findings across the trainings. However, for most of the activities at least 80% of the participants selected category "4" or higher on a 6-point scale, indicating a high suitability of the taught activities for the teaching. On average, participants found the activity of working with regression on a dataset from the area of biology (Abalone) using Orange3 more suitable for higher grades, at least from grade nine.

In addition, in the post-evaluation survey teachers were asked, "How much do you agree with the following statements?" and were given a scale from 1 ("not at all") to 6 ("definitely"):

- "I wish the training had lasted longer"
- "The interactive format of the training is appropriate"
- "After the training, I am confident that I can independently implement the learned content in my teaching"

As Figure 3 demonstrates, on average participants in the primary trainings in Lithuania and Austria, as well as a very short training of 1.5 hours for CS teachers in Germany agree more with the statement, that the training should have lasted longer compared to the other trainings. Similarly, for the statement on the confidence to implement the learned content in teaching 8see Figure 5), the 1.5-hour training stands out with a very low level of agreement compared to the other trainings, indicating that 1.5 hours is clearly insufficient for the teacher trainings on DL and AI. For the

statement on the appropriate level of the interactivity, there were no notable differences across the target groups or length of the trainings: on average participants agree with the statement that the interactivity level was appropriate 8see Figure 4).

Figure 3 Distribution of the post-evaluation survey results for the survey item "I wish the training had lasted longer", post-evaluation survey, n=122
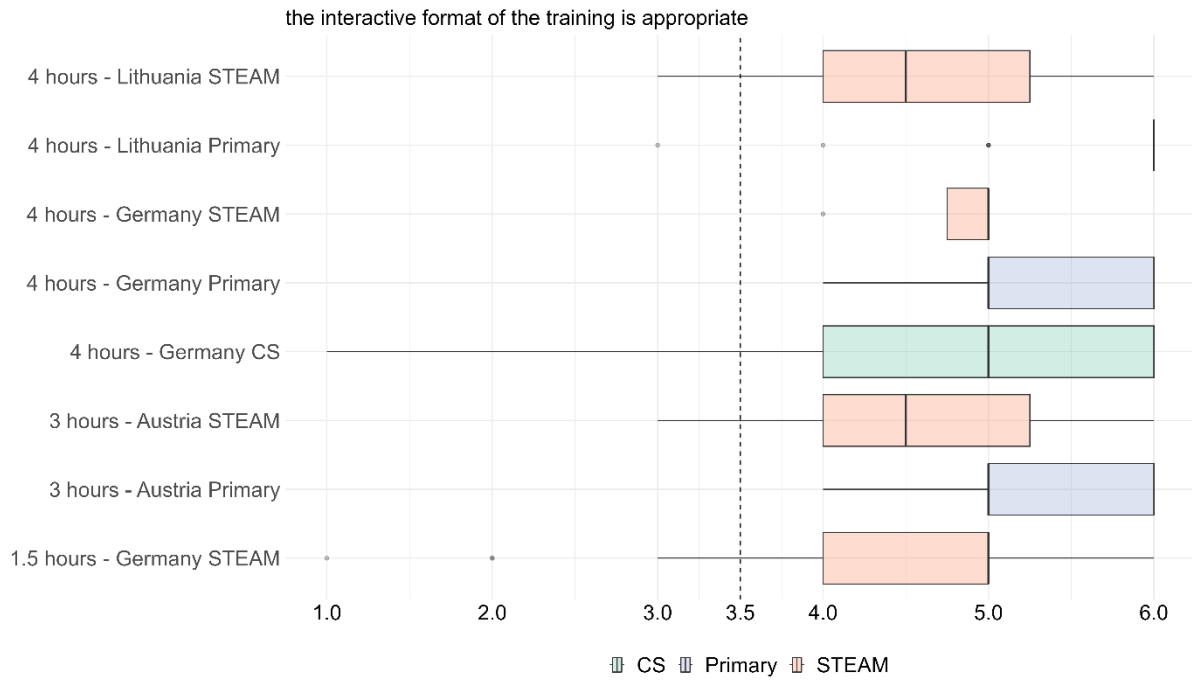
Figure 4 Distribution of the post-evaluation survey results for the survey item "The interactive format of the training is appropriate", post-evaluation survey, n=122
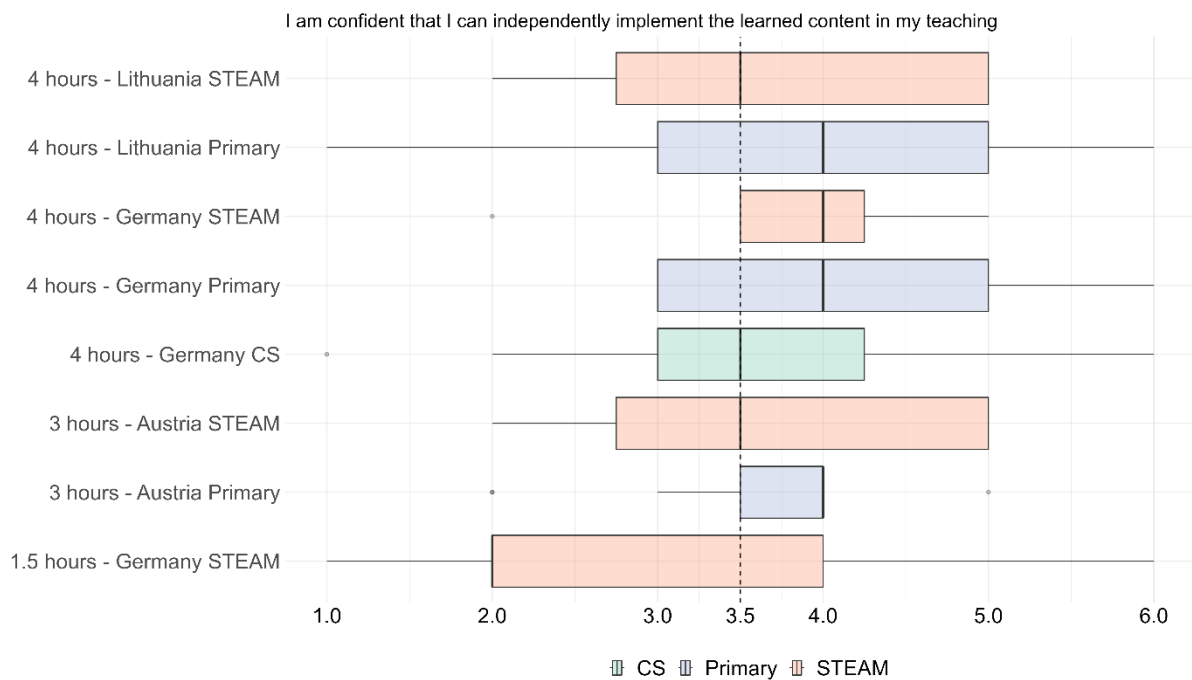
Figure 5 Distribution of the post-evaluation survey results for the survey item "I am confident that I can independently implement the learned content in my teaching", post-evaluation survey, n=122

2.3   Perceived competences on how to use DL/AI in class

As demonstrated in Figure 6 and 7, respondents reported an increase in the average self-reported level of competences in using DL and AI content though all the trainings, albeit the interquartile ranges (IQRs) – the boxes representing the middle 50% of responses - for most of the groups remained quite large. It's noteworthy that the post-training self-assessed competence level for both DL and AI was the lowest for the 1.5-hour training.
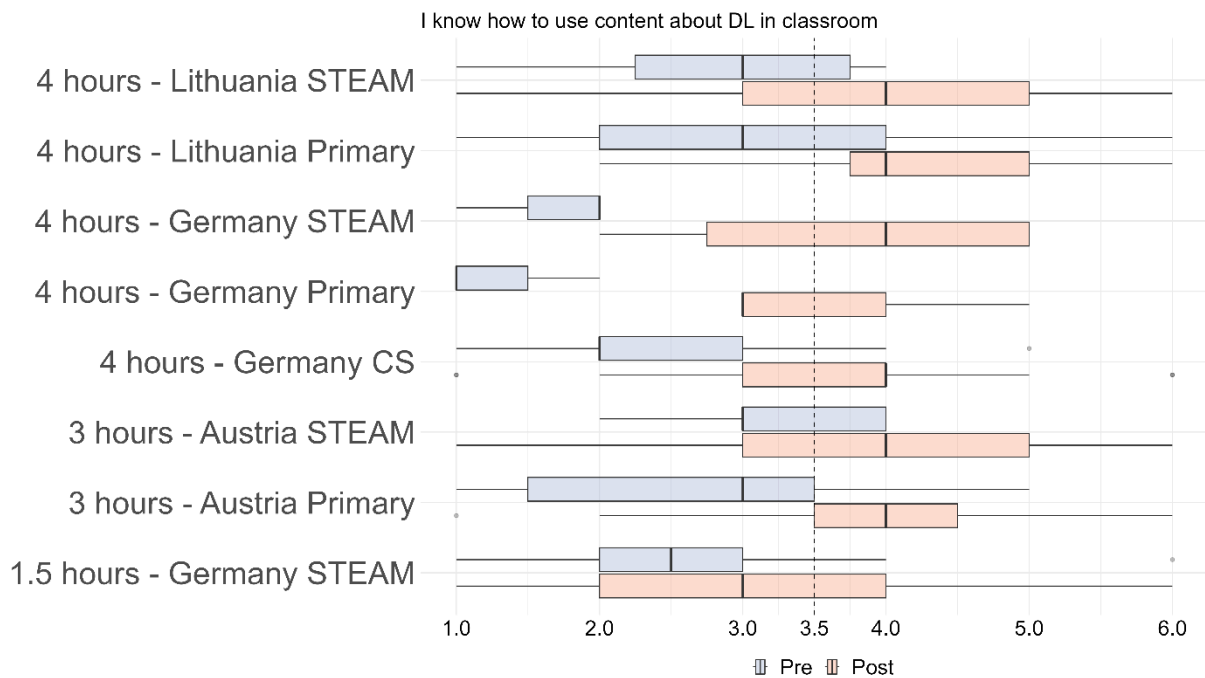
Figure 6 Boxplot comparison of pre- and post-results for the evaluation survey items on teachers' perceived competences to use DL content in class, pre- and post-evaluation survey, n=97

I know how to use content about AI in classroom
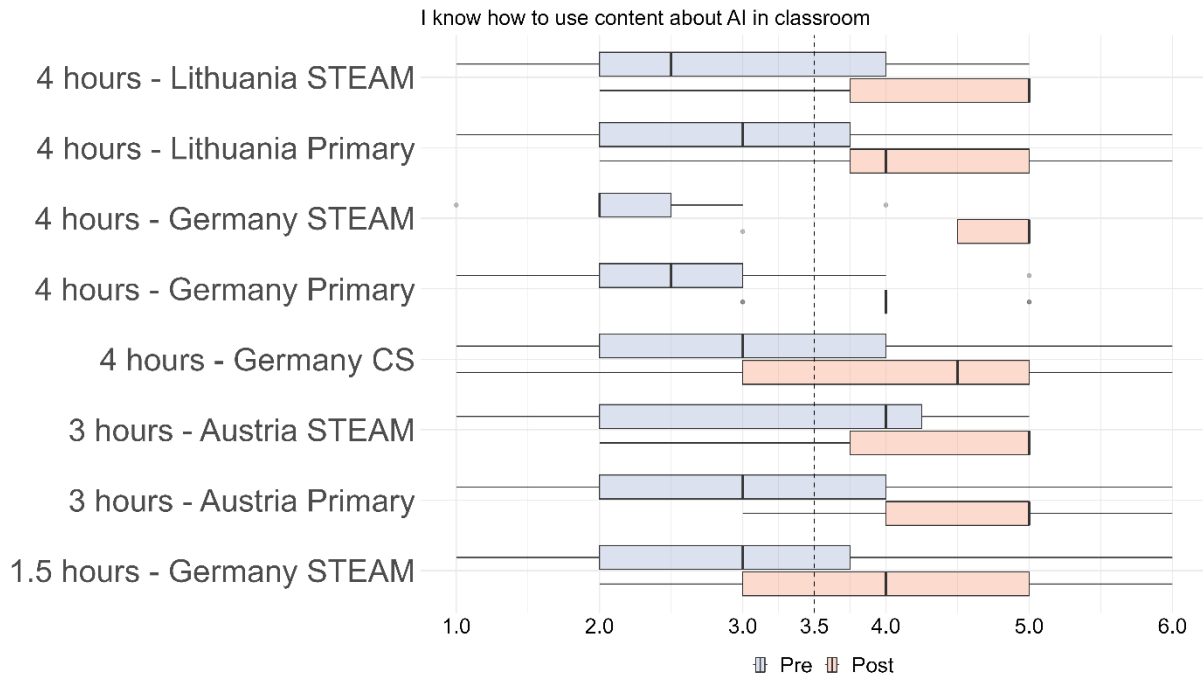
Figure 7 Boxplot comparison of pre- and post-results for the evaluation survey items on teachers' perceived competences to use AI content in class, pre- and post-evaluation survey, n=124

2.4   Understanding of DL/AI concepts introduced in the training

The knowledge tests were aimed to capture the understanding of main concepts and definitions introduced in the training. The tests differed from training to training, with some questions being modified in different versions. In addition, in one training in Lithuania it was reported that teachers were worried about the correctness of the results and tried to answer the questions together, which makes it difficult to use the results for the evaluation. Yet, in the future trainings, the tests could be valuable for teachers' self-assessment, when presented with the individual results for pre- and post-trainings.

For the primary and STEAM trainings, the knowledge tests indicated that the understanding of the introduced definitions and concepts improved to some extent. There were some easy questions on the understanding what AI is and how it can be implemented in various applications, which were answered correctly by most participants immediately before the training. Another set of questions were answered by ca. 50% of participants before and by ca. 70% after the training. Two questions (on

the application of decision trees and the definition of classical AI) were still answered correctly only by ca. 50% of the teachers after the training. For the CS teachers (who had questions different from those in the primary and STEAM groups), the pre- and post-differences in the knowledge test were more pronounced. Prior to the training, only two participants out of 20 selected at least 75% of the correct answer options and 10 participants got less than 50% of the answers right. After the training, eight teachers have selected at least 75% of the correct responses and only three respondents have chosen less than 50% of the correct responses. The most difficult question has proven to be a question about regression and Orange3.

2.5   Attitudes towards DL/AI and motivation to learn further

In the post-evaluation survey, teachers were asked, "How much do you agree with the following statements?" and were given a scale from 1 ("not at all") to 6 ("definitely"):

- "I believe that the integration and teaching of DL in the [respective subject] is very important"
- "I believe that the integration and teaching of AI in the [respective subject] is very important"
- "DL topics are of enough societal importance, to be included into the curriculum"
- "AI topics are of enough societal importance, to be included into the curriculum"
- "In the future, teaching DL will provide added value to students"
- "In the future, teaching AI will provide added value to students"

Figures 8-9 show pooled data for all the subjects for the items "I believe that the integration and teaching of DL/AI in the [respective subject] is very important." Interestingly, there are no clear patterns in how teachers see the importance of integrating DL and AI into their teaching across the target groups, but the importance is rated higher for AI as compared to DL.
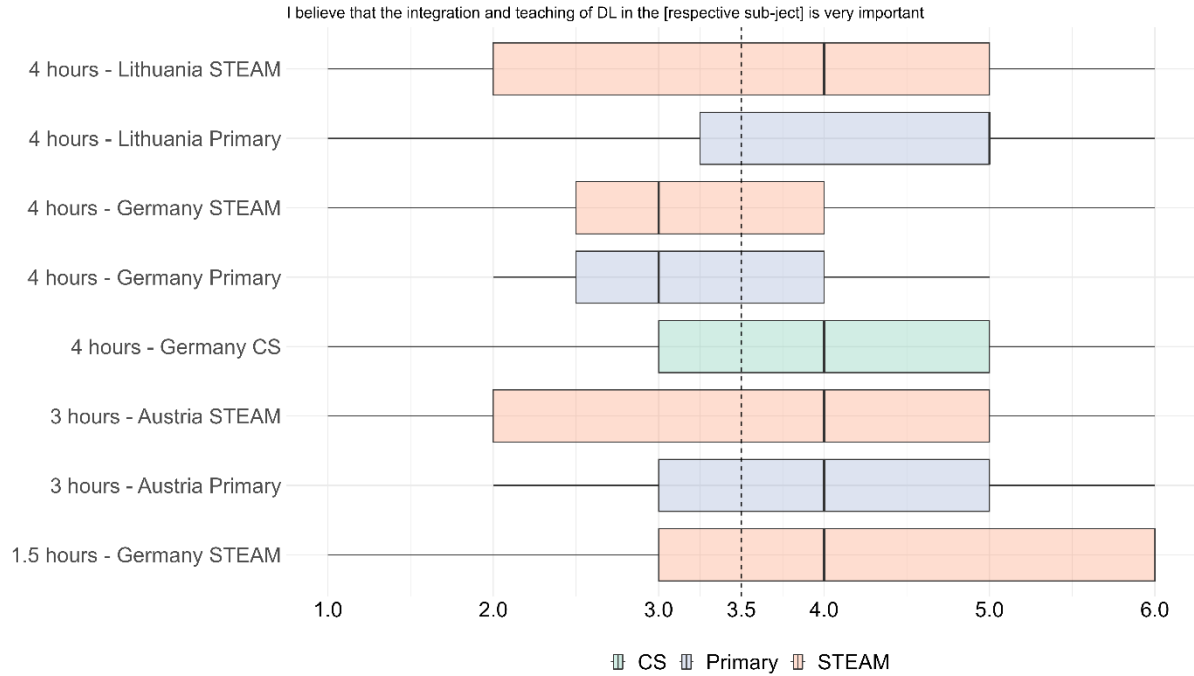
Figure 8 Distribution of the post-evaluation survey results for the survey item "I believe that the integration and teaching of DL in the [respective subject] is very important", post-evaluation survey, n=124
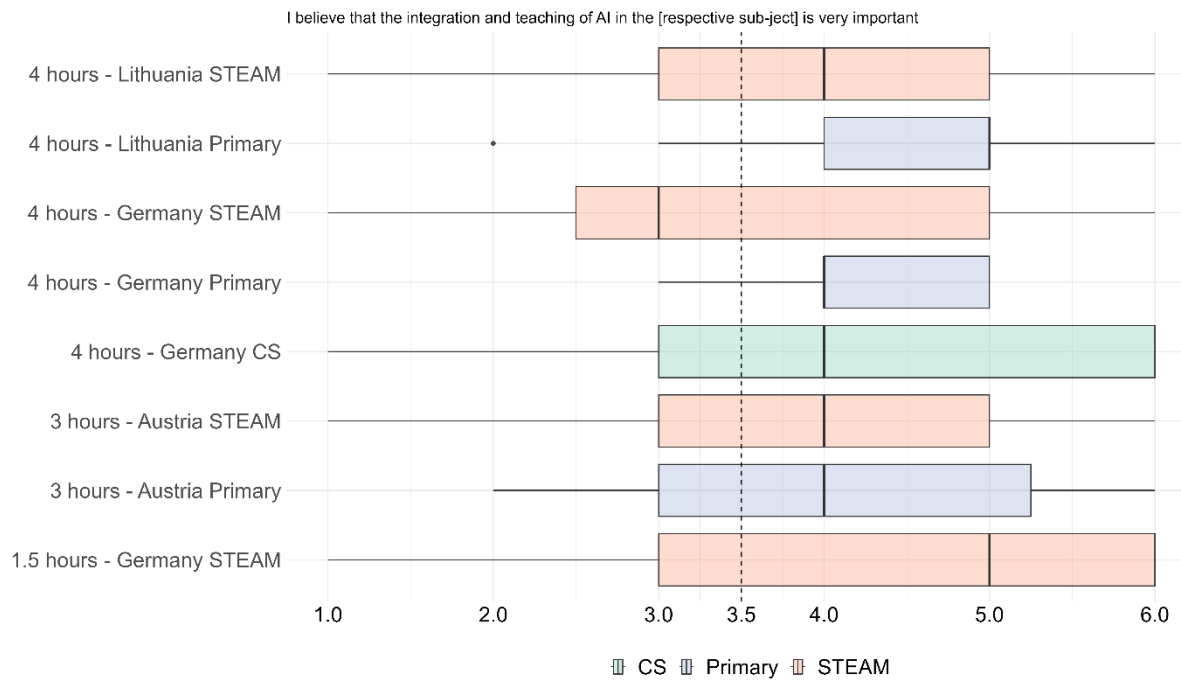
Figure 9 Distribution of the post-evaluation survey results for the survey item "I believe that the integration and teaching of AI in the [respective subject] is very important", post-evaluation survey, n=124

Figures 10-13 show the distribution of the survey items on teachers' attitudes. In-terestingly, on average, for the AI item, participants on average tend to agree more with the statement that it is of enough societal importance to be included in the curriculum when compared to DL. The same trend can be seen for the item on the value of teaching the respective topic to students in the future, suggesting that on average trained teachers do not quite understand and value the role of DL in teaching AI in school.

For the question about motivation to learn further about DL and AI, all the re-spondents except for one person indicated that they would like to learn further about these topics.
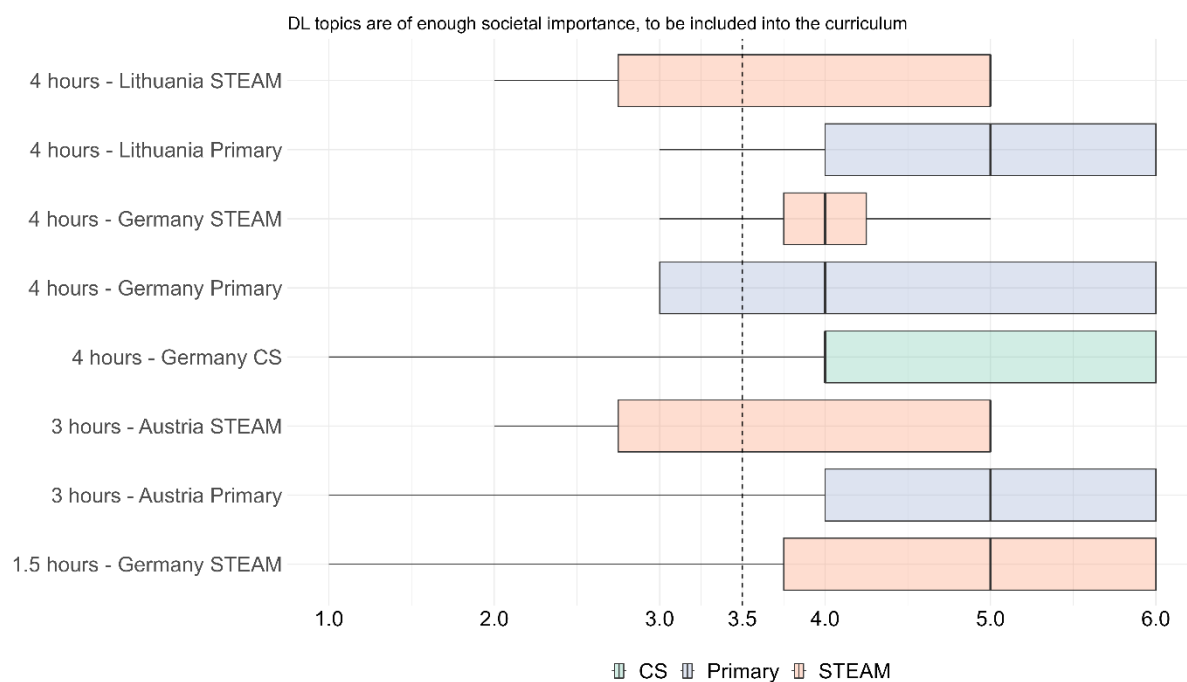
Figure 10 Distribution of the post-evaluation survey results for the survey item "DL topics are of enough societal importance, to be included into the curriculum", post-evaluation survey, n=124
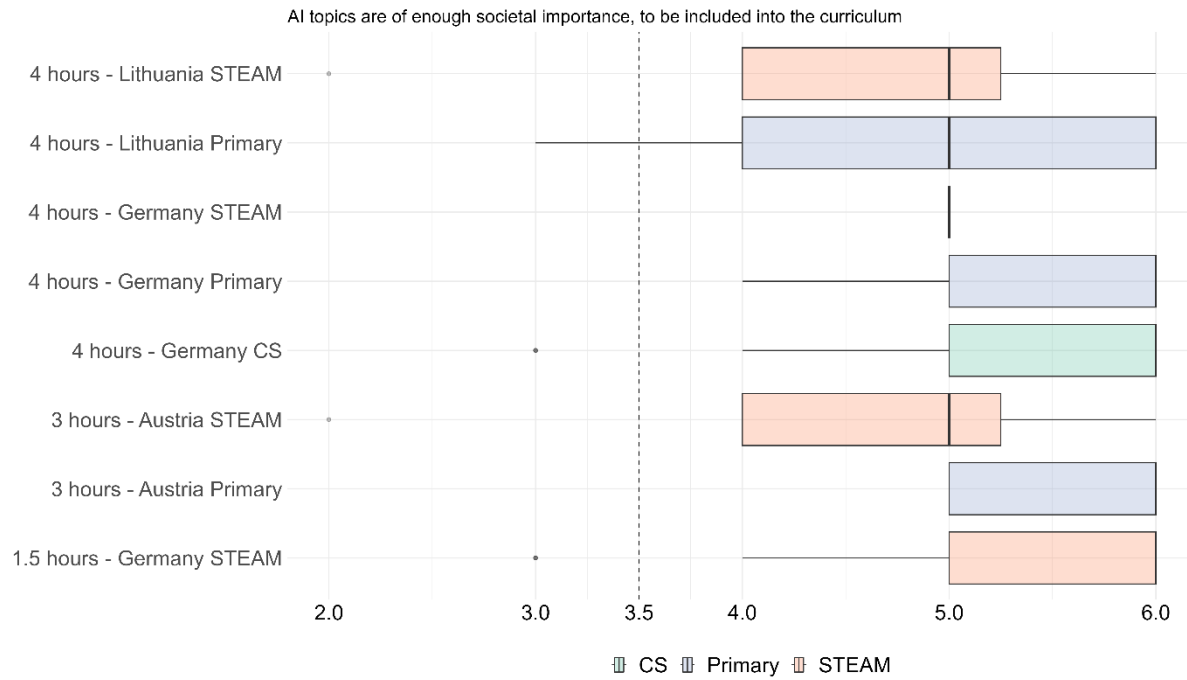
Figure 11 Distribution of the post-evaluation survey results for the survey item "AI topics are of enough societal importance, to be included into the curriculum", post-evaluation survey, n=124
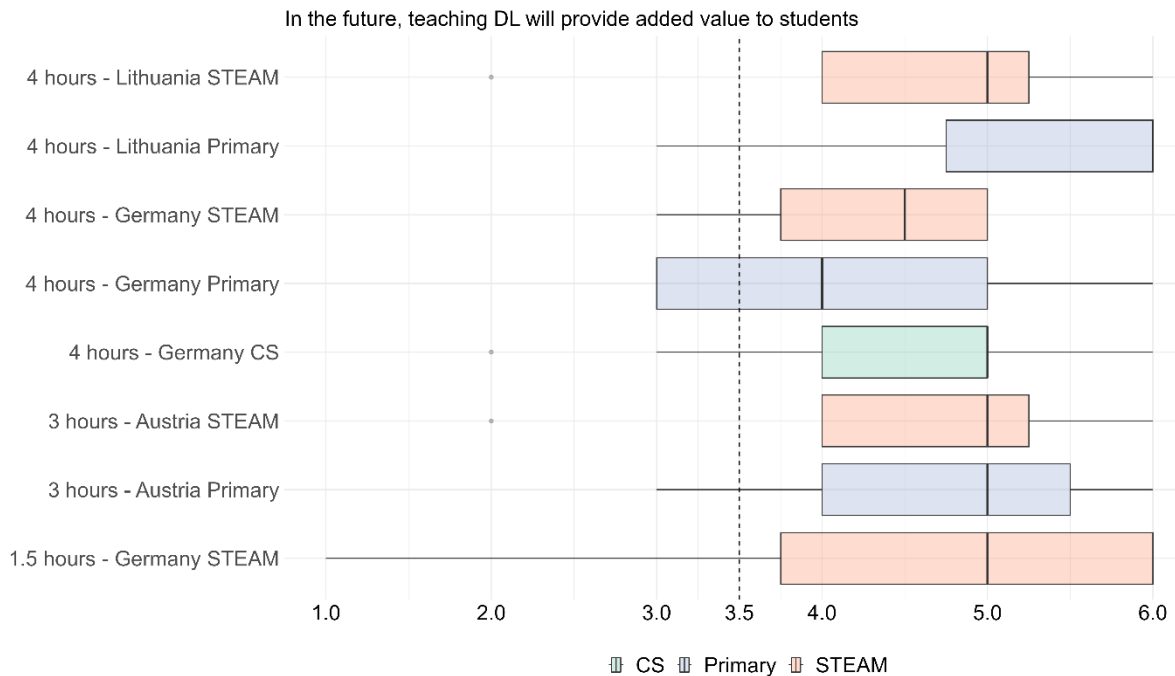
Figure 12 Distribution of the post-evaluation survey results for the survey item "In the future, teaching DL will provide added value to students", post-evaluation survey, n=124
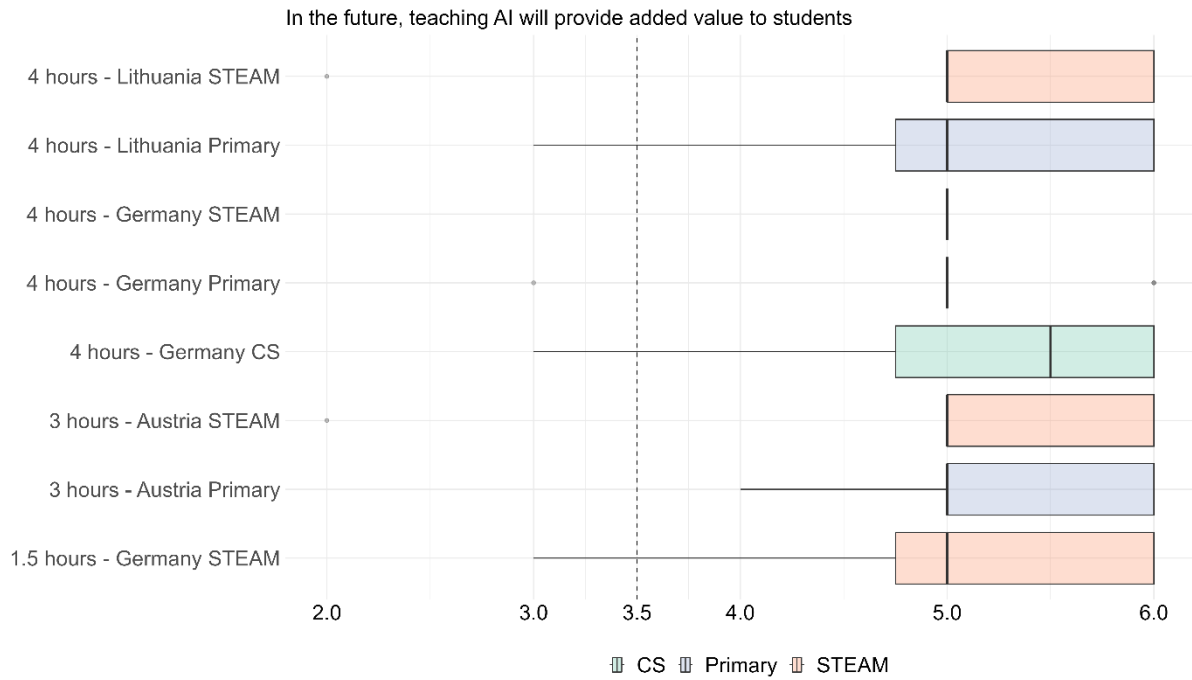
Figure 13 Distribution of the post-evaluation survey results for the survey item "In the future, teaching AI will provide added value to students", post-evaluation survey, n=124

2.6 Summary of the quantitative results

The sample consisted of 171 participants, with 141 completing the pre-evaluation survey. Participants predominantly ranged in age from 30 to 59 years across various training sessions. Gender distribution varied by country and training focus: nearly all primary education participants in Lithuania and Germany were women, while in Austria, the gender split was equal within a small sample size of eight participants. For Computer Science (CS) training in Germany, only six out of 21 participants were women, reflecting lower female representation similar to national statistics for CS teachers. In STEAM sessions, gender distribution was more balanced across all countries. In terms of subjects taught, most CS and STEAM teachers reported teaching students from grades 7 to 12. The additional subjects most frequently taught by CS teachers included Mathematics, Languages, Physics, and Biology. Among STEAM teachers, the most popular subjects (including the second subject) included Mathematics, Languages, Physics, Chemistry, and Biology. Primary teachers predominantly reported teaching grades 1-4 with Mathematics and Languages as the most common subjects.

The overall feedback on the training content and format was positive, with 89% of participants stating they would recommend the workshops to others. The post-training surveys assessed the perceived suitability of the exercises presented during the sessions. Most participants rated the activities highly, with at least 80% choosing "4" or higher on a 6-point scale, indicating that the activities were highly suitable for teaching. Specifically, activities involving working with regression on a dataset from the field of biology using the software Orange3 were deemed more appropriate for higher secondary level.

For the primary trainings in Lithuania and Austria as well as the shortest (1.5 hours) STEAM training in Germany, the feedback highlighted a desire for longer training sessions. On average, responses suggested that the interactive format of the training was appropriate. However, there were variations in confidence about incorporating the learned content independently in class, with the shortest training session receiving lower scores.

Prior to the training, participants generally reported higher familiarity with AI compared to DL, except for primary educators in Lithuania. These discrepancies are also seen in the pre-and post-results for the self-reported competence in using DL and AI content in class, with on average higher pre- and post-scores for AI compared to DL. In addition, the overall trend for knowledge tests showed an improvement in understanding post-training, albeit each target group had questions they struggled with: for STEAM and primary teachers these were decision trees and the definition of classical AI and for CS regression and Orange3.

The survey results showed a strong belief among participants in the societal importance of including DL and AI topics in the curriculum. Interestingly, participants on average expressed a slightly higher agreement with the importance of inclusion of AI into curriculum compared to DL, suggesting a misunderstanding of the fundamental role of DL in teaching AI. Similarly, when considering the future value of teaching these subjects, respondents saw a significant benefit for students, again with a

slight preference for AI over DL. Regarding motivation to learn more about DL and AI, the responses were overwhelmingly positive, with nearly all participants expressing a desire to further their understanding of these critical subjects. Qualitative results

3. Qualitative results

3.1 Personal interviews immediately after the training

The themes below describe key patters that repeatedly surfaced in the data, which were gathered based on the questions posed during the interview conducted immediately after the training. The labels on the right correspond to a short version of the description of categories that were assigned inductively throughout the qualitative analysis process.

3.1.1 Training feedback

CS trainings

Germany (18.09.23, Berlin)

One participant found the training to be *"rather too easy, I would say. For me, it was too little new"* (Participant B - 18.09.23, Berlin). This participant indicated having no prior knowledge in DL and moderate knowledge in AI. For the other three participants the difficulty levels for the training matched well according to their respective backgrounds in DL and AI (with distributions of no to moderate / average / little expertise in both of them). One of these three participants noted that not much new information about AI was included in the training for him.

Design of training: Well aligned with prior knowledge levels (AI & DL: from no to little /moderate / average); too easy for one participant (DL: no, AI: little /moderate / average knowledge)

The training was categorised as successful. The training provided a good overview: *"I always like it when you don't delve too deeply into a*

Overall feedback: Positive – Good / successful (general statement); good overview of various topics

topic and then work on that topic for four hours straight, [...]. We approach diving into topics quite differently when it comes to lesson preparation, so it's better as an overview when you cover various topics. I found that very cool. That was the case last time as well." [The participant attended a training developed by FU last year already.] (Participant C - 18.09.23, Berlin)

The practical orientation of the training received great approval among other things,*" when you know exactly and have tried what to expect, you feel confident using it in class"* (Participant D - 18.09.23, Berlin). Individual exercises were positively described: Abalone and Super-CodingBall (football game) were outlined as fun and applicable in class. Regarding Teachable Machine, the scanning of materials was an aha moment.

Participants partly highlighted that the exercises were new to them. Additionally, the training content could provide a good foundation for application in the classroom.

One participant brings up critical aspects regarding the content. It is described as too superficial, and exercises like SuperCodingBall are deemed suitable for an introduction, *"but what happens afterward? That is the difficult part. When it really gets down to the nitty-gritty, how can I convey to the student what truly lies behind it? Or, in general, do we want to avoid going into such depth and only explain what exists and how to apply it? However, I believe that wouldn't be proper computer science education any more"* (Participant B - 18.09.23, Berlin). This was also associated with too many black boxes being included in the training: The functioning behind the content/exercises often remained unclear.

| Format - Content: Positive - Practical tasks well liked |
| Format – Content: Positive: Individual exercises positively assessed (Abalone, SuperCodingBall, Teachable Machine) |
| Format – Content: Positive: Learned new exercises, exercises/content good foundation (e.g., for teaching students) |
| Format - Content: Negative: Too superficial, Only beginner level / lack for intermediate level, too many black boxes |

Regarding individual exercises, the Abalone exercise could potentially be challenging, and the instructions for the SuperCodingBall were unclear.

Format - Content: Critical note: Abalone - challenging, SuperCodingBall - unclear work instructions

The duration of the training was described as good.

Format - Length: Positive - Good

The structure was praised. The division of the training into two parts with a break in the middle was appreciated in this context. Participants were guided well through the training.

Format - Structure: Positive – Good (general, division of training with a pause in the middle, effective guidance through the training)

The materials were praised, especially the fact that one can take them and *"immediately incorporate them into the teaching"* (Participant D - 18.09.23, Berlin). Additionally, this allows for better familiarization with the topic and better recall of the training. The layout of the materials for the Abalone exercise was specifically highlighted.

Materials: Positive - Good / very good (general & Abalone), takeaway copies praised

A participant said that the use of the materials could be tested at an Integrated Secondary School (ISS) and then also applied at the high school (gymnasium).

Materials: Positive - Suitable for beginner and advanced level

As with the content, one of the criticisms is that the material is too superficial and not suitable for more advanced lessons.

Materials: Negative - Too superficial, lack of material for advanced purposes

The existing infrastructure (PCs) at the venue was praised. This allowed for a quick start without much administrative effort. It was positively noted that there was flexibility in the selection of exercises.

Other factors: Positive - Freedom in choice of exercises, appropriate infrastructure for training is available

It was mentioned as a negative point that it was not possible to register for multiple trainings simultaneously on the event day (IBBB).

It is suggested to share the breaks during the training, possibly by organizing activities together:*"[...] one would have to consider whether to have more of a come-together. Not eating in the cafeteria, but having a meal together, or at least having a small coffee buffet where people can socialize. Otherwise, it disperses"* (Participant B - 18.09.23, Berlin). Another idea is to have two training sessions on the topic in one day, with very different aspects (for example, one part on AI, one part on framework curriculum). Online educational platforms for teachers such as fobizz[11] could be mentioned.

More public relations work should be done to promote the existence of the IBBB. Additionally, there should be significantly more, for example, training sessions on CS topics or subjects like DL and AI.

It would be helpful if the contents that play a role in the training were classified in advance (for example, through a goal-end diagram or types of machine learning (AI)).

Concerning other topics, it is wished for theoretical foundations of AI: *"There were definitions regarding the theory of AI, but the various types of machine learning could also be quite interesting. A bit of general theory."* (Participant C - 18.09.23, Berlin). For advanced learners, the

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[11] The teaching platform fobizz offers ready-to-use teaching materials, which also enable digital teaching for the topics of AI and digital literacy (https://fobizz.com/en/)

tool TensorFlow would be suitable for of AI. Programming with Python would be another option.

An idea is to conduct training *"more concretely on-site in schools, saying: We are now conducting training for all ISS [Integrated Secondary Schools], eighth grade, on a specific topic. And then the topic is actually covered in the school using the resources available to the schools"* (Participant D - 18.09.23, Berlin). This could be extended beyond a single day, for example, spread over specific days over specific days of several consecutive weeks.

Ideas for further training: Format - Length: Training on site at the school (also possible as series)

A training spread over several weeks provides the opportunity to *"collaborate on planning a joint series of lessons. All computer science teachers face the same problems, and this could actually be a chance to do something together."* (Participant B - 18.09.23, Berlin) The content can be tried in the classroom between the training sessions and then evaluated collaboratively during the training.

Ideas for further training: Format - Length: Advantages of weeks / months (as series): Possible to plan a longer, joint teaching unit for classroom; content can be tried out with students in-between

Material could be designed not only for single use but as a series of progressively building resources. Teachers would also benefit from concrete ready-to-use implementation plans. Furthermore, for the exercises, it would be beneficial to provide alternative web-based resources as links.

Ideas for further training: Materials: Series of thematically similar materials, plugged alternatives, concrete implementation plans (ready-to-use)

CS summary

The CS training was rated as a good overview and aligned in difficulty with or below the participants' knowledge. The exercises received approval, particularly for their activating practical relevance and the participants' ability to choose which exercises to complete. They could be used as a foundation for teaching in the classroom; however, more advanced and complex approaches, including the provided material, are

called for longer series of classroom lessons. The materials should be supplemented with alternative plugged options and ready-to-use implementation plans.

The length and structure of the training were positively evaluated. There is a desire for more such trainings, along with an expansion of the offered topics and a clearer classification of the training content beforehand for orientational purposes.

Regarding conceivable training possibilities, on-site training in schools and training series were suggested, allowing the content to be tried out with the students between these sessions. Attention should be drawn to other (plugged) training possibilities that are accessible online.

STEAM trainings

Germany (23.08.23, Düsseldorf)

The person indicated that the difficulty of the training was tailored to their prior knowledge, and was not too complicatedly designed. The teacher indicated that they have no prior knowledge in DL and AI.

> Design of training: Well aligned with prior knowledge levels, not too complicated (AI & DL: no knowledge)

The participant was grateful for the event as it aligns with the digitalization mandate in North Rhine-Westphalia. Furthermore, the event was described as *"well-organised"* and *"very efficient"* (23.08.23, Düsseldorf).

> Overall feedback: Positive – Thankful for training, good (general statement), high efficiency

The teacher finds it challenging to evaluate the fulfilment of the training's objectives as her background includes subjects like music and art, while the training was designed for teachers from STEM fields (such as mathematics).

> Overall feedback: Neutral – Interviewee was not the 'real' target group of the training

In general, regarding the format, the teacher prefers in-person events because there is better opportunity for exchange and one can practically try things. The content also tends to be better remembered.

The content was very illustrative, and overall, it provided a good insight into the topics was provided. The theoretical inputs and speeches were of the right length, for example: *"No presentation was too long. It was briefly introduced what AI is and where the word comes from. Teachers always want to hear that. Where does it stand? Where does it come from? That was well done"* (23.08.23, Düsseldorf). Another plus was that practical work was done, allowing things to be tried out and handled in practice.

The practical exercise "Prompt Engineering with ChatGPT" was praised: *"[...] It was directly tried out by myself because I wanted to know what happens when I want to create an individualized development plan for a child. It leads to new ideas and encourages looking at a broader spectrum or checking if it really fits. Some aspects actually came into play for me that I hadn't considered before. [...]. It was helpful to see how one could create such an individualized development plan. [...]. That you work out a specific plan, I found very helpful, and I would also pass that on to my colleagues"* (23.08.23, Düsseldorf).

For teachers who instruct primary students or students up to the sixth grade, the content of the training was deemed suitable.

Therefore, the interviewed person believed that the suitability of the training content has be assessed in the context of the age of the students being taught by the participating teachers.

When it comes to discussing the negative critique points for content, the difficulty level of tasks may have been too low for mathematics teachers. For music teachers, some content may not have been as relevant as it probably was for STEM teachers. Other participants had also expressed during the training that certain content was superfluous (for music teachers), but the interviewee did not specify which). The interviewee also said, that *"a few things were thoughtfully designed, also for our understanding, but not usable for the students"* (23.08.23, Düsseldorf). However, it is not clear which subject areas this referred to.

Format – Content: Negative: Difficulty level of content/tasks may be too low for mathematics, some content superfluous & not teachable in classroom

Additionally, due to the length of the event, participants were unable to complete all the exercises: *"I would have liked to do more of the stations [exercises], but we didn't have that much time. I would have liked to continue. Maybe it was enough for others. It was a good insight, but I didn't complete everything"* (23.08.23, Düsseldorf).

Format – Content: Negative: Not enough time for planned content

Even though all exercises could not be completed, the length of the training was rated as not too long.

Format – Length: Positive: Not too long

The ability to take materials along was viewed positively.

Materials: Positive feedback: Take-away copies praised

The suitability of the material, like the content, depends on the age of the students and the participants' subject area.

Materials: Neutral: Suitability of content dependent on certain criteria

It is critically noted that some aspects of the training would not be feasible for the classroom yet (it is unclear whether this only refers to materials or also to the content): *"A colleague from the German*

Materials (+ may be content): Negative: Not feasible for classroom, not teachable in classroom

language department mentioned that a few things in German format were not applicable. It didn't fit. It depends on whether it is a mathematically motivated computer program or a language program. Some things cannot be done; we are not yet at that level with the computer programs we had available" (23.08.23, Düsseldorf).

With regard to other factors such as interaction during the training, group work was emphasized: *"We had different groups [...]. I was among these people for the first time, and I didn't find it unpleasant"* (23.08.23, Düsseldorf).

Other factors: Interaction/communication: Positive – Group work

Regarding ideas for further training, for the subject music, there would be the need for *"[...] a composition program or similar things. We still need a lot more"* (23.08.23, Düsseldorf).

Ideas for further training: Format – Content: For the subject music, additional/different content needed

The training should be extended for the topics presented and the exercises conducted.

Ideas for further training: Format – Length: Make training longer

It would be possible to conduct trainings online.

Ideas for further training: Format - Length: Online trainings

Online-trainings have advantages, i.e. that there are fewer barriers because you can *"[...] ask everything. Then it is not embarrassing for anyone. [...]. In a small setting, the barriers would probably not be as high when doing it online. If you share your screen, you can see the operation [of computer programs] and difficulties. As a learner, you first have to practice using the computer program. What is self-evident for one person is by no means common for another. It is important to learn that too. In a small group, there may be less hesitation. You can share your screen, ask if you did something correctly"* (23.08.23, Düsseldorf). Furthermore, online trainings would

Advantages of online trainings: Fewer obstacles to asking questions, can be meaningful for computer programs that teachers will use, self-learning is strengthened, for teachers with children positive

be suitable for individual computer programs that teachers engage with. You can also teach yourself a lot. For teachers with children, these trainings would be positive because then professional development is more compatible with private requirements.

Online educational platforms for teachers such as fobizz could be mentioned so that teachers could use such resources also themselves.

Ideas for further training: Training-specific - point out other training opportunities

Germany (05.09.23, Berlin)

Regarding the question about the design of the training in relation to the participant's previous knowledge, one statement was that the content presented would have required at least double the time. The participant stated having no prior knowledge in DL and moderate familiarity with AI.

Design of training: More time needed for content (DL: no knowledge, AI: little / moderate / average)

For other participants, the training was well-designed, allowing even laypersons to follow along and understand everything. Either the teachers did not provide information about their DL background, or they explicitly stated that they had no prior knowledge. Regarding AI, they indicated having little / moderate to average knowledge.

Design of training: Well aligned with prior knowledge levels (DL: no / no information given, AI: little / moderate / average)

The training was perceived as (very) good and exceptionally relevant. Further workhops like this one (with some adjustments) would be welcomed.

Overall feedback: Positive – (Very) good, training was tailored to very current issue, more trainings like / similar to these welcomed

In light of the AI content that was somewhat redundant for one participant, they noted, *"[...] that it's probably challenging to structure*

Overall feedback: Neutral - Hard to design training when participants' knowledge not clear

such a presentation when you're not precisely aware of the prior knowledge of each individual" (Participant C - 05.09.23, Berlin).

In general, with regard to the format, a participant expressed a preference for in-person over online trainings.

<div style="float:right">Format: Face-to-face events are preferred</div>

When positively referring to the training content, Orange3 was specifically mentioned. It was noted that it was enjoyable to work with and considered it is a good tool because it allows for working visually.

<div style="float:right">Format – Content: Positive: Individual exercises/tools positively assessed (Orange3)</div>

It was praised that practical work could be done in the training, for example: *"[...] we receive a worksheet and are allowed to try it ourselves. It has definitely been productive. This will certainly be something that some can take away or implement, especially if they are interested in incorporating things like linear regressions, into their teaching"* (Participant D – 05.09.23, Berlin). Additionally, the content was highlighted as very current, and theoretical introductions, as the overview of what AI encompasses, were positively acknowledged.

<div style="float:right">Format – Content: Positive: Practical tasks well liked, content very up-to-date, theoretical introductions / inputs / good</div>

A participant noted that there wasn't much new content for him.

<div style="float:right">Format – Content: Neutral: There wasn't anything substantially new</div>

Parallel to this, explanations about AI (to the extent in the training) were not necessary for this participant. Furthermore, it was criticized that there was too little time available for working with Orange3.

<div style="float:right">Format – Content: Negative: Some content superfluous (AI), too little time with tool Orange3</div>

The length of the training, when explicitly addressed, was negatively connoted. The duration of the training, respectively for the Orange3 program (which occupied a central place in the 90-minute training), was considered too short. There was an impression that content was cut in several places. Furthermore, it was noted, *"[...] it's also difficult if you're not there ten minutes earlier to do the pre-survey, and then it overlaps [with the training]. Similarly, at the end, we couldn't finish the exercise because we had to do the survey again afterward"* (Participant A – 05.09.23, Berlin).

Format – Length: Negative: Too short, Evaluation time becomes a problem when you arrive late

It was praised that there was an *"overview catalogue"* that one could use to engage independently outside of the workshop (Participant B – 05.09.23, Berlin).

Materials: Positive: Good (general statement)

Communication (with the participants) was clear, good, and understandable.

Other factors: Interaction / communication: Positive - Clear communication

The training was conducted at a good pace. Additionally, the expertise of the instructors was positively emphasized: *"First of all, I liked that there were actually instructors who come directly from the field and could incorporate their own experiences"* (Participant B – 05.09.23, Berlin). The visual presentations accompanying the training were well-received.

Other factors: Positive feedback - Good tempo, experts have presented (and reported from their field), training / presentations visually appealing

Now follow the expressed ideas for further training. Generally, it is always important to *"[...] target the right audience. It might be advisable to use teachers as multipliers, intensively training them, and then having the teachers integrate it [training's content] in their classrooms"* (Participant A - 05.09.23, Berlin). Additionally, it is advisable to clarify the technical requirements in advance on-site (such as ensuring PCs

Ideas for further training: General: Finding the right target group (teachers as multipliers), sufficient technical conditions should be established

with the required pre-installed software for the training) to avoid losing time on the actual training content/exercises.

"The desire was expressed that more time should have been available for Orange3, for example, to trace the individual steps again or to better familiarize oneself with the functions. Regarding the approach to working with Orange3 in the training, it was suggested, *"[...] maybe showing step by step how to work together with the course participants or workshop participants, connecting these two things here, and selecting a column. I think, in hindsight, I would have found it good to do everything in parallel. Since I noticed that I was thinking, okay, what was the step and what had to be done afterward? Then somehow there was a lack of time to really delve into it more deeply"* (Participant B – 05.09.23, Berlin). In this regard, another idea is to make Orange3 the main focus of this training.

Perhaps the exercise Abalone or introductory and ending inputs could be less detailed, allowing for a stronger focus on Orange3. Additionally, it is worth considering whether it is necessary to explain to mathematics teachers what a regression is; instead, topics could be treated in more depth from the start.

Furthermore, an orientation of the training content towards classroom use was desired: *"I would have liked, for the time that was initially used for the general explanations of AI, that it would have been used to delve a bit more into concrete topics that may ultimately be relevant for teaching"* (Participant C –05.09.23, Berlin). It was also expressed that the emphasis should be on ready-to-use exercises, meaning that

Ideas for further training: Format - Content: Cover Orange3 more in depth

Ideas for further training: Format – Content: Cover less Abalone exercise (because of too little time); cover complex content / more in depth

Ideas for further training: Format – Content: More work on relevant topics for classroom teaching, ready-to-use practical exercise (e.g., along with material)

practical exercises should be designed and conducted with the participants in a manner that makes them immediately applicable in the classroom.

In terms of the length of the training, suggestions were made to extend the training. To make the limited time more effectively usable, options such as a shift in focus (on Orange3) or less time for specific content (Abalone exercise or introductory and ending parts) were proposed, as already outlined. Because the time for evaluation and training could overlap, they should therefore be spaced out more from each other.

Ideas for further training: Format – Length: Make training longer, less time for specific exercises or refocus topics in the training, take into account evaluation time

There was a desire to delve deeper into the training topics in a subsequent workshop.

Ideas for further training: Format: Length: Dealing with topics in more depth in a follow-up workshop

Another possibility would be to extend the completed 1.5-hour to a two to three-hour training.

Then the training could also be designed in a way so that the content would be immediately applicable in the classroom; participants could also be provided with didactic support right away during the training so that integration into their teaching is possible.

Ideas for further training: Format – Length: Two-to-three-hour workshop

Ideas for further training: Format – Length: Advantages of two-to-three-Hour workshop: Content from training can be implemented (as is) in the classroom

A further possibility for teacher training that is mentioned, is training sessions that run over two days, *"[…] supplemented again after a quarter of a year for two days and supplemented again after half a year for two days. This is a very practical method because there is enough time in between to interact with it [content] and not have the six days in a row. Whether the content [of the TrainDL training on that day] is suitable for a duration of six days, I cannot judge, […]"* (Participant A – 05.09.23, Berlin).

Ideas for further training: Format – Length: Advantages of extension to weeks / months (as series) / multiple trainings: Teachers can engage with content in-between sessions

In terms of materials, it would be of interest to *"[…] go through ready-to-use teaching concepts, perhaps even role-play them as we have done it so far [teaching], and break down the backgrounds a bit"* (Participant C – 05.09.23, Berlin).

Ideas for further training: Materials: Concrete implementation (ready-to-use) plans

Lithuania (09.01.24, Vilnius)

The training was rated as very useful. The interviewee would take part in it again and would also advise her colleagues to do so.

Overall feedback: Positive – (Very) Successful / interesting / good / valuable, will be recommended to others

The content was considered a good inspiration for future teaching in the subject of physics, and the participant was excited after the training about how they can now implement AI content into the classroom.

Format – Content: Positive: Good inspiration for future teaching

The length was generally considered to be good.

Format – Length: Positive: Good / very good

Nevertheless, the wish was expressed for continuous training (again with practical exercises), which has the advantage that training content is not forgotten.

Ideas for further training: Format – Length: Advantages of extension to weeks / months (as series) / multiple trainings: Teachers can engage with content in-between sessions

STEAM summary

The trainings were tailored to participants' prior knowledge, but overall, the trainings were deemed too short. It was suggested to extend them, and there was also a call to take into account evaluation time when planning the trainings. Additionally,

the challenge of designing trainings was highlighted, when the knowledge levels of teachers are unknown beforehand.

There were wishes for more trainings, for example encompassing online approaches. However, there were also indications of a preference for in-person trainings. To enhance the practical application of knowledge, suggestions were made for follow-up workshops or continuous training or training series, as, for example, these would allow content to be tested in schools between sessions.

Overall, the trainings were positively received and were commended for providing a good introduction to the topics, practical exercises, theoretical inputs and inspiration for future teaching. The use of engaging group work was praised, and positive feedback was received for effective communication, professional presenters, and visually appealing presentations. Specific exercises, such as Orange3, were highlighted positively. However, there was a consensus that more time was generally needed for this tool and other content to be covered more in-depth and to introduce more complexity. Additionally, some content (and materials) were deemed superfluous and not suitable for classroom teaching. The feasibility of teaching the training's content was noted to depend on the subject, with some content considered too easy for subjects like mathematics and unsuitable for others like music. The materials received high praise, and participants appreciated the opportunity to take something away. However, there was a desire for more ready-to-use practical exercises, along with materials and plans. There should be mention of alternative sources for materials, such as online educational websites.

Primary trainings

Germany (13.09.2023, Düsseldorf)

A respondent from the group interview made it clear that she understood the content well. Starting from a previous *"brief overview of*

Design of training: Well aligned with prior knowledge levels (DL & AI: average)

what data is and how it relates to AI" the participant now has a *"[...] rough overview of how I could formulate this in a more understandable way for primary school children and provide examples, but definitely only for third and fourth grade"* (Participant – 13.09.23, Düsseldorf).

In relation to the training, the participant found it to be helpful to learn the background of where AI can be found and how to possibly convey such topics that in a child-friendly way.

Overall feedback: Positive – Helpful

The practical relevance of the exercises was emphasized positively in relation to the content.

Format - Content: Positive – Practical tasks well liked

At times, however, the connection of the training content or exercises to AI was not clear: *"Yes, what does that have to do with AI when the children have learned sorting or similar activities in the game? This is an important matter because ultimately that's why I do this with the children, not just for them to play a nice game"* (Participant – 13.09.23, Düsseldorf). Some content would also not be suitable for all primary school grade levels, like mentioned at the beginning of the paragraph. Moreover, there was a wish for a comprehension of how (exactly) AI operates, enabling it to be communicated to the children appropriately.

Format - Content: Negative – Link from content to AI and didactics not clear, Content / materials doesn't work for some primary school level, too many black boxes

It was positively noted that materials for exercises/examples were provided that can be applied in the classroom. Additionally, praise was given for referring to websites with a didactic connection, enabling further engagement with the content after the training.

Materials: Positive - Materials are practical/implementable in classroom, good references for further independent work

The criticism regarding the content, that the connection of the training content or exercises to AI was not clear, would apply also to corresponding materials. Additionally, a lack of further examples and

Materials: Negative - link from materials to AI and learning objectives not clear, more materials are needed

materials was mentioned, for instance, on how to structure a series of lessons.

Regarding further ideas, it was suggested that there should be *"[…] be a follow-up training to this [TrainDL] training specifically focusing on what we are currently working on thematically or where it might potentially fit, and also for developing new ideas. We've had many ideas that could be conceptualized to implement this, but after this training, I wouldn't be able to start immediately"* (Participant – 13.09.23, Düsseldorf).

In general, (additional) trainings should not take place on weekends. Furthermore, the idea of a working group that meets regularly was suggested.

In relation to the content, there was a desire for more pedagogical input respectively examples *"[…] to discuss with the children what is exemplified in the AI processes"* (Participant - 13.09.23, Düsseldorf). Additionally, more practical examples were requested.

The desire for already developed plans that can be applied in the classroom was clearly expressed, e.g.: *"The examples [from the training] are very practical and can be used very well, but the whole framework is still missing. How do I start the topic with the children? How do I introduce the topic to the children? What is the meaningful structure with the children? I now know this is cool, I can do it, and the children would understand it too, but only with the framework, and that is still missing"* (Participant - 13.09.23, Düsseldorf). This framework would include materials/guidelines, also for series of lessons: *"[Usually] It is like we have an introduction to a topic, then the children delve into this topic intensively, and then there is a concluding session on the topic. This doesn't just happen in one*

Ideas for further training: Training-specific (Overall training) – Follow-up training to TrainDL training needs to be offered

Ideas for further training: General – Trainings should not be on weekends, working group ("Arbeitskreis")

Ideas for further training: Format - Content - More pedagogical content & practical exercises

Ideas for further training: Materials: Concrete implementation (ready-to-use) plans

hour, but over a series of lessons" (Participant - 13.09.23, Düsseldorf). Additionally, children should not only be familiar with exercises but also with the theory behind them. This information could be incorporated into such frameworks/plans that should be provided to teachers. Teachers have little time but could engage with these plans, acquire knowledge, and wouldn't need to completely conceive a teaching concept from scratch.

Furthermore, it has been suggested that materials should be adapted to the different class grade levels of primary school.

Ideas for further training: Materials: Materials should be adopted for a given school grade/group

Austria (25.04.2023, Vienna)

The event was overall, with feedback as a face-to-face event, rated as very good. Face-to-face events are preferred.

Overall feedback & Format: Positive – Very good (face-to-face events preferred)

The length of the theoretical inputs was fine for individuals with limited background knowledge: *"[...] for me, it completely worked to have this basic knowledge, on which I then build the actions."* (Participant B - 25.04.23, Vienna). The Ligretto cards had been well-received as were the practical tasks as a whole.

Format - Content: Positive – Theoretical introductions / inputs, Ligretto cards game and practical tasks rated good

At the same time, there was criticism that more experimentation could have taken place: *"Purely from the title, I would have liked more hands-on activities with materials. Because these were more or less worksheets. The Ligretto cards were good, but the rest were actually worksheets. [...] For me, it would be exciting to do a bit more instead of searching for something on paper. A bit more that you can touch."* (Participant A - 25.04.23, Vienna) The theoretical inputs may have been too long for people who already have more than basic knowledge.

Format - Content: Negative – Work more hands-on (don't use so many worksheets), theoretical introductions / inputs too long (for experts)

The length, also in relation to its content, was considered to be okay.

Format - Length: Positive – Good, in accordance with the content

The structure was perceived as *"a bit chaotic [...] because we jumped thematically back and forth, between Data Literacy and Artificial Intelligence."* (Participant A - 25.04.23, Vienna) At times, some blocks were also perceived as both DL and AI.

Format - Structure: Negative – Too much jumping back and forth thematically

It was pleasant that the trainers asked about the (various) solution approaches of the participants.

Other factors: Interaction/communication: Positive - Participants were asked about different solution approaches

In terms of ideas for further training, participants could indicate their prior knowledge in advance, *"then I can provide that to the algorithm. And it suggests training sessions that suit me. It's incredibly difficult as someone who is choosing further training to figure out: Is this something that suits me or not? "* (Participant B - 25.04.23, Vienna)

Ideas for further training: General - Teachers specify knowledge in advance to find suitable training

Furthermore, there is a desire for more hands-on activities instead of an increased use of worksheets.

Ideas for further training: Content - Work more practical (e.g., don't use so many worksheets)

A participant mentions that it would have helped to follow a clearer thematic line, for example, having one block only on AI and another block only on DL.

Ideas for further training: Structure - Clear structure: One block each for DL and AI

Lithuania (11-21.04.2023, Vilnius/Vilkaviškis/Druskininkai)

To the question regarding the design of the training based on prior knowledge, only one participant made a statement: It was appropriately designed. The prior knowledge was not specified for DL and/or AI and was indicated as moderate/average.

Design of training: Well aligned with prior knowledge levels (unspecified: little /moderate / average)

When talking about the whole training, it was very well-received by the participants, and gratitude for it was expressed in some instances. In this context, the utility was also highlighted: *"I think that seminars like this one are very useful. First of all, as you said, it would be very useful to introduce them into studies. Then the seminars would be more practical because everyone who comes to it will know already."* (Participant D - 11.04.23, Vilnius) The training was positively evaluated because knowledge was conveyed, and understanding became clearer after the training. The desire/need for further training was emphasized.

Overall feedback: Positive – Good / thankful for training (i.e., because useful and knowledge was disseminated), everything clearer now, more trainings like / similar to these welcomed

Content-wise, there was appreciation for the practical aspects/tasks covered in the training. The Ligretto game was highlighted positively: *"Mostly I think I like that card game because when you read the articles and news about artificial intelligence, you didn't even know how it works on the inside. The card things, when you're sorting those cards, it helps to understand the inside process. So, I like it really a lot"* (Participant C - 18.04.23, Vilkaviškis).

Format - Content: Positive – Practical tasks well liked, Ligretto cards game: well liked

Positive remarks regarding the materials emphasized their (immediate) implementability for classroom teaching: *"Yes, we can use this material for the students because we are already using Bebras cards.*

Materials: Positive - Materials are practical/implementable in the classroom

We also use ViLLE[12] [collaborative learning platform] and other cards [Ligretto], which we were shown today." (Participant B - 18.04.23, Vilkaviškis)

The training sessions should be scheduled on specific days: *"When organizing the trainings, it would be good to select a day of the week that isn't Friday because on Friday afternoon, it's already challenging for the teachers to participate after the long workweek."* (Participant A - 21.04.23, Druskininkai)

> Ideas for further training: General - Trainings should not be at the end of the week

More content from the ViLLE platform is desired in a training, or a training that is majorly tailored to this platform.

> Ideas for further training: Format - Content - Additional topics: ViLLE platform

The training should be made longer.

> Ideas for further training: Format - Length: Make training longer

Longer trainings (full-day trainings) are not preferred. Instead, *"a couple of hours, I think would be the best duration because the whole day, it's rather difficult and our mind then becomes not very hard-working"* (Participant D – 11.04.23, Vilnius).

> Ideas for further training: Format - Length: Disadvantages of full-day trainings (e.g., 7-hour trainings): It can be mentally / cognitively exhausting

Against the backdrop of primary students being educated, more information, such as the underlying functionality, is desired for the materials. Additionally, more materials related to the games that the students play should be provided, and *"more material that is connected to children's social life, to their everyday life."* (Participant B - 18.04.23, Vilkaviškis)

> Ideas for further training: Material: More background information, more material connected to students' games and their everyday life

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[12] ViLLE is a collaborative learning platform developed by the Centre of Learning Analytics of the University of Turku. [...] The materials in ViLLE include various exercises on programming, mathematics, languages, and other subjects." (https://en.learninganalytics.fi/ville#introduction)

Primary summary

The primary training design was well-aligned with participants' prior knowledge levels. Overall, the trainings were positively received. The length was considered appropriate in relation to the content. However, more trainings were welcomed, and there was a desire for longer sessions, although some participants found whole-day training too lengthy. A preference for in-person sessions was noted. It was suggested that teachers should be able to specify their knowledge in advance to ensure suitability of the training.

The theoretical inputs and practical tasks, such as Ligretto, were praised for making topics clearer. However, participants expressed a wish for a more hands-on approach instead of primarily engaging with worksheets. Structurally, there was feedback about too much thematic jumping back and forth, so the suggestion was having one block each for DL and AI.

In terms of materials, there was a positive view, noting that they are practical and implementable in the classroom. However, participants suggested including more background information and establishing a stronger connection to the everyday life of students. Additionally, there was a suggestion to provide guidance on the usage of online teaching platforms.

3.1.2 Teachability and difficulties of teaching DL and AI
CS trainings

Germany (18.09.23, Berlin)

There are certain basic requirements for learning and working on information technology topics in the classroom: *"There are various things, such as WLAN and computers. [...] That you have an IT administrator*

Teachability: Prerequisites: Better infrastructure, Environments with greater decision-making freedom are helpful, Practicing content in classroom (e.g., internship) helpful,

in the school. This is often only the case one day a week, which is unfortunately not enough. In my opinion, you really need someone who is employed full-time at a school and only takes care of these things. [...] The internet goes down or the server goes down, the mice are missing. What do you do then? Unfortunately, sometimes it really does fail because of very trivial things.“ (Participant A - 18.09.23, Berlin) In environments where you are freer and can experiment, it is easier to integrate new content (e.g. AI / AI exercises) into the classroom. It also helps if you can practise this integration (e.g., as part of a traineeship).

For DL and AI, it depends on how you deal with the issues, i.e. how deeply you treat them and what you do with them in the classroom.

Abalone is very challenging, but would definitely be fun for the students.

Orange3 was used in the Abalone exercise. With the help of this tool, very challenging tasks can be realised with Orange3, which is why, among other things, it is *"more for upper secondary school students who already have a bit of experience. Even if it's just drag-and-drop, there's a bit more to it, especially mathematically"* (Participant C – 18.09.23, Berlin).

There are different opinions on the teachability of AI. One is: *"That is really difficult. You don't know how it works, and that's why I always find these examples so tricky. Unless you engage with it yourself now. [...]. It's not easy to explain that in three weeks. There's already more to it. You can start by taking a middle ground to alleviate the fear and say that it's essentially not much more than mathematics and statistics, but of course, there's more to it."* (Participant B – 18.09.23, Berlin). For example, in the

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Marginal notes:

Teachability of DL & AI: Dependent on depth of treatment

Teachability of DL & AI: Abalone: challenging, but would be fun for students

Teachability of DL: Orange3: Orange3 for higher grade levels

Teachability of AI: Problematic: Not easy to explain / teach in short amount of time, black boxes

Teachable Machine exercise, the teacher should also be able to explain the background of AI learning to the students.

On the other hand, AI has already become a part of the students' everyday life, making it easy to find an application or context (such as the SuperCodingBall soccer game). Furthermore, there are many educational computer programs on AI for various degrees of difficulty, i.e. secondary level I (lower) and II of the school (upper).

Teachability of AI: Positive: Relating teaching to practical/everyday contexts possible, many computer programs for use at upper and lower secondary levels

The Teachable Machine exercise will be well-received by the students, and the fact that they can train an AI, optionally using their own images, within a short period is inherently exciting. Teachable Machine and block-based programming with the soccer game (SuperCodingBall) as well as Teachable Machine can be implemented in lower grade levels.

Teachability of AI: Teachable Machine – achievable, like SuperCodingBall for lower grade levels possible

Programming neural networks with Python would probably not be possible in grades below 12. AI could be taught in the basic course.

Teachability of AI: Neural network would not feasible for grades below 12, AI as additional topic in basic course

Larger projects should be developed in schools and also be taken outside; projects *"that involve the community or perhaps enable collaboration with other schools"* (Participant D - 18.09.23, Berlin). For example, older students from one school could teach younger students from another. Exit games could introduce children to the computer.

Ideas how topics could be taught (unspecified): Collaboratively working on (larger) projects, Children teach children (e.g., as part of a project), exit-Games to introduce students to the computer

For chemistry, potential connections to AI are seen with limitations: *"The application areas for artificial intelligence in chemistry are given to some extent, but not necessarily impressive. You can move molecules with augmented reality, but I don't know exactly where AI can come into play. There are certainly possibilities for educational apps, but I can't think of anything specific to chemistry right now"* (Participant C - September 18, 2023, Berlin). In mathematics, connections to AI (in connection to algorithmics) as well as to other fields are recognized: *"For example, you can draw boxplots or similar things. This is done in statistics or stochastic. Of course, you can show this again with Excel. Sometimes you have to teach such things in mathematics, that's clear."* (Participant A - September 18, 2023, Berlin) Another intersection with the data theme could be curve discussions and the representation of functions using the GeoGebra software. Another participant believes that there are fewer connections between DL and AI with the subjects mathematics and WAT (Economics-Work-Technology).

Linkage between subject to DL & AI: Chemistry - yes, (with limitations), mathematics - yes (statistics, stochastic, probability theory, algorithmics, tools) and no, WAT - no

For CS and in general, the relevance of training topics is considered high. DL holds a higher priority than AI for one participant, especially the *"big data topic, [...]. What companies do with our data and such stories [...]. That is not covered enough in the classroom, in my opinion"* (Participant B - 18.09.23, Berlin).

Relevance of DL & AI: High (e.g., for CS), DL higher than AI, big data very interesting

CS summary

Participants emphasize the need for improved IT infrastructure in classrooms, including full-time IT support.

Teaching AI is considered challenging due to its complexity, but its relevance in students' lives and educational programs makes it relatable. Collaborative projects

and community involvement are suggested for larger AI-related projects in schools. The Teachable Machine and SuperCodingBall exercises would be well-suited for lower-grade levels, while tools like Orange3 and topics such as neural networks are recommended for higher-grade levels. However, teachability always depends on the depth of content treatment.

Chemistry and mathematics are explored for potential connections to AI, with varying levels of applicability. In computer science, DL is seen as more relevant than AI, especially in the context of big data, which is highly interesting and currently underrepresented in classrooms.

STEAM trainings

Germany (23.08.23, Düsseldorf)

The feasibility of implementing the exercises from the training in the classroom was well assessed: *"I don't find these practical things difficult now. I couldn't do all of these things [in the training], but it looked tangible to me. The practical things that you should test [in the training] are easily achievable"* (23.08.23, Düsseldorf).

Teachability of DL & AI: Practical exercises are feasible

On the other hand, the interviewer also mentioned that during the training, it was already pointed out that *"a few things [unclear if materials and/or content of training is meant] were not applicable in German-speaking form"* (23.08.23, Düsseldorf) and the computer programs would not be advanced enough yet for implementation in some cases.

Teachability (Unspecified): Computer programs not yet advanced enough

Several ideas on how to better convey music to students were brought up, although it is unclear to what extent relates to the topics

Ideas how topics could be taught (unspecified): Interactive web pages, tools, devices (subject music)

of DL and AI. For example, *"interactive web pages, like those used in English class"* for *"listening, tapping, confirming"*, *"One could also dance, like with the Switch [gaming console], and receive immediate feedback"*, or *"a pen that speaks. Something like that could also be great for music class, especially when learning about orchestras"* (23.08.23, Düsseldorf). It would also be beneficial to have the option for children to work on a score on the computer.

In response to the question of how important it is to integrate DL and AI into subjects, the interviewee stated that it must be done, and children should be taught how to use computers.

Relevance of DL & AI: (Very) High / important

Germany (05.09.23, Berlin)

The implementation of the Abalone exercise – involving the usage of Orange3 – with regression analysis could be suitable as a foundational teaching method for STEM classes, starting perhaps from the eighth grade (lower secondary level) and potentially in other subjects for higher grade levels (upper secondary level). This aligns with the opinion of another expert who emphasizes that the teachability of the training content is strongly dependent on the grade level. Another viewpoint suggested that the exercise would be feasible for students who have an interest in topics connected to this exercise or for advanced courses.

Teachability: DL & AI: Exercise Abalone: Feasible for higher grade levels, advanced courses and students who are specifically interested in topics

The topic of regression analysis, as presented in the training (Abalone), would be feasible, but it is more suitable for the subject of CS than mathematics. Furthermore, *"we also have vocational school students with us who learn to work with Excel and similar tools. This [Abalone] might be quite interesting, just to increase a bit of data literacy. However,*

Teachability (after the training): DL & AI: Exercise Abalone: Regression analysis (Abalone) in CS (not Mathematics)

this is still scarcely present in these framework curriculum plans. I do find it conceivable to use it [Abalone] as a black box" (Participant C – 05.09.23, Berlin). The participant also wished for more background information on this black box. This is because, among other reasons, the background knowledge for mathematics students is inadequate to comprehend more complex examples like the exercise presented and their inner workings.

When it comes to ideas on how to convey topics of DL, one could demonstrate with linear regression how to work with both small and large datasets. This would also be possible with Excel. The exercise from the training (Abalone with the support of Orange3) could be used as introduction to working with Orange3.

Ideas how DL could be taught: Regression analysis with large dataset (Orange3) (mathematics), Abalone exercise as introduction to Orange3

It was mentioned that there are certainly approaches to the teaching of AI in the subject of mathematics, but these were not further elaborated in the interview.

Ideas how AI could be taught: There are approaches where it can be integrated (Mathematics)

The topics of DL and AI could be integrated into many subjects, even beyond CS, such as in STEM or AI in the subject of art. Further details on this were not provided. In the subject of mathematics, examples related to these, which also motivate, would be *"[...] practical applications. I am never a fan of textbook examples because they are usually a bit far-fetched. So, for me, these are the things that provide an interesting framework but are sometimes difficult to access. At least, if one wants to convey the mathematical backgrounds"* (Participant C – 05.09.23, Berlin).

Linkage between subject to DL & AI: Non-CS-subjects & Mathematics: yes

For the subject of physics, a connection to DL is seen: *"In data analysis in physics, one deals more with self-measured data. Building electronic*

Linkage between subject to DL: Physics – yes, Linkage between subject to AI: Physics & mathematics - no

data systems to capture and automatically evaluate data in larger quantities is initially an approach without AI. How one can effectively convey AI there is not immediately clear to me. The necessity of learning AI is actually much more important societally" (Participant A – 05.09.23, Berlin). Another interviewee also sees no connection for the topic of AI in the subject of mathematics (refer also to the comments regarding the feasibility of incorporating the Abalone exercise into mathematics classes above).

The topic of data analysis should be included in the subject of mathematics, but the specifics were not discussed.

> Linkage between subject to DL: Mathematics – differentiated

Lithuania (09.01.24, Vilnius)

Children are interested in new topics, such as AI.

> Teachability of AI: Students are interested in AI

The students would probably like it if they themselves were asked how AI could be implemented in this subject and a lot of ideas would come out of it.

> Ideas how topics could be taught (AI): Ask students for ideas how to integrate AI into physics

STEAM summary

The feasibility of implementing practical DL and AI exercises in classrooms, emphasizing their tangible and achievable nature, was acknowledged. While some suggestions targeted introduction in third and fourth grades, the Abalone exercise, utilizing Orange3 for regression analysis, is deemed suitable for higher-grade CS classes.

The integration of DL and AI into subjects beyond CS, such as STEM, art, and mathematics, is considered plausible, with a preference for practical applications. Physics is seen as connected to DL in data analysis, while scepticism was noted about AI's

relevance in physics and mathematics. Students would be interested in AI. The importance of integrating DL and AI into subjects is underscored, emphasizing the necessity of teaching children computer usage skills.

Primary trainings

Germany (13.09.2023, Düsseldorf)

Regarding DL, an idea was brought up on how it can be taught at the primary school level: data can be presented using column or bar charts; this would be feasible starting from the second grade. One could conduct the same survey in a parallel class and then compare the charts.

Ideas how DL can be taught: Data analysis via bar charts / comparison of surveys

The "Good Monkey – Bad Monkey Game" would probably be too complex for primary school students compared to exercises with cards, for example: *"I found it exciting to establish rules and then check whether something applies or not. In the fourth grade, it might be possible to generally address these decision trees. However, I see it more suitable for the lower secondary level and not yet for the second grade"* (Participant – 13.09.23, Düsseldorf).

Teachability of AI: Monkey exercise too complex for primary (decision trees / rule setting: feasible for lower secondary level)

Several ideas were put forward on how to teach AI, such as using Midjourney, an LLM capable of generating images. This could involve creating images of animals in various art styles or, in grades three or four, *"[…] for example, placing a self-portrait on a different background and overlapping the images. Certainly, this could be done. One could also cut something out from a well-known painting like 'The Scream' and create a different background. That might be possible with it, although I haven't tried this out yet"* (Participant – 13.09.23, Düsseldorf). Since the children

Ideas how AI can be taught: via images using the Midjourney tool, with use of tools / apps

now all have a smartphone, one can use apps or tools to introduce topics like facial recognition (on the smartphone) to them.

The Teachable Machine could be used for a variety of subjects. For instance, in art class for sculptures or in general studies ("Sachunterricht"): *"You hold up a beech leaf or a tree trunk, and the computer should tell you what kind of tree it is. That could have been well integrated. You could take a forest walk with the children and train the machine during the process using iPads"* (Participant – 13.09.23, Düsseldorf). In essence, Teachable Machine could be applied to any categorizable content, such as yoga positions or types of fruits.

Ideas how AI can be taught: Teachable Machines – e.g., sculptures, recognizing tree species by leaves (in forest), underlining connection to everyday life; in short, all content which is categorizable

The teachability of content that has not been specified or is not clearly attributable to DL or AI could be applicable to exercises involving cards in primary school. Content would generally be more applicable to grades three to four, not for grades one to two.

Teachability (unspecified): Card games too complex for primary, materials/exercises (content) work for grades 3-4, not for 1-2

Rules (decision tree) and optimisations (via data) *"[...] could be very well included in the area of social skills, so that ultimately, one focuses on group work with the children and then asks them how to optimise group work. This is an area where one could conduct social training instead of religious education, if the children are not in religious education. This could be well integrated into such an area"* (Participant - 13.09.23, Düsseldorf).

Ideas how topics could be taught (unspecified): Rules and optimisations as part of social training

However, as already noted, it was also mentioned that decision trees and rule-setting are not relevant for the primary education level.

Relevance of AI: Decision trees / rule setting - no relevance for primary

In the field of mathematics, working with data is possible (for example, visually through bar/column charts).

Linkage between subject to DL: math

It became clear that connections to art exist within the context of generative AI (LLM - Large Language Models) and image recognition (Teachable Machine). Image recognition also allows a connection to be made with general studies ("Sachunterricht"). Many examples were mentioned in the interview for Teachable Machine without specifying the exact application in a particular subject.

Linkage between subject to AI: image recognition - link to art and general studies ("Sachunterricht"), generative AI -– link to art

As mentioned, the use of decision tree-based topics/exercises was not foreseen in the primary education level.

Linkage between subject to AI: decision trees: no link to primary subjects

Austria (25.04.2023, Vienna)

Generally, the teachability in primary education, could be difficult, *"so that there should already be specially trained teachers. Or someone who brings in external inputs from time to time, someone who really engages with it."* (Participant B - 25.04.23, Vienna)

Teachability: Prerequisites: Teachers with these skills should handle these topics, inputs from outside

The teachability of DL is considered good, also for lower grade levels: *"I think Data Literacy can be made quite playful, and also like puzzle tasks."* (Participant A - 25.04.23, Vienna). On the other hand, with DL, a lot of figuring out can also take place, as there are different solution paths.

Teachability of DL: Feasible (also for lower grade levels), different solution paths possible

As mentioned before, DL could be conveyed in a playful manner (e.g., puzzle tasks). One can work on different paths to solutions through DL. Since there are already connections to mathematics, it should be tried out to try to integrate it even more strongly there.

Ideas how DL can be taught: Puzzle tasks / brain teasers, subject Mathematics: integrate it even more in subject mathematics, find different solutions for one problem

DL was defined as *"fundamentally a form of logical thinking and pattern recognition"* (Participant A – 25.04.23, Vienna)

Definition of DL

Based on this, it was observed that there is a connection between DL and mathematics, in the sense that *"logical thinking and pattern recognition [...] are already represented in mathematics, especially through competency orientation"* (Participant A - 25.04.23, Vienna).

Linkage between subject to DL: Mathematics - yes

"To come to the topic of AI, it could be taught in primary school, but it could be difficult to create tasks.

Teachability of AI: Feasible for lower grade levels, setting up tasks / learning for students possible, but could be difficult

An idea for teaching AI is: *"maybe students could be given tasks, perhaps for a presentation on dinosaurs or something like that comes to mind. Maybe you could generate images of the dinosaur you imagine or something. But otherwise? I think, besides that, I don't really have any ideas about Artificial Intelligence"* (Participant A – 25.04.23, Vienna). One could also discuss fake news with the students.

Ideas how AI can be taught: Students generate pictures with AI, presentation, fake news

AI is defined by one participant as follows: *"I think, especially Artificial Intelligence, is a kind of tool. I would include it in the toolbox, that's what I call it. So, how to use the computer to type texts, create a presentation, or provide references. That, for me, falls thematically into that category."* (Participant A - 25.04.23, Vienna)

Definition of AI

In general terms, the teachability of topics is viewed critically because *"in primary school, basic knowledge is often lacking. The children just*

Teachability (unspecified): Not feasible for lower grade levels

type around and try to come to some result as quickly as possible." (Participant B - 25.04.23, Vienna) Hence, like already mentioned, there is also a desire to receive external inputs.

Lithuania (11-21.04.2023, Vilnius/Vilkaviškis/Druskininkai)

One assessment is that the training contents would be conveyable to students, whereas another participant views it as contingent on specific criteria: *"I think we can use everything, but we have to separate according to the student's age and different topics. One part we can use for the smaller children and other parts can be used for the older children in primary education"* (Participant E – 21.04.23, Druskininkai).

Teachability of DL & AI: Feasible, but also dependent on topics and on students (e.g. grade level)

A participant provided the following definition of AI: *"The thing about artificial intelligence, I knew that it made a decision by the information that it already has"* (Participant C – 18.04.23, Vilkaviškis).

Definition of AI

Furthermore, Bebras cards could be used for instruction, along with an increased focus on practical tasks (and less theory), though it is unclear for which specific task areas.

Teachability (unspecified): Feasible for lower grade levels

Regarding ideas on how DL or AI can be conveyed, students would enjoy tasks from the ViLLE platform. Furthermore, "there could be some tasks related to, for example, animals to find differences or similarities between them. For my children or fourth form, it would be quite interesting, I think to know this related to the topic." (Participant D – 11.04.23, Vilnius)

Ideas how topics could be taught (unspecified): ViLLE platform, find differences/similarities between animals

There is one statement referring to the linkage of subjects to DL and AI, where it is acknowledged but not elaborated upon, regarding which subjects or whether DL or AI or which topics are meant.

Linkage between subject to DL & AI: Some (not further specified for subjects or topics)

Primary summary

Teaching DL and AI in primary school education poses challenges: For effective instruction, teachers need knowledge, and external support from outside the school is also conceivable.

The teachability varies based on topics and grade level. Emphasizing playfulness, such as through puzzle tasks and practical activities like using Bebras cards or tasks from the ViLLE platform, is essential. DL is considered teachable for lower grade levels in general. While AI's feasibility in primary education is also acknowledged, creating tasks may be challenging. Possible approaches for teaching AI include working with images, addressing fake news, and emphasizing pattern recognition.

A connection between DL and mathematics is highlighted, aligning with competencies taught in this subject.

3.1.3   Motivation & information sources used
CS trainings

Germany (18.09.23, Berlin)

In relation to the source of information, the subject seminar leader is mentioned, who wanted to attend the training with his trainees ("Referendare").

Source of information: Personal contacts / colleagues

There was a general expression of interest in the training – for example: *"I had originally registered for a different workshop but switched to this one because I found it more exciting"* (Participant A – 18.09.2023, Berlin). Furthermore, it becomes evident from the interviews that another motivation was to receive materials or application examples for AI or in general for use in teaching. Additionally, participants expected to gain new knowledge or to supplement existing knowledge gained from other training sessions or practical experience.

> Motivation / expectation for participating: (General) interest in topics; application / usage in teaching (e.g., didactics, materials) of AI and in general; obtaining (new) knowledge, because of previous knowledge / experiences

Other reasons relate to the exchange with familiar colleagues or the regular attendance of events offered by the MNU ("Association for the Promotion of STEM Education") or the GI.

> Motivation / expectation for participating: (Personal) Exchange with colleagues, regular attendance at events like IBBB that e.g., GI, promote

There was also the statement that no specific expectations were present.

> Motivation / expectation for participating: No (specific) reasons / motivation

The understanding of AI was *"much simpler"* after the training. *"I always thought AI is a complicated topic, which is difficult to make understandable in the classroom. Now I have the impression that it is quite possible. Of course, you can only touch on it, it remains a black box, that's true. But it becomes more understandable, and that's the point. I want to make the world more understandable for my children. With that, I can at least make a few layers more understandable, even if not everything from zero to one hundred"* (Participant A – 18.09.23, Berlin).

> Difficulty of the topics for teachers (after training): AI – Easier / clearer after training

It was also expressed that the examples from the training could be implemented immediately, so no further preparation would be needed beforehand.

> Difficulty of the topics for teachers (after training): DL & AI – No further engagement needed

Regarding the interest in further training opportunities, it is *"[...] definitely there, the willingness as well. Naturally, apart from the regular teaching duties, time constraints pose an issue to attend further training, especially here in [location]. Otherwise, there is definitely interest, everyone would participate"* (Participant B – 18.09.23, Berlin). The interest for mathematics teachers was also considered high.

Interest of colleagues in DL & AI training: Positive: There is interest (also for maths teachers), but also time constraints to attend trainings

CS summary

Participants joined the training due to personal contacts, colleagues as sources, and an interest in topics, with a focus on reasons connected to knowledge and application in classroom. The desire for personal exchange was highlighted as well.

After the training, AI was perceived as less challenging, and there was a consensus that ongoing involvement with DL and AI topics was unnecessary for immediate integration into teaching.

Despite expressed interest from colleagues for further training, time limitations among the teaching staff are underscored.

STEAM trainings

Germany (23.08.23, Düsseldorf)

The reason for participation was mentioned as: *"I am new to the music competence team, and this was part of the moderators' full assembly ['Moderatorenvollversammlung'][13]"* (23.08.23, Düsseldorf).

Motivation / expectation for participating: (New) Responsibilities

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[13] In the context of education in North Rhine-Westphalia, moderators are teachers who conduct training sessions in their subject area.

Regarding the difficulty of the topics after the training, AI was mentioned. Knowledge about the topic was gained: *"I found the designation of AI very good, also how it is fed and forms from it"* (23.08.23, Düsseldorf). The topic of AI is now manageable; it would be clear now, for example, *"what needs to be entered or entered more [in ChatGPT] so that AI can recognise in which space it has to operate. I found that very successful"* (23.08.23, Düsseldorf). The topic can also be passed on to colleagues at the school.

Difficulty of the topics for teachers (after training): AI – Easier / clearer after training, can be explained/transmitted to colleagues

The interest of colleagues from the music department is considered very high: *"The music department would have been thrilled to learn something completely new [...] because we are really eager. The colleague and I [...] are both very interested in the field"* (23.08.23, Düsseldorf). Judging by the experiences of the TrainDL training, the motivation of other teachers from subject areas, respectively the general interest is also considered very high.

Interest of colleagues in DL & AI training: Positive: Very high (for music teachers and teachers from other subject areas)

Germany (05.09.23, Berlin)

One interviewee was informed about the training by the MNU since he is a member of it. Another participant was noticed about it by his colleagues, respectively head of subject department.

Source of information: Member of MNU, personal contacts / colleagues

In addition to (also private) interest in the topic of AI, and having already heard about it, the application of the topics DL and AI in teaching plays a role, for example: *"It was mentioned that AI is being used and this Orange program/data mining is applied, that you can take various things from it, how I personally can investigate things in my own project [...]"* (Participant B - 05.09.23, Berlin). Furthermore, AI is considered a very important topic because *"[...] especially we as teachers*

Motivation / expectation for participating: Interest in & importance of and heard about AI before, application / usage in teaching

are simply at the forefront and should know what it's all about" (Participant D - 05.09.23, Berlin).

Furthermore, it was mentioned that AI is a very current topic, for example, in relation to ChatGPT. One must stay abreast of knowledge in these areas and acquire relevant expertise to avoid losing 'connection' with the students.

> Motivation / expectation for participating: AI - Because it is a current issue, Keep pace with developments / students

For the tool Orange3, it was expressed that additional familiarisation time would be needed. There was a desire for further engagement with it (in a subsequent workshop). Additionally, there were doubts about being sufficiently confident in the topics of DL and AI (and also Orange3) after the training to effectively convey them later on in classroom teaching.

> Difficulty of the topics for teachers (after training): DL, AI, tools (Orange3) – Further engagement needed

There was also a sense that the topics (it is unclear whether DL or AI is meant) have become more challenging. Nevertheless, basic knowledge could still be conveyed through the training.

> Difficulty of the topics for teachers (after training): Unspecified - More difficult / challenging after training, basic knowledge obtained

Lithuania (09.01.24, Vilnius)

DL and AI are topics that colleagues would be interested in.

> Interest of colleagues in DL & AI training: Positive: There is interest

STEAM summary

Information sources for training opportunities included association memberships and personal contacts. Participants' motivation and expectations for attending the training encompassed new responsibilities and a keen interest in AI, as well as how to apply it in the classroom.

The post-training assessment of the difficulty of these topics for teachers presented a mixed view. AI was perceived as easier and clearer after the training, for example, with the ability to explain and transmit the knowledge to colleagues. However, there was acknowledgment that while basic knowledge was acquired for all topics, including Orange3, further engagement and involvement would be necessary.

In terms of the assessed interest from colleagues in additional training opportunities, it was estimated that there is interest, possibly very high, spanning across various subjects. This includes for example music teachers.

Primary trainings

Germany (13.09.2023, Düsseldorf)

There were no statements/questions regarding this category in the focus group interview.

Austria (25.04.2023, Vienna)

Since *"there will be an increased focus on teaching about digitisation and computers in schools in the coming years"* (Participant B - 25.04.23, Vienna), there was a desire to prepare accordingly and acquire knowledge in that context. Furthermore, the subtitle of the training referred to 'Unplugged' was attractive, because it meant it was about *"activities that can be done without devices because the delivery of the tablets is very delayed for us, and we want to make the most of the time until they arrive"* (Participant B - 25.04.23, Vienna). As this person is responsible for procuring these devices, the training was of particular interest to them.

Motivation / expectations for participating: Importance of topics, Obtaining (new) knowledge, unplugged approach of training interesting, (new) Responsibilities

Regarding the difficulty of the topics after the training, DL felt easy for one participant, while AI was more challenging – the functioning was clear, but the difficulty would lie in the applicability of AI in teaching. Overall, there was a consensus for both topics that further engagement is necessary, *"otherwise, one does not practice what is learned and certainly does not implement it"* (Participant B – 25.04.23, Vienna).

At one participant's school, colleagues' interest in DL & AI training is highly valued: *"I believe we can already make it appealing to them. Especially since we've been preparing for it for a while now, with the expectation building up due to the imminent arrival of tablets: When can we finally start?"* (Participant A – 25.04.23, Vienna)

Lithuania (11-21.04.2023, Vilnius/Vilkaviškis/Druskininkai)

Among the participants, the primary motivation for engaging in the training was stated as the acquisition of new knowledge in the fields of AI, DL & AI, or general knowledge typically conveyed in the field of CS. Additionally, some participants had already encountered these topics and, as a result, developed an interest. The context of application was also emphasized, as expressed by one participant: *"My expectations were just to know what does it mean [AI] and how I could use it in my lessons because I'm a teacher"* (Participant D - 11.04.23, Vilnius). Furthermore, another participant, who already possessed knowledge about AI, aimed to test and expand their understanding.

Basic knowledge was acquired, but further engagement with the topics, through self-research or additional training, is necessary.

Interest of colleagues in DL & AI training: Positive: There is interest, high among teachers of this school

The colleagues' interest was mostly directed towards aspects related to their own school and was assessed as existent or (very) high in terms of digital competencies, as well as AI and DL, for example: *"Because computer science is compulsory as an integrated subject in primary education and also it's an important subject, my colleagues and other teachers are interested and they are trying to get more knowledge. They study all the topics of computer science."* (Participant E - 21.04.23, Druskininkai).

Primary summary

Participation in the trainings was mainly driven by the importance of the topics, the desire to acquire and expand new knowledge, and the application of DL & AI concepts in the classroom, along with being in a new role at the school. The training's unplugged approach also contributed to making it interesting.

Post-training, there are instances where the topic of DL became easier, while AI became more challenging. Overall, although basic knowledge has been acquired, ongoing engagement with both topics would be essential.

Teachers' interest in DL & AI training is assessed positively on a general scale, and there is also interest among primary teacher colleagues at the schools of the participants.

3.1.4 Integration into teaching before and after the training
CS trainings

Germany (18.09.23, Berlin)

Two out of four respondents have integrated content specific to the topics from the training into their teaching (included were only AI topics, specifically neural networks, working with images and the analogue game "Good Monkey - Bad Monkey").

Integration: Topics: AI

Participant B had previously programmed a neural network with students – three times in the basic course of CS (twelfth grade level) – using Python *"[...] which then recognizes handwritten digits, but without any libraries. That involved a lot of mathematics, matrix calculations, and we had to go through all of that again"* (Participant B - 18.09.2023, Berlin). The process was such that, at first, *"[...] a bit of theory was covered, such as what matrices are, what a neural network is. Then we always did it in parallel, the mathematics and the simultaneous implementation in the programming language"* (Participant B - 18.09.2023, Berlin).

Participant B: Integration: AI, subject CS, frequency – more than once: Neural network (programming with Python)

Positive experiences regarding these implementations were reported, stating that, in general, they proceeded well. It was also emphasized that at the end of the project, there was always a functional 'product'.

Experiences: Positive – Successful

For some students, *"[...] the mathematics behind it eventually became too dry, causing them to simply disengage"* (Participant B - 18.09.2023, Berlin).

Experiences: Negative – Students: For some, content became too theoretical

These projects which resolved around neural networks and lasted for four weeks, might have been too extensive (for the time given)

Experiences: Negative: Project too big and too theoretical, Pratical

and, as mentioned based on the students' experience, too theoretical. The practical work, the programming, was somewhat neglected. Assessing the students at the end was not easy, as *"in the project, there is, of course, a lot that needs to come from the teacher. Otherwise, you won't manage it in the short time"* (Participant B - 18.09.2023, Berlin). Assessment of students was resolved, among other things, by assessing participation and through a written exam at the end.

work (somewhat) neglected, assessment of student performance

In the CS class, Participant D tried out the analogue game related to AI or supervised learning, "Good Monkey - Bad Monkey", at an integrated school with a secondary level: *"The students first have to establish the features by which they want to make decisions, set up a decision tree. Then, with the second set of data, check how good or not the decision is. Through the students exchanging their decision trees and checking each other, a competitive element was also added"* (Participant D – 18.09.23, Berlin). As a second activity, apples were to be sorted, and work with images was involved in this context.

Participant D: Integration: AI, subject CS, frequency – once: "Good Monkey - Bad Monkey" game, working with images

During the "Good Monkey - Bad Monkey" game, the students, particularly the boys due to the competitive element, were motivated. They independently arrived at results: *"For those who showed interest, it was definitely worthwhile. They understood it, they acknowledged it"* (Participant D – 18.09.23, Berlin).

Experiences: Positive – Students: were motivated, arrived at results independently, well received

One non-positive experience was that *"not all students kept up, but that's always the case. It doesn't matter which subject we teach. It's not just in computer science, it's the same in mathematics or German"* (Participant D – 18.09.23, Berlin).

Experiences: Negative: Students: Some couldn't keep up

Overall, the "Good Monkey - Bad Monkey" game worked well. Participant D was *"[…] surprised that it worked so much better than I thought. Accordingly, I would say that if it is prepared correctly and slowly, even students in an ISS can handle more complex things"* (Participant D – 18.09.23, Berlin). Regarding sorting apples and images, there are no experiences reported. Regarding sorting apples and images, there are no experiences reported.

The other two participants had not integrated these topics yet. One participant had been teaching more towards ITG, information technology basic education and *"[…] can't address such topics in terms of difficulty level in that context yet"* (Participant A – 18.09.23, Berlin). However, they plan to implement these topics in a new class / school after the training. The other teacher who didn't integrate these topics in the classroom, also plans to do so in the future.

Following this, now the analysis of the extent to which the respondents assess their ability to (better) integrate the content into their teaching after the training is carried out.

A participant wants to immediately integrate content on DL / data in a lesson where an algorithm is introduced, interpreted, and example tasks related to it are solved. The class involved is at the ISS and already has experience with programming in Python.

At another participant's school, a day on AI will soon be conducted, but there, the topic will only be superficially addressed. For this purpose, the SuperCodingBall (soccer game) exercise could possibly be used: *"Five years ago, however, I would never have done that under the heading of AI. We would have done algorithmics on a small scale,*

now we let the soccer players run there, and suddenly, it's called AI. I don't know if I would do it under the heading of AI now" (Participant B – 18.09.23, Berlin).

One interviewee wants to immediately incorporate the content into their teaching for an advanced class (at a high school / gymnasium), which they believe would be easily achievable based on the examples from the training. As an example, the exercise SuperCodingBall (soccer game) was mentioned.

Ability to integrate (after training): Instantly capable – DL & AI: The goal is to teach content with more advanced classes, e.g. SuperCodingBall

An immediate integration of the topics is viewed critically because *"[…] the examples we worked on are likely done after one or two weeks when working on them with the students, I think. Actually, I would like to expand it a bit larger, and I don't know yet how to structure it and what would be omitted instead. I would feel capable of doing that [integrate topics into teaching], and there are training courses to help with that […]. But currently, I think this is an introduction, motivating the students, that's how it goes. But what happens next? This part is missing for me"* (Participant B – 18.09.23, Berlin). Another participant could modify the material from the training and then use it in class.

Ability to integrate (after training): Not (instantly) capable – DL, AI: Prerequisites: Implementation plans, Modify / adapt material

Even though one is well-prepared with materials from training, it is also important to be prepared for the actual implementation in teaching; materials alone are not sufficient, even though such trainings prepare the teachers very well.

Ability to integrate (after training): Not (instantly) capable – Unspecified: Prerequisites: Sufficient material, implementation plans

CS summary

AI-related content was integrated into teaching, yielding varied experiences but overall positive outcomes. In one instance, neural networks were successfully programmed with students using Python, combining theory and practical implementation. Despite successful results, assessing student performance posed challenges, and some students found the content too theoretical, leading to disengagement. In another case, the "Good Monkey - Bad Monkey" game was integrated, fostering motivation and independent results, though it proved challenging for some. Working with images was another successfully integrated topic. The participants who had not integrated DL or AI topics yet are planning for future integration.

Regarding the ability to integrate the training's content, some feel instantly capable, intending to incorporate DL content into an algorithm-based lesson or promptly integrate using the SuperCodingBall exercise for AI. However, reservations about immediate integration were expressed, emphasizing the need for structured planning, implementation strategies, and further modification of material from the training. However, the importance of being well-prepared beyond training materials is highlighted for effective integration into teaching.

STEAM trainings

Germany (23.08.23, Düsseldorf)

The interviewed person indicated that they have not yet integrated content related to DL or AI into their teaching.

No Integration – DL & AI: General statement

The reason given for the previous non-integration of AI was that the person teaches in primary school, and there is (legal) uncertainty regarding *"[…] telling the children to enter something [into the computer]*

Prerequisites for Integration: AI: has to be safe for children (primary school)

because I don't know what child-friendly things [G-rated] will come out afterward. As a teacher, I would first have to check what it says. To see if something comes out that should be avoided or could lead to problems with parents. In primary school, you would need a secure AI. But they [students] could definitely operate it" (23.08.23, Düsseldorf).

For this reason, an immediate integration of AI would not be possible.

<div style="float:right; font-size:smaller">Ability to integrate (after training): Not (instantly) capable – AI: AI has to be safe for children (primary school)</div>

Setting aside legal concerns regarding AI, practical implementation, however, would be possible immediately: *"They [students] get their iPad, and I tell them what to access. We could definitely do that. In terms of handling the data, it would be easy"* (23.08.23, Düsseldorf).

<div style="float:right; font-size:smaller">Ability to integrate (after training): Instantly capable – AI: Purely in terms of handling (devices), it would be feasible</div>

Germany (05.09.23, Berlin)

Two out of four participants have already integrated topics from the field of AI into their teaching.

<div style="float:right; font-size:smaller">Integration: Topics: AI</div>

Participant B has already conducted a unit on ChatGPT in the foreign language class (English) in the thirteenth grade: *"We [teacher and students] exchanged ideas about opportunities and risks. First, we looked at what ChatGPT is, what it is capable of, and whether one can actually distinguish it from texts written by upper secondary level students, primary school students, etc. There we delved into the matter"* (Participant B – 05.09.23, Berlin). However, it was very basic, and there were no major practical tasks.

<div style="float:right; font-size:smaller">Participant B: Integration: AI, subject foreign languages, frequency – once: ChatGPT (but no in-depth instruction or practical tasks)</div>

The experiences were good, *"[...] because one doesn't have to ignore the fact that the students are aware of ChatGPT and actively use it. It's better to collaborate with them, to see what the possibilities are"* (Participant B - 05.09.23, Berlin).

Experiences: Positive: good

The students responded well to the topic. The unit was completed about a year to six months ago, at a time when ChatGPT was not yet so prevalent, and all the students were very interested in the possibilities it offers.

Experiences: Students - Positive: Well received / understood

Participant C often uses AI as an example for mathematical models at their high school (gymnasium). It is unclear whether this occurs in both subjects of the participant (CS and mathematics).

Participant C: Integration: AI, subject unclear, frequency – more than once: AI as example for mathematical models (within regular lessons)

Outside of the gymnasium, a mathematics circle at a university is regularly supervised, where they explore topics like AI more deeply. For instance, the participant programmed a neural network with twelfth-grade students this year. It was noted that the participating children in this setting are much more mathematically interested than the children who participate in classes of the interviewee's gymnasium.

Integration: AI, subject mathematics, frequency – more than once: e.g. neural network (outside regular lessons: Supervision of a mathematics circle at a university)

At the gymnasium, there is hardly the possibility to delve deeper into topics like AI. It is already problematic to convey the framework curriculum topics.

Experiences: Negative: No opportunity to delve deeper into topics (at the high school / gymnasium)

The other two participants had not integrated either DL or AI into their teaching so far.

No integration: DL & AI: General statement

For one interviewee, this was also primarily due to their absence for personal reasons, but there has been an expressed interest in teaching such topics in the future.

No integration: DL & AI: Personal reasons

For the other interviewee, AI has so far seemed very daunting, partly because it is difficult to determine whether students create their work with or without LLMs like ChatGPT. However, the teacher expressed an interest in wanting to engage with these topics in the future.

No integration: AI: Seems discouraging / deterrent

There was a wish to receive more support in the form of materials or approaches/concepts that also address topics beyond their immediate application: *"I somehow need to learn how to handle responses from a chatbot, how to check sources, and similar things. That's media literacy. On the other hand, for me, it's about understanding how AI works, what data is, how to handle data, and such matters. I would also like more guidance, actually a bit more broken down, because it is often a bit challenging to find approaches on how to pursue these aspects further"* (Participant C – 05.09.23, Berlin).

Ability to integrate (after training): DL & AI: Prerequisites: More support for teachers (e.g., integration plans, materials)

For an instant integration of DL and AI, too little knowledge was provided in the training. The question would be *"whether one day [respectively the finished training] is sufficient [...]. For it [whether DL and AI or the exercise Abalone is meant, is unclear] to be feasible, one should at least receive the basic tools. In order to convey it, one should also feel competent enough. I have to engage with it very intensively so that I can simply continue and pass it on as an instructor"* (Participant D – 05.09.23, Berlin). The exercise Abalone could be used as an introduction to Orange3; however, further familiarisation would be necessary to actually address it in the classroom.

Ability to integrate (after training): Not (instantly) capable – DL & AI: Only basic / insufficient knowledge through training, continued engagement / preparation / time necessary

Lithuania (09.01.24, Vilnius)

There was already an integration of AI once: *"[...] the students who have used artificial intelligence have written it off. They dictated the questions to it and wrote down the answers. Nothing. There was no analysis of any kind. So, we haven't used it any more for the time being"* (09.01.24, Vilnius).

Integration: AI, subject physics, frequency – once: Chatbot

The students thus did not gain a deeper understanding.

Experiences: Negative – Students did not gain deep understanding / knowledge

STEAM Summary

Different AI topics have been integrated into classroom teaching with varying experiences. ChatGPT was covered in an English class, resulting in positive experiences and student interest. For another case, there was also AI integration via chatbots but the students did not learn or analyse anything subject-wise. AI was also used as an example for mathematical models both within and outside the gymnasium, with limitations noted for deeper exploration at the gymnasium level.

Barriers to integration include legal concerns about AI safety for primary school children and the perceived daunting nature of AI, though there is expressed future interest to integrate such topics.

Immediate AI integration is hindered by safety concerns, but practical implementation is seen as feasible. To integrate DL and AI topics into teaching effectively, participants emphasized the need for more support, materials, and guidance in AI integration. Training opportunities are essential because the provided training only covered fundamental knowledge, emphasizing the necessity for teachers to engage in learning processes to effectively teach these topics.

Primary trainings

Germany (13.09.2023, Düsseldorf)

The teachers from the group interview were all exclusively primary school teachers with different constellations of subjects such as art, German, mathematics, foreign languages, music, sport, and general studies ("Sachunterricht").

One participant in the group interview has already gained integration experience with data in the subject mathematics. Surveys on *"favourite subjects, favourite animal, and how one gets to school"* (Participant - 13.09.23, Düsseldorf) were conducted in two classes, and then the results were compared using bar charts with the survey data from another class.

> Integration: DL, subject mathematics, frequency – once: visualised and compared data

Otherwise, data was not utilized because there was a lack of time, and it had to be allocated to other topics/priorities.

> No Integration – DL: Lack of time, other priorities

AI and other topics were not integrated into the lessons.

> No Integration – AI & unspecified: General statement

The participants would not be immediately ready and not confident enough to implement the content in the classroom after the training. But the training provided ideas that the respondents could review and work on: *"I found today to be a good start. However, depending on what I cover in my series, I would have to engage with it intensively because there are already some children who are very interested in technology or computer science and can ask very specific questions. [...]. However, certain foundational knowledge is needed. I don't know exactly where the beginning and the end are right now because I myself do not know it yet. The questions would arise in the process of engaging with it"* (Participant – 13.09.23, Düsseldorf).

> Ability to integrate (after training): Not (instantly) capable – Unspecified: Training as good entry point, only basic / insufficient knowledge through training

To achieve this, guidelines/plan would be helpful, documenting the foundational aspects of the material. Additionally, more materials that have been tested beforehand would be necessary. More time for familiarization and elaboration of the content would be required.

Ability to integrate (after training): Not (instantly) capable – Unspecified: Prerequisites: Implementation plans, well-founded and sufficient material, continued engagement / preparation / time necessary

Austria (25.04.2023, Vienna)

Within the third grade level in the context of combinatorics in the subject of mathematics, for Participant A, currently, *"decision trees [...] come up, and I have also, which I enjoyed a lot myself, developed a few tasks in this direction"* (Participant A - 25.04.23, Vienna). Despite this portrayal, the participant believes that they have never integrated AI into their teaching and, until now, hadn't got to it.

Participant A: Integration: AI, subject mathematics, frequency – once: Decision trees (also stated no integration took place)

It is unclear in which subject exactly the topic of 'fake' was addressed and to what extent it touches on the areas of DL and AI, but when asked about the integration, Participant B responded: *"An example was now in my class. We watched a movie, and the kids say that everything is fake. Then you had to filter out: What actually is, if I tell a story and from the beginning, it was a story, then it's not fake. Then I say yes, it's a made-up story. Then I don't want to deceive anyone."* (Participant B - 25.04.23, Berlin) Similar to Participant A, it is also stated that the topics have not been integrated into the teaching so far (here due to time constraints).

Participant B: Integration: Unspecified, subject unclear, frequency – once: Watched a movie (identify what is fake) (also stated no integration took place, because of lack of time)

In response to the question of whether the content of the training sessions could be integrated, a lack of knowledge was attested, stating, *"but to introduce children in a targeted manner, I certainly need more*

Ability to integrate (after training): Not (instantly) capable – DL & AI: Only basic / insufficient knowledge through training, bring

training. Since I simply had too little prior knowledge and do not feel confident enough" (Participant B - 25.04.23, Vienna). However, uncertainties are evident both in the expressed desire to bring external experts into the classroom and in terms of integrating AI into teaching, particularly concerning the specified topics: *"The examples we saw were ChatGPT and also DALL-E at the end. I understand how it works in principle, but how I can use it in school, I'm still a bit stuck."* (Participant A - 25.04.23, Vienna)

in experts who can talk about these topics, AI - Unsure how to integrate

Lithuania (11-21.04.2023, Vilnius/Vilkaviškis/Druskininkai)

Of the five respondents, four individuals indicated that they have taught DL, AI, or related topics.

Topics mentioned include Ligretto cards and data security issues (DL), fundamentals of AI and Eduten platform[14] (AI).

Topics: DL and AI

There are also topics not clearly assignable to AI or DL in the answers or other areas with digital relevance. – Scratch for programming, Bebras cards and ViLLE platform.

Topics: Unspecified

Participant A has a task on the Eduten and ViLLE platforms. Specific details about the type of task(s), how often it has been integrated so far, etc., are not clear.

Participant A: Integration: AI, subject math, frequency – unclear: Eduten platform; unspecified, subject and frequency unclear: ViLLE platform

AI was not integrated but only mentioned during teaching.

No Integration: AI

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[14] "Eduten is a digital math learning platform that combines Finnish educational excellence with gamification and AI." - https://eduten.com/

Participant B has several-year experience in teaching certain topics: *"All those digital competences and digital learning are not new in our school, because we have worked with Professor [name] for several years. We also use Bebras cards and other applications to teach computational thinking. There are also basics of artificial intelligence."* (Participant B – 18.04.23, Vilkaviškis) In addition to Bebras cards, Ligretto cards are also used.

Participant B:
Integration: DL, subject unclear, frequency – more than once: Ligretto cards; AI, subject unclear, frequency – more than once: Fundamentals; Unspecified, subject unclear, frequency – more than once: Bebras cards

However, it should be noted that Participant B makes potential contradictory statements regarding the integration of AI; mentioning a lack of knowledge, tailored teaching/didactic strategies, and possibly materials to teach it already. On the other hand, it could mean that, of the previously mentioned topics, Participant B does not teach AI in their classroom.

Potential contradictions in statements regarding the integration of AI / No Integration of AI

It was pointed out that the teaching quality could, however, be better: *"We have to learn more ourselves so that we can improve in teaching these topics to children"* (Participant B – 18.04.23, Vilkaviškis).

Experiences: Neutral - Teacher: Has to get better / teaching has to be improved

Bebras cards were used several times in classroom by Participant C, as well as programming with Scratch. Further details were not provided.

Participant C:
Integration: Unspecified, subject unclear, frequency – more than once: Bebras cards, Scratch for programming

The integration of topics for Participant B occurred for *"children of age eight and nine and [...] during the lessons in a more abstract way. From data literacy, there was a focus on data security issues and artificial intelligence. There was just explained how to say the main definition or main understanding of artificial intelligence."* (Participant E – 21.04.23, Druskininkai)

Participant E:
Integration: DL, subject unclear, frequency – more than once: Data security issues (also in connection with AI); AI, subject unclear, frequency – more than once: Fundamentals

The following statements address the extent to which the respondents assess their ability to (better) integrate the content into their teaching after the training.

One teacher assumes that some, but not many, contents from the training can be immediately integrated (it is not clear from the response what these contents are).

Ability to integrate (after training): Instantly capable – Unspecified: Only some content

There are further expressions of integrability, although it is not clear when this is supposed to happen, for example: *"About information sourcing and the decision tree, I think I will try it with my students. They would like it"* (Participant C – 18.04.23, Vilkaviškis). It would be possible to include a task in the classroom for data in general. More knowledge about DL and AI was gained, which is intended to be incorporated into the teaching, but it is not stated when exactly.

Ability to integrate (after training): Unclear if instantly or not – DL & AI - Information sourcing, decision tree, data; possible (general statement)

Furthermore, card games wanted to be used in the classroom instruction (although it is not clear whether this refers to Bebras, Ligretto, or both card games). Another workshop participant would like to cover more in the instruction, such as a task related to the ViLLE platform.

Ability to integrate (after training): Unclear if instantly or not – Unspecified: There is an attempt to integrate more, cards games, ViLLE platform

Another teacher wants to integrate more contents, too, but not immediately. The training served as a starting point, *"because I just got some of the knowledge. I think that to use it in my lessons, I have to get more about it, whether on the internet or attend more seminars."* (Participant D - 11.04.23, Vilnius)

Ability to integrate (after training): Not (instantly) capable – Unspecified: Training as a good entry point, only basic / insufficient knowledge through training; Prerequisites - More knowledge

In the context of mathematics, topics such as decision trees (AI) and tasks on the Eduten and ViLLE platforms were introduced. Other integrated topics in unspecified subjects included Ligretto cards, data security issues (DL), fundamentals of AI, tasks from Bebras, and programming via Scratch. Experiences were barely mentioned, but hinted at time constraints and a retrospective desire for improved teaching quality.

Regarding the ability to immediately integrate training topics into teaching, participants noted a need for more factual and didactic knowledge and external expertise to effectively integrate DL or AI topics, as the training provided only fundamental knowledge. Also, more materials would be needed. Some considered immediate integration of specific content, such as decision trees, while others expressed an interest in introducing additional topics like card games, planning integration in the future.

3.1.5 Steps to bring DL and AI into the classroom
CS trainings

Germany (18.09.23, Berlin)

All statements refer to statements about content within the framework curriculum. No issues were addressed that pertain to content outside of the curriculum.

All categories: Within the framework curriculum

The integration of the topics of DL and AI into the framework curriculum found approval. The strong obsolescence of the existing curriculum was cited as the reasons, and it was emphasized that it urgently needs to be renewed. Additionally, it was pointed out: *"In computer science, the whole subject matter is still very vague [...] and it is not yet properly manageable. I don't believe that a student takes away much*

Framework curriculum integration: Pro arguments / important / necessary - General agreement, needs to be updated / worked on, current framework curriculum is too vague, DL & AI offer opportunity to make curriculum. more engaging

from it" (Participant A – 18.09.23, Berlin). Furthermore, there is an opportunity, with the incorporation of AI, for *"more exciting possibilities, especially in the direction of database design. What is needed today? Today, we no longer need relational databases; we are creating entirely different structures than before. The computer learns almost on its own or continuously enhances itself and programs itself better and better. That is more of the state of the art compared to this database design, to put it that way"* (Participant A – 18.09.23, Berlin).

It was emphasized that the sole integration of content into the framework curriculum is not sufficient, among other reasons because it does not prescribe everything for teaching: *"But honestly, a lot is stated in the framework curriculum. In all subjects, there is a lot, and how much of it is actually implemented? When I look at the reality out there, very little. Because there is simply no control. Where I come from, every teacher was observed by the school principal at least once per semester. With a preliminary discussion, during the lesson, and a follow-up discussion. [...]. Here, I've heard [in Germany]: survive the exam lesson, and afterward, no one looks again, whether it's in the framework curriculum or not. Yes, it must be included, but that is by no means sufficient."* (Participant D - 18.09.23, Berlin)

> Framework curriculum integration: Neutral - Only integration in framew. curr. not enough; Pro or against depending on conditions of framework - Not everything that is framw. curr. is taught

The topic of big data is very current and should therefore be integrated.

> Framework curriculum integration: Topics to integrate - Big data (DL)

This should happen especially in the CS curriculum, alternatively in subjects that revolve around media literacy or ethics. In line with that there was the suggestion to *"[...] introduce a new subject on media literacy, and in mathematics, such things naturally occur. One could create*

> Framework curriculum integration: Details for subjects and grade/school levels: Big data (DL) in CS, DL in mathematics, Create new subject 'media literacy'

a combination like that. I don't necessarily have to explain in computer science what a matrix is or what regression means. It would be nice if mathematics could take over in that regard, if there was more collaboration. That would be cool." (Participant B - 18.09.23, Berlin).

The integration of DL and AI topics into teacher education has been approved. One argument mentioned was that a breadth of knowledge about AI should already be present when coming from teacher education, rather than just possessing foundational knowledge.

Teacher education: Pro arguments / specifics - General agreement, AI needs to be integrated more in framew. curr.

The interviewees are asked about concrete steps on how to integrate DL and AI into the curriculum. The desire is expressed to update the framework curriculum, *"not just in CS [...], but in all subjects. This is so that one can address such currently socially relevant topics in schools. I wouldn't know where to incorporate it now, except to say that I'll forgo topic XYZ with the risk that it might still come up in the central exam later. That's the annoying part"* (Participant B – 18.09.23, Berlin). The framework curriculum in computer science should be updated more frequently, as there are faster-paced developments and tools (such as ChatGPT), compared to, for example, subjects like mathematics. The topics of DL and AI should be part of the framework curriculum.

Steps for anchoring in the classroom: Framework curriculum - Update framew. curr, & CS framew. curr. more often than other subjects, anchoring of DL & AI

It should be started that the existing (digital) devices in the school are also fully used. For them to be utilized, teachers would need not only familiarity with them but also knowledge of AI, so that instruction on such topics can take place in the school. Such topics should then be taught not only in CS but also in other subjects.

Steps for anchoring in the classroom: Other – Existing (digital) devices / resources must be utilized, teachers have to gain knowledge, teaching of topics not only in CS

This is in accordance with *"collaboration among colleagues, not just teaching computer science as an isolated subject somewhere in the computer room but actually interdisciplinary"* (Participant D – 18.09.23, Berlin). Furthermore, the opening of the school in terms of collaboration with external institutions such as town halls or communities is considered, where children, for example, give presentations to them: "*The school has to open up. The school simply has to be a place of encounter. Nowadays, this is not possible without computer science"* (Participant D – 18.09.23, Berlin).

Steps for anchoring in the classroom: Other – Interdisciplinary cooperation among teachers, school must open itself

This is in accordance with *"collaboration among colleagues, not just teaching computer science as an isolated subject somewhere in the computer room but actually interdisciplinary"* (Participant D – 18.09.23, Berlin). Furthermore, the opening of the school in terms of collaboration with external institutions such as town halls or communities is considered, where children, for example, give presentations to them: "*The school has to open up. The school simply has to be a place of encounter. Nowadays, this is not possible without computer science"* (Participant D – 18.09.23, Berlin).

Steps for anchoring in the classroom: Trainings – Create training opportunities

To build knowledge among teachers, there needs to be a wide range of training opportunities.

Steps for anchoring in the classroom: Trainings – Create training opportunities

The school curriculum is considered important. The framework curriculum is a prerequisite/basis for integration into the school curriculum. The latter specifies the implementation of the framework curriculum. Mandatory components of the framework curriculum cannot be removed, but minor modifications, such as in the depth/length of coverage, can be defined in the school curriculum.

School curriculum: Important, framework curriculum prerequisite for school curriculum and must be aligned with it

Another teacher mentioned not having a school curriculum at his school, but would see a it as an opportunity to introduce topics into it, for example, those not covered in the framework curriculum.

School curriculum: There is no school curriculum at school, but when one would exist, own emphases (in addition to framework curriculum) could be introduced

When asked about potential challenges that could arise when incorporating DL and AI into classrooms, concerning the framework curriculum, it was noted: *"The creation of the framework curriculum is the biggest problem. Once it's in there, it gets adopted; if it's not in there, it doesn't get done. If it's in there again, it has to be done again, so that's the biggest sticking point"* (Participant C – 18.09.23, Berlin). Another obstacle is that the framework curriculums are currently overloaded (which could possibly be addressed with reprioritisation).

Potential challenges: Framework curriculum - Topics need to be in curriculum, otherwise they can't be taught; not up-to-date and needs reprioritisation

In relation to teachers, barriers could include, for example, *"[...] that now, of course, the teaching staff is not yet ready. Even computer science colleagues are not ready, they have never dealt with it intensively, there is no teaching material for that. You have to acquire it yourself"* (Participant B – 18.09.23, Berlin). If the knowledge is not present, and the materials/didactic methods for teaching subjects like AI are outdated, the lessons can become uninteresting for students and/or too theoretical. However, this would also be a fundamental problem in teaching new topics. Besides the lack of training opportunities to build this knowledge, there can also be a deterrent effect, namely *"[...] that it's such a huge topic where you can't see through"* (Participant B – 18.09.23, Berlin).

Potential challenges: Teachers - Lack of knowledge, pedagogical implementability, training opportunities; difficult integration due to deterrent effect

Other obstacles can include resistance to the introduction or use of a specific tool or similar: *"Similarly, reservations about the use of ChatGPT and such can arise. Of course, it is forbidden in an examination*

Potential challenges: Other - Resistance against / to use of tools (e.g., ChatGPT),

situation and should continue to be prohibited. But if I assign homework, how can I control that? In my opinion, it's simply utopian to exclude the possibility that parents, computers, or someone else helped. I also think it's normal to support each other through such tools and that one should learn to do so because adults do that in everyday life as well. [...] It has more advantages than disadvantages. I mean, it's important to train a healthy and reflective approach to it" (Participant A – 18.09.23, Berlin). The technical prerequisites, the infrastructure at schools (e.g., hardware, computers, input devices like computer mice), need to be improved or provided for; for example, the continuous presence of an IT administrator throughout the week is desired, who takes care of the technology, was mentioned.

lack of resources / infrastructure to integrate topics

Furthermore, the lack of suitable teaching materials was brought up. Some subjects or content of a subject could be disadvantaged, especially challenging for *"experienced colleagues"*: *"They have been doing their thing for many years, and now comes a new topic. Now you have to deal with it and maybe throw away your old stuff. That is certainly a challenge"* (Participant B – 18.09.23, Berlin).

Potential challenges: Other - Sufficient materials for teaching missing, other subjects / topics could be disadvantaged

CS summary

Participants advocated for integrating DL and AI into the CS framework curriculum due to outdated and imprecise content. DL and AI are viewed as ways to enhance engagement. However, mere content integration is considered insufficient, lacking control and adherence. Topic-wise, big data should be integrated and a media literacy subject could be created.

The integration of DL and AI topics into teacher education was supported, emphasizing the necessity of a comprehensive understanding of AI beyond foundational knowledge.

Concerning concrete steps for integrating DL and AI into classroom teaching, key recommendations include updating the framework curriculum, particularly in CS to more frequently to keep pace with rapid developments. These topics should not only be taught in CS but also in other subjects. Collaborative, interdisciplinary approaches among teachers and external institutions are emphasized to open up schools, making CS an integral part. Additionally, creating diverse training opportunities is essential for building knowledge among teachers to be able to convey DL and AI.

The school curriculum was considered vital, relying on the framework curriculum as a prerequisite. While allowing minor adjustments for its incorporation into the school curriculum, there is also an opportunity to introduce new topics.

Potential challenges in incorporating DL and AI into classrooms, particularly related to the framework curriculum, include concerns about overloading it and the risk of not anchoring these topics in it at all. Teachers face obstacles such as a lack of readiness, insufficient knowledge, outdated teaching materials, and pedagogical challenges, with potential deterrent effects due to the complexity of the topics. Resistance to tools like ChatGPT and the need for improved infrastructure add further complexities, like insufficient materials, highlighting the importance of addressing such challenges for effective integration.

STEAM trainings

Germany (23.08.23, Düsseldorf)

New content must be tested before it is included in the framework curriculum, hence: *"It's actually good that not more is included in the framework curriculum because it's not possible due to legal and technical reasons"* (23.08.23, Düsseldorf).

Framework curriculum integration: Pro or against depending on conditions of framework - What is in framework curriculum has to feasible

The interviewee saw the necessity for these topics to be included in teacher education. Currently, trainees *"[...] basically teach more to schools than the other way around. I have acquired a lot privately; otherwise, I wouldn't know a lot at all"* (23.08.23, Düsseldorf). Therefore, teachers need early education within these topics to be equipped with knowledge because they *"[...] have to teach and apply it, not just look at it once and forget it because it is never done again"* (23.08.23, Düsseldorf).

When asked about which steps could be considered for the integration of DL and AI topics, many ideas were expressed by the participants that were already mentioned under the category of Teachability (ideas about the means by which music can be taught): Interactive website/tools, devices, and computer programs. The interactive and practical aspects would be important, and *"[...] for schools, it's a great thing. So that the children can't just avoid it and don't just watch and do nothing"* (23.08.23, Düsseldorf).

In addition, it was expressed in the interview that (supporting) infrastructure should also be provided. For example, greater networking in terms of school grading, so that grades are not entered by the teacher multiple times but ideally only once. In line with this, a better networking of the PCs is also proposed, so that the teacher can better monitor students' use of PCs in class and intervene if they engage in activities unrelated to the lesson.

Regarding potential obstacles, it also involves infrastructural / technical challenges, such as the inadequate equipment in schools, like the absence of whiteboards or Wi-Fi. There is currently too little diversification concerning the used devices, e.g., an overly one-sided

Margin notes:

Teacher education: Pro arguments / specifics – General agreement, trainees impart more knowledge to schools than other way around, basic knowledge is lacking school, teachers must gain knowledge in order to teach students

Steps for anchoring in the classroom: Other – Provide interactive web pages, tools, devices, computer programs; teach interactively

Steps for anchoring in the classroom: Other – Provide infrastructure (for support), better control of children's interaction with PCs

Potential challenges: Other - Lack of resources / infrastructure to integrate topic, technical hurdles, too little diversification of devices, compatibility issues between devices and computer programs

focus on iPads. Additionally, compatibility issues between computers and its programs often need to be addressed.

In practical class work, further hurdles emerge: *"I asked all the children in my class if I could record them. It's challenging when the framework curriculum states that you can record your music piece or dance. Nevertheless, many parents are against it, and then you can't do it. There are legal and technical hurdles […]"* (23.08.23, Düsseldorf).

Potential challenges: Students - Legal/bureaucratic barriers

Germany (05.09.23, Berlin)

The integration of these topics into the framework curriculum was approved, among other reasons, *"[…] because it simply influences everyday life and currently has very direct consequences on the teacher's side, namely in the assessment of written assignments [of students]"* (Participant B – 05.09.23, Berlin). The topics also play a role in the everyday lives of students; therefore, integration into the framework curriculum is necessary.

Framework curriculum integration: Pro arguments / important / necessary - General agreement, topics shapes everyday life, already now has an impact on teachers / their work, connection to everyday life of students can be established

The framework curriculum should also reflect technological developments: *"We cannot simply ignore the technology that will change our world in the next ten years. Just as we use Excel and Word in our teaching, we should also use that"* (Participant A – 05.09.23, Berlin).

Framework curriculum integration: Pro arguments / important / necessary - Framework curriculum reflects everyday life / new technologies

Regarding the question of framework curriculum integration, it depends on how the topics are implemented into it. It was also conveyed in the interview that the topic area of the training is already present in the subject area of media literacy.

Framework curriculum integration: Pro or against depending on conditions of framework - It's a question of how topics are implemented in framework curriculum, topics already integrated as media literacy

When questioning the importance of integrating these topics into teacher education, there was agreement.

Teacher education: Pro arguments / specifics: General agreement

The integration of the topics in teacher education and framework curriculum would be important, as *"data is the oil of the 21st century. A lot is happening in that regard. They are also significant employers and major industry sectors where people can build a future for themselves. Therefore, I find it absolutely relevant"* (Participant C - 05.09.23, Berlin). Also, certain considerations should be made, for example, *"[...] it would have to be considered, clarified, and worked out at which points it makes sense to incorporate it [DL and AI] into the teaching, to what extent, and at what times"* (Participant A - 05.09.23, Berlin).

Steps for anchoring in the classroom: Other - Integrate topics into framework curriculum and teacher education, find right places in lessons/subjects where topics can be integrated

For the integration of topics into the classroom, teachers need more time. Also helpful for integration would be content that is anchored and tested in practice; that would be something with which *"[...] one simply relieves the teacher and says, 'You don't have to work everything out yourselves. You can take this, it's a module that has proven itself, you can adapt it.' Alternatively, these concepts could be developed in schools themselves or in a separate subject for this purpose. However, leaving teachers completely alone with it and saying, 'Please do this. It's such a great topic.' [...] there must also be realistic conditions for that. I would say that this is more achievable with relief [of the teachers], or maybe already with certain guidelines"* (Participant B – 05.09.23, Berlin).

Steps for anchoring in the classroom: Other: Sufficient time for teachers, teaching concepts (ready-to-use)

Addressing potential challenges related to teachers, the issues of insufficient time and high workload were raised. Conveying additional content beyond the framework curriculum implies an increased workload, which can already be higher during certain phases of professional life: *"It is always said that the teacher is a seasonal worker.*

Potential challenges: Teachers - High Workload / little time

There are times when one sets aside everything that is not necessary. Then there are times when you have the leeway to take care of it [the conveyance of new content]" (Participant A – 05.09.23, Berlin).

Given that the content specified in the framework curricula must be taught, there is a lack of appropriately prepared concepts for new content outside of the curriculum. These concepts would be helpful, including ideas and materials. Even ready-made small projects that could be instantly feasible in the classroom would mean significant support for teachers.

Potential challenges: Resources and materials: Missing teaching concept

In relation to the framework curriculum, it is already densely packed with content, so in the process of integrating new topics, old ones would need to be removed.

Potential challenges: Framework curriculum is full: reprioritisation

A critical perspective is taken on the slow integration of topics and the associated processes: *"Teachers are currently being trained. In five years, they will be in school for the first time. What about those of us [teachers] who are already in school? All these processes just get on my nerves because AI is a current topic, we want to work with it now, and students want to hear about it now. It's always the same story; it takes far too long to implement. By the time it is implemented, it's old news, and no one cares anymore. That's unfortunate, but one also understands that it's challenging"* (Participant D – 05.09.23, Berlin).

Potential challenges: Time-related: Too slow integration of topics

It was expressed once that no obstacles were expected from the parents.

Potential challenges: Other: No obstacles expected from parents

Lithuania (09.01.24, Vilnius)

AI should be integrated into teacher education, as it already plays a role in the everyday lives of everybody.

Teacher education: Pro arguments / specifics - AI is part of everyday / daily life

STEAM summary

There was support for the careful testing of new content before its inclusion in the framework curriculum, acknowledging legal and technical constraints. The integration of DL and AI into the framework curriculum is approved due to their impact on everyday life (of students) and professional life of teachers and also reflecting technological developments in society. The integration of DL and AI into the curriculum is considered with attention to how this integration is managed, taking into account the existing presence of related topics in media literacy.

The interviewees emphasized the necessity of including DL and AI topics in teacher education. The importance of early education in these topics is recognized to equip teachers with essential knowledge for effective teaching and application.

Regarding steps for integrating DL and AI topics into classroom teaching, integration into teacher education and the framework curriculum was considered crucial, with a need for careful consideration of when and how to incorporate these topics. The use of interactive websites/tools, devices, and computer programs for practical and interactive engagement were noted. For this to be feasible, adequate infrastructure needs to be provided. Moreover, it was recommended to offer teachers more time, ready-to-use teaching concepts, to ensure effective integration.

The potential challenges associated with integrating DL and AI into classrooms encompass a lack of infrastructure or the existence of technical issues. Teachers face challenges of high workload and time constraints. The absence of prepared teaching

concepts, materials and projects, as well as the need for reprioritisation in the (already saturated) framework curriculum, also pose challenges. Concerns about the slow integration of topics were emphasized.

Primary trainings

Germany (13.09.2023, Düsseldorf)

In the interview, on one hand it was highlighted that DL and AI are already integrated in the lower secondary school level and within the media literacy framework ("Medienkompetenzrahmen").

Framework curriculum integration: Neutral: Already within media literacy framework ("Medienkompetenzrahmen")

On the other hand, the integration of DL ad AI topics within the framework of media literacy is relevant for the students, but depends on *"[...] at which points it makes sense. Connection or embedding, yes, but one must ensure that this is achieveable [in the classroom]. That it is done in a meaningful way"* (Participant – 13.09.23, Düsseldorf). Furthermore, content should not simply be added *"on top of it"*, meaning just be added to the existing framework curriculum (Participant – 13.09.23, Düsseldorf). Instead, it should be examined and integrated within an overarching context, considering how it relates to other content in the curriculum.

Framework curriculum integration: Pro or against depending on conditions of framework - It's a question how topics are implemented in framework curriculum

Regarding the integration of DL and AI into teacher education, it has been advocated to ensure that this content can be applied in the classroom later on. It was also noted that integration is even more crucial for teacher education than merely incorporating it into the framework curriculum, to ensure that teachers are confident in handling DL and AI topics from the beginning. These topics should be incorporated into the respective individual subjects. Additionally,

Teacher education: Pro arguments / specifics - General agreement, even more important as framework curriculum, for primary: should be integrated in respective subjects, should not be theoretical

it was mentioned that teacher education should not be overly theoretical in nature.

When addressing potential challenges in teaching DL and AI, one obstacle is the large class sizes (approximately 30) in regard to students: *"If you're doing it alone in such a large group, and it's also new for the students, then you need even more time to bring order and automate the processes. That's pushing the limits"* (Participant – 13.09.23, Düsseldorf).

Possible barriers for teachers could include a lack of factual and pedagogical knowledge. Additionally, the absence of comprehensive plans for classroom, including materials, could pose an obstacle to implementing content in the classroom. Moreover, competing priorities play a role: *"[...] we [have] work schedules where the topics are set that we still have to cover in the school year, and if we insert something else, those plans completely fall by the wayside. Then we have a huge problem because we haven't achieved what fundamentally needs to be accomplished"* (Participant – 13.09.23, Düsseldorf). Connected to this is the fact that teachers have little time for other topics or the preparation for (new) topics, for example: *"It's just that we don't want to solve everything around it. If the practical aspect is given to us, then we will find our way, as in everything else. We still have to adapt and, above all, acquire the background knowledge ourselves. We will manage everything when we have the basic framework to work with, but we don't have that basic framework"* (Participant – 13.09.23, Düsseldorf).

Other obstacles may include a lack of support for children with special educational needs, respectively requirements. Additionally, the absence of widespread institutionalized forms of exchange

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Marginal notes:

Potential challenges: Students - large classes (about ca. 30 students)

Potential challenges: Teachers - Lack of knowledge or pedagogical implementability, other priorities, high workload / little time

Potential challenges: Teachers - no support for students requiring more attention, lack of collegial (possibly institutionalized) exchange

among the teaching staff, such as workgroups or circles, is a further challenge.

The framework curriculum can also be an obstacle; it was mentioned in the same wording as the lack of time for teachers.

Potential challenges: Framework curriculum - General statement

Furthermore, limited resources, insuff or inadequate school facilities were cited as obstacles (e.g., lack of iPads or a projector shared among multiple classes that needs to be set up each time, or insufficient materials).

Potential challenges: Other - Lack of resources / infrastructure / sufficient materials to integrate and teach topics

Austria (25.04.2023, Vienna)

All statements refer to statements about content within the framework curriculum. No issues were addressed that pertain to content outside of the curriculum.

All categories: Within the curriculum

There are prerequisites for integrating. For example, it is necessary to discuss how AI is utilized in the education system and what potential risks exist. Additionally, it is crucial to teach students how to navigate these subjects given in accordance to their rapidly evolving nature so that they can handle them appropriately in adulthood.

Framework curriculum integration: Prerequisites - Reflect on educational system, Students must understand / handle these topics in the future

There is a general agreement that these topics should be included in the framework curriculum, justified, among other reasons, by their growing (societal) importance:

Framework curriculum integration: Pro arguments - General agreement, because topics are a contemporary societal relevant / will become more important

Regarding the duties to be taught, there is an opinion that specially trained teachers should be responsible for this, or inputs from

Framework curriculum integration: Contra arguments - For primary school, there should be (other) experts for topics, for primary

external sources should be introduced into the teaching. In this sense, integration for the primary school is viewed critically.

school level could be difficult

The integration into teacher education is supported, among other reasons, because foundational knowledge is often lacking in primary school. It could possibly be done *"similarly to how it is currently done in teacher education, where there are specializations, such as focusing on music or computer knowledge. One could adopt these emphases"* (Participant B – 25.04.23, Vienna).

Teacher education: Pro arguments / specifics - General agreement, basic knowledge is lacking in primary school, there has to be thematic emphasis

A potential obstacle mentioned concerns uncertain future assessments: *"I think my issue, on how to use this in the classroom, also relates a bit to the fact that it's not clear how it will be used. I believe this is a problem that is not yet clear on how much it will be integrated into everyday life or even into school life in the future."* (Participant A - 25.04.23, Vienna)

Potential challenges: Teachers - Not clear how AI will affect future

Lithuania (11-21.04.2023, Vilnius/Vilkaviškis/Druskininkai)

All statements refer to statements about content within the framework curriculum. No issues were addressed that pertain to content outside of the curriculum.

All categories: Within the curriculum

One mentioned prerequisite for integration into the curriculum is that there is a need for *"more training for the teachers so that they could deepen their knowledge and that they could teach appropriately."* (Participant A – 21.04.23, Druskininkai)

Framework curriculum integration: Prerequisites - Knowledge of teachers

The integration into the framework curriculum would be very beneficial because modern technologies and, consequently, the societal

Framework curriculum integration: Pro arguments – General agreement, Framework curriculum reflects daily life which also AI

environment are continually evolving; moreover, AI is a part of everyday life. Therefore, the topics are important to teach, because they are and will become more important (for students)

is a major part of, because topics are / will become more important

In this regard, not only the importance but also the necessity for students is emphasized: *"Children, one day they'll become adults and they need to understand what is going on with the world. I know many people are elderly people. They don't understand digital technology and they are feeling like outsiders. They cannot use many of the public services because they can't use computers. Kids need to understand the world and more artificial intelligence will be in their lives. So they need to understand it."* (Participant C – 18.04.23, Vilkaviškis) They should gain theoretical knowledge, but more importantly, practical skills in dealing with modern technologies.

Framework curriculum integration: Pro arguments – Students must understand / handle these topics in future, students gain knowledge

A specific topic suggestion was made, namely that within the scope of DL, the most important theme would be data security.

Framework curriculum integration: Topics to integrate - Data security (DL)

DL and AI would be crucial for prospective teachers and should therefore be incorporated into teacher education. The advantage of including them in teacher education is that there would be no need for subsequent compensation of knowledge: *"Maybe it would be useful because I had finished my studies long ago. It was not included there. Now I have to compensate this with the seminars. But, if these studies and this seminars like this would be included in studies, it would be more useful for the teachers because they come to the school and they know already about it."* (Participant D - 11.04.23, Vilnius) With the knowledge *"then they can teach the children in the same way as they were taught"* (Participant B – 18.04.23, Vilkaviškis).

Teacher education: Pro arguments / specifics – General agreement, integration of topics right from start useful, teachers must gain knowledge in order to teach students

Regarding specific steps mentioned for integration into teaching, it is stated concerning the framework curriculum: *"I think additionally that what we need so to have separate subject as computer science at least once a week and to assure continuity of teaching those subjects, those topics."* (Participant A – 21.04.23, Druskininkai)

Steps for anchoring in the classroom: Framework curriculum - CS must be taught at least once a week

Other steps involve having sufficient materials on how to learn the topics and having enough time: *"Maybe we need more time to integrate it because in my position as a first-year teacher, if you want to do something good, you need time and you have to always feel the lack of time."* (Participant C – 18.04.23, Vilkaviškis) Children should be educated with the gamification approach, and *"[…] very clear examples from daily life should be used so that they could better understand artificial intelligence and see where they could use them"* (Participant B – 18.04.23, Vilkaviškis). In general, the integration of these topics should proceed gradually to ensure a smooth process and maintain continuity in teaching these topics.

Steps for anchoring in the classroom: Other – Sufficient material and time for teaching, teach with gamification approach and clear examples from (students') everyday life, step-by-step integration into teaching

Potential challenges are identified as the lack of preparation of teachers with knowledge to teach the topics. Additionally, a general lack of time is mentioned, also hinting at the available time during classes: *"We do not have constant time when we can use computer classes or tablets. It would be good if we have constant time when we can use and where we can learn at least once a week."* (Participant A – 21.04.23, Druskininkai)

Potential challenges: Teachers - High Workload / little time, lack of preparation

Furthermore, there are too few digital devices, such as the tablets just mentioned. Another difficulty could be that there are not enough financial resources available to acquire the necessary resources for

Potential challenges: Other - Lack of resources / infrastructure to integrate topics or financial means to acquire them, suffi-

teaching DL and AI. Additionally, appropriate materials would need to be available for teaching these subjects.

cient material / concepts for teaching needed / missing

One person has indicated that they do not expect any obstacles at their school or municipality

Potential challenges: No challenges expected

Primary summary

There is a general agreement on the inclusion of DL and AI topics in the framework curriculum due to their growing importance. Integration is deemed beneficial as modern technologies, including AI, are integral to everyday life and students therefore must learn about these topics. Concerns arised about integrating these topics at the primary school level, suggesting the need for specially trained teachers or experts to help with that. The prerequisites for integrating DL and AI is that teachers also have the knowledge to effectively convey these topics.

The integration of DL and AI into teacher education is supported due to the lack of foundational knowledge in primary schools. It would also eliminate the need for subsequent knowledge compensation, ensuring that educators are well-equipped from the start to teach students.

The steps for integration into teaching included advocating for a separate CS subject. Additional measures could involve providing sufficient materials and allowing ample time for teachers. Adopting a gamification approach and using clear examples from daily life to enhance students' understanding of AI in class was deemed beneficial. A gradual integration process is suggested for a smooth and continuous teaching experience.

There was uncertainty about how AI will impact every day and school life. Further potential challenges could include lack of time and preparation of teachers with

knowledge to teach the topics, insufficient digital devices / infrastructure, and potential financial constraints for acquiring those and other necessary resources.

3.1.6   Potential changes due to integration of DL and AI

CS training

Germany (18.09.23, Berlin)

The students acquire knowledge, whereby *"the focuses are already changing. For example, scanning images or creating classes ourselves, which we did today, that is a completely different semantics or a whole different classification for the computer. In earlier times, maybe people still programmed. Now you can also work with images. In the past, it was just coding, just text. This opens up entirely new worlds, also working with audio or with these gestures, I find that cool"* (Participant A - 18.09.23). The students could then better navigate everyday life and understand it more effectively with related topics from computer science. They also gain the ability to reflect more effectively on these topics, understanding their opportunities, risks, and functioning.

> Students: Gaining factual knowledge / skills & awareness / ability to reflect, can apply knowledge in everyday life, better understanding

On the one hand, these gains in knowledge and skills lead to students being better prepared for future developments. On the other hand, it is important to note that students should not be overwhelmed with tasks if they become more demanding due to or through AI.

> Students: Preparing them for future, Risk of overwhelming students

A participant saw no impact on both the school itself and the school authority or the senate administration.

> School authorities (or other school related institutions): No impact

Another opinion was that the technical requirements must be in place to meet the demands: *"Currently, the things are not so computationally intensive, but if we want to do a lot with AI or work with it, we have to ensure that the computers have the appropriate power to train the models. For schools, there are applications where you can use small images for training, that's not a big problem. But the hardware requirements can become an issue. That's always the case in schools, every 10 to 15 years"* (Participant C – September 18, 2023, Berlin).

School authorities (or other school related institutions): Prerequisites: Resources / infrastructure (e.g., to support teaching)

Because exams would be more difficult to control with the use of AI, it is worth considering whether AI should be allowed or not: *"Maybe at some point in [the subject] German, one has to say ChatGPT is allowed. You can't always cling to the old ways. Sometimes you have to see what advantages the new things bring. Maybe then I can focus on the really difficult things and can leave the easy things to the computer. Why not? I don't necessarily see only disadvantages, on the contrary"* (Participant A – 18.09.23, Berlin).

School authorities (or other school related institutions): Positive: Simple tasks can be delegated; negative: Exam situations will be more difficult to control

In the future, developments such as ChatGPT will change the assessment of students in the context of homework and exams, and the prevailing assessment formats and methods need to be reconsidered, which can also be seen as an opportunity: *"It may be that the teaching becomes significantly more productive and challenging"* (Participant C - 18.09.23, Berlin).

School authorities (or other school related institutions): Rethinking performance assessments

In relation to society and here, professional life, there could be a range of activities/jobs that will become obsolete such as *"[...] when someone fills out Excel sheets, creates any statistics, or something that can be automated. Or someone writes large texts for search engines or something"* (Participant A – 18.09.23, Berlin). However, it would then be

Society: People can focus on more challeng. tasks if others are replaced (work place); Grey / precarious areas: Possible job replacement

possible to concentrate more on certain tasks in more difficult and complex areas that cannot be solved by computers.

Another teacher stated that the emerging new topics will have positive effects on the economic location Germany (without elaborating on it further).

Society: Strengthening the country's economic position

In general, people are informed about these topics. Furthermore, there are probably *"[...] things that we can't even imagine yet that can emerge from it. That's actually the beauty of technology, that it offers so much, such a broad, vast field. That will, of course, always get bigger and more complex"* (Participant A – September 18, 2023, Berlin).

Society: People are becoming more informed, open up new possibilities that aren't even imaginable yet

CS Summary

In working with topics like AI, students will gain diverse CS skills, transitioning from traditional coding to working with images, audio, and gestures. The interviewees emphasized that students will be better prepared for the future technical impacts while also highlighting concerns about potential task overload.

Adequate technical resources / infrastructure in schools are seen as essential. Exam control challenges and assessment of students in light of usage of AI tools (e.g., LLM) are noted and reconsideration of (written) assessments is suggested. On the other side, some participants see opportunities in delegating simple tasks to computers.

This plays also part for societal changes, were job contents could be altered, with potential benefits for economic positions. But there is also the risk of jobs getting replaced. Participants acknowledge the transformative potential of the new topics, emphasizing optimism about societal benefits and the continuous expansion of technological possibilities.

STEAM trainings

Germany (23.08.23, Düsseldorf)

Too much work on the computer (due to the increased integration of DL or AI) could have negative consequences: *"There are also children who are hyperactive or totally freak out when they are on the computer or sit for too long. You would have to make sure that it doesn't become too much, and you should also limit such activities if you were to do it in every lesson. It is proven that if children do not write, do not use handwriting, it is not good for the brain. If it continues, you would have to make sure that it doesn't become too much in a day"* (23.08.23, Düsseldorf).

Students: Too much digital work can be harmful

Accordingly, if the use of devices or tools is already so frequent during school age, this could also have implications for people in adulthood, in the sense that, for example, they may lack a sense of tranquility.

Society: Children who constantly are 'online' struggle to find tranquility as adults

A possible consequence on the technical side could be that, concerning migrant children in classes, *"[...] a program quickly translates the language so that the child can follow what is happening in class in their own language. This is not AI but an implementation computer program. That would be a very positive outcome, for which this entire technology could be utilised"* (23.08.23, Düsseldorf).

Other: New computer programs

Germany (05.09.23, Berlin)

As AI is set to play a pivotal role in society and reshape it, students engaging with AI in school can subsequently contribute more effectively to society later on. Additionally, dealing with such topics provides potential for them to perceive and choose career fields related

Students: Participation in society possible, preparing students for future (e.g., like jobs), Gaining awareness / ability to reflect

to it in their future. The earlier students engage with these topics in school, the better they can critically examine or reflect on them in a more differentiated manner.

Furthermore, engagement with DL and AI topics in schools could have an impact on the *"[…] gender gap that we have between men and women, with many more men or boys being involved in STEM fields. Perhaps something would change in that regard if we introduce them earlier, creating a bit more awareness, but also generating a bit more interest in these interdisciplinary fields"* (Participant B – 05.09.23, Berlin).

> Students: Reduce in gender gap in STEM subjects

Societally, there could be a risk that in the future, AI automates too many tasks without human involvement.

> Society: Grey / precarious areas: AI could take over too many tasks

Therefore, people need to engage more with AI: *"If AI takes over the important tasks for us, do we still have something where we stay smarter? Or do we sit back and become less intelligent in the future? We need to stay on top of things, we need to embrace and understand the new trends. We have to learn how to deal with them"* (Participant A – 05.09.23, Berlin).

> Society: Reflection on usage

Lithuania (09.01.24, Vilnius)

Through integration of AI, students could have more interest in the subject of physics. Tools like ChatGPT could spark interest in the students. They would also be able to create things with AI tools.

> Students: More interest in subject when AI is integrated, they can create something themselves with AI, Arouse / increase interest in topics

The introduction of AI is therefore categorised as a win-win situation for both teachers and pupils.

> Other: Win-win situation for teachers and students

Integrating DL and AI topics in education could help bridge the gender gap in STEM fields, sparking students' interest – not only in AI but also in the subjects that the topics are integrated in, so that teachers benefit. Students' reflective and critical thinking abilities could be enhanced. However, excessive device use during school age may negatively impact children's well-being and tranquility in adulthood. Therefore, it's crucial to monitor and adjust activities for a balanced approach. Early exposure to AI in schools can prepare students for future contributions to society, fostering awareness and guiding career choices.

Regarding societal changes, a potential risk is the over-automation of tasks by AI, highlighting the necessity for human participation. People must stay informed, embrace new trends, and learn to navigate the changing technological landscape, exploring new possibilities within it. Positive outcomes, such as language translation programs, showcase such potential benefits of technology in education.

Primary trainings

Germany (13.09.2023, Düsseldorf)

There were no statements/questions regarding this category in the focus group interview.

Austria (25.04.2023, Vienna)

There was a statement that referred to potential changes and addressed the increasing awareness of the issue – although it is unclear which group of people is meant (e.g, students, teachers) – namely: *"The engagement with information I receive would be sharpened, similar to how we already engage with sources. It would be a consideration questioning whether something can be true or where it comes from. And what is intended when I see this and that. I believe training in this regard is*

Gaining awareness / ability to reflect (target group unclear)

not bad and also training to recognize when something is presented in a simplified manner" (Participant B - 25.04.23, Vienna).

Lithuania (11-21.04.2023, Vilnius/Vilkaviškis/Druskininkai)

Students would gain knowledge in DL and AI, CS, and related subjects, leading, among others things, to the outcome that *"they will know all the changes, all the news about that [DL & AI], and could use it in their daily life, not only in the lessons"* (Participant D – 11.04.23, Vilnius). The digital literacy of the students would be enhanced, and their adaptability to the digital society would increase. They would better understand technologies, have a stronger foundation for decision-making in processes related to everyday life and within the school, and *"children's thinking, mathematical thinking, and logical thinking"* (Participant C – 18.04.23, Vilkaviškis) would be improved overall.

Students - Gaining factual knowledge / skills, students can apply knowledge in everyday life, Better adaptability to digital society, improved digital literacy, better decision making & understanding, gaining awareness / ability to reflect

The improvement of students' skills is linked to society in the sense that *"[...] those topics would improve digital literacy for our future society, for the children who will be our future society"* (Participant E – 21.04.23, Druskininkai).

Society: Improve / new skills in society

Primary summary

Increased awareness regarding DL and AI topics was emphasized as a potential result of further engagement. For students, knowledge gains would enhance skills such as decision-making in that regard, positively influencing overall cognitive development. This knowledge contributes to the practical application of these topics in everyday life and improves adaptability to the digital society. The broader impact extends to the enhancement of digital literacy for future society as a whole through DL and AI education.

3.1.7   Wishes for educational policy
CS trainings

Germany (18.09.23, Berlin)

The framework curriculum needs to be revised as it is already out-dated. Furthermore, CS should be introduced as a mandatory subject: *"I really find it important at all education school levels. Maybe not in primary school, but from the seventh grade at the latest, perhaps from the fifth. [...]. Regardless of the type of school graduation, but everyone should have programmed something simple by the end of school. To then be able to say: This is not for me or maybe it is. [...]. The kids play a lot on their phones, but they don't really understand what they're doing. I find that this is not right."* (Participant A – September 18, 2023)

Framework curriculum: needs to be updated / worked on, CS should be mandatory subject

DL should be integrated into the curriculum, and also AI should be included promptly. AI should not only be included in CS but also in other subjects. Furthermore, AI should be a mandatory and *"[...] not just as a small elective topic alongside other things, but that it is included as a mandatory topic or as a partially mandatory topic in a semester. At least for the upper level, for the lower level, from seven to ten, that it becomes part of the curriculum for secondary level one"* (Participant C – 18.09.23, Berlin).

Framework curriculum: DL & AI should be in framework curriculum, AI in other subjects besides CS, AI should be compulsory

Furthermore, there must be an understanding created that *"[...] it is not done [teaching of AI] simply because someone wrote it into the framework curriculum. But because it is actually necessary for people nowadays and to alleviate their fears. Everyone is afraid that their job will disappear because AI is coming. Because no one has any idea what AI actually is. So that is terrible, terrible advertising for AI"* (Participant D – 18.09.23, Berlin).

Other: Alleviate people's fears (e.g., concerning AI)

Regarding the implementation of DL and AI, it requires *"[...] more time and money for the topics, as [the lecturer of the training] said. In other countries, hundreds of hours are dedicated to these topics. But of course, to be able to do this, you need to have the topics, you need to have the people, you need to have the equipment"* (Participant D – 18.09.23, Berlin).

Other: Sufficient numbers of teaching hours and qualified teachers, better infrastructure, more money for digital education

CS summary

Urgent updates are needed for the outdated framework curriculum, with the inclusion of topics related to DL and AI. For successful integration of them, sufficient teaching hours, teacher knowledge, and improved infrastructure are essential. Additionally, it is proposed that CS becomes a mandatory subject and AI should be a compulsory theme in secondary education. To address fears and misconceptions surrounding AI, efforts should be made to alleviate concerns.

STEAM trainings

Germany (23.08.23, Düsseldorf)

The lessons should take place *"rather intensively and practiced"*. That would be more important than integrating new obligations with the existing ones, which bring technical difficulties or with which the teachers cannot yet cope, therefore another suggestion is: *"I would rather say that we prefer to have fewer hours, as there are not so many teachers anyway"* (23.08.23, Düsseldorf).

Framework curriculum: Fewer school hours, but more intense; additional teacher's duties should not be added to the existing ones

This could result in fewer class hours overall, and teachers instead could *"[...] participate in an online training from the IServ[15] computer program, for example. [...] For example, I would specifically inquire about who brings what for the Christmas party. We would all enter that on IServ. I don't even know if that's possible there. I would wish for that. Things that would make the work life of a teacher much easier"* (23.08.23, Düsseldorf).

Trainings: More trainings; Other: Introduce simplifications through devices/tools for teachers

Germany (05.09.23, Berlin)

DL and AI should be integrated into the framework curriculum. When new topics are introduced into the curriculum, some existing ones should be removed.

Framework curriculum: Topics should be in framework curriculum

The integration into the framework curriculum should not come at the expense of the teachers and should be associated with a clear integration concept. This concept should provide sufficient time resources as well as materials for classroom use, designed in a way that makes the integration of topics feasible and motivating for the teachers.

Other: Clear integration concept, more resources for teaching in classroom

Regarding the use of ChatGPT by students, regulations were requested, such as: *"The better the models become, the more challenging it will be. Eventually, certain assignments simply disappear. You can't even tell them to write an essay at home. They just won't do it anymore. What I somehow wish for in terms of AI from the Senate, I'm not exactly sure. Certainly, more integration of such tools [like ChatGPT] in the classroom. To create suggestions or framework conditions [for them]"* (Participant C – 05.09.23,

Other: Guidelines on how to handle student work created with ChatGPT, resolutions of KMK should be (better) implemented

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[15] The "[...] IServ school platform supports with all challenges of school digitisation, simple and tailored. It is based on the IServ principle: a modular system that combines all functions, [...] from virtual teaching to network management [...]." (https://iserv.de/)

Berlin). Additionally, a wish was expressed that decisions of the Conference of Ministers of Culture ('Kultusministerkonferenz' or KMK) should be better implemented in the federal states ('Bundesländer'), as they are sometimes ignored.

Lithuania (09.01.24, Vilnius)

There were no statements/questions regarding this category in the focus group interview.

STEAM summary

Participants suggest integrating DL and AI into the framework curriculum and establishing the groundwork for their proper instruction. This would involve, for example, an integration concept ensuring the provision of necessary time and materials for classroom use. Another approach could involve shorter but more intensive classroom hours, allowing teachers to engage in additional training opportunities. Clear rules are being sought for students using LLMs such as ChatGPT, and there is a desire for improved implementation of education policy decisions.

Primary trainings

Germany (13.09.2023, Düsseldorf)

There were no statements/questions regarding this category in the focus group interview.

Austria (25.04.2023, Vienna)

Regarding the wishes for educational policy, it is formulated that there should be more trainings, and that teachers should also be more pointedly informed / sensitised to these.

Trainings (Continuous teacher education): More training opportunities

There should be sufficient infrastructural provisions, for example, *"digital devices or, for instance, projectors or something, so that one can work on it not only unplugged but also plugged in school"* (Participant A-25.04.23, Vienna). If corresponding devices, such as PCs, are not available, then one cannot teach the topics in classroom.

Resources: More resources for teaching in classroom

Lithuania (11-21.04.2023, Vilnius/Vilkaviškis/Druskininkai)

The topics of DL and AI should be introduced to the students. A significant portion of the respondents suggests that, for this purpose, CS should be established as a separate subject in the primary education sector, among others: *"I would like to make computer science a separate lesson, because now, in primary education, all the computer science topics are integrated into other lessons."* (Participant B - 18.04.23, Vilkaviškis) In this context, it is proposed that CS should be taught (as a separate lesson) at least once a week.

Framework curriculum: Topics should be taught to students, CS as its own subject in primary level, topics and CS must be each taught at least once per week

There is a desire for teachers in Lithuania (compared to Finland) to have more time because then they *"[...] don't feel so stressed because you need to do everything right, faster and it makes you stressed."* (Participant C – 18.04.23, Vilkaviškis)

Other: More time for teachers

Primary summary

In the interviews, participants expressed a desire for more training opportunities. They also called for increased infrastructural provisions for teaching, such as sufficient digital devices. The recommendation to introduce CS as a separate subject in primary education was emphasized. Additionally, teachers should have more time to reduce stress and enhance teaching effectiveness.

3.2   Summary of the qualitative results

The trainings received an overall positive feedback across all of the target groups CS, STEAM, and primary education. However, overall the length of the training was perceived as too short by participants. Teachers expressed eagerness for more (extensive) trainings, as the provided content during the session covered only basic knowledge. In general, interviewees from all three target groups felt that the respective trainings were designed to match their existing background knowledge.

Across all three target groups, the integration of DL and AI topics into teaching varied in the respective countries. Immediate integration of training content was not always considered feasible. The practical orientation of the training via exercises was praised. Practical exercises and the knowledge shared during the training were seen as a good foundation for classroom teaching. While the availability of materials was positively acknowledged, for more advanced and complex approaches, complete ready-to-use plans / guidelines with sufficient material and theoretical foundations explained, was deemed necessary. This was particularly emphasized for a suggested alternative format of longer series of classroom lessons. Additionally, in CS and primary, it was noted that currently in the training there are too many contents which are black boxes, possibly also from a didactic / pedagogical standpoint.

The interest from colleagues (from different subjects) was rated high by all interviewees from primary, STEAM, and CS. To enhance knowledge in all three groups, there is a desire for more accessible training opportunities. Suggestions include on-site training in schools, training series offered online or face-to-face approaches. The possibility of trying out content with students between these sessions (a series of trainings with interleaving and spacing) was also recommended.

DL and AI were considered relevant topics for both society and students, given their integration into everyday lives. All three teacher groups indicated that teaching of these topics depends on certain criteria, such as grade level, specific topics, or the

depth of treatment. For instance, for lower grade levels gamification approaches are very relevant or simple (visual) tasks via Teachable Machine or LLMs can be used, while more complex tools for more complex subjects like Orange3 are suitable for higher grades in CS and STEAM classes. While the connection of DL and AI topics to CS is clear, it is not always clear for STEAM and primary subjects. STEAM and primary teachers did not always see a clear connection of DL and AI to their subjects and have to prioritize their curriculum content, making it hard to integrate DL and AI subjects into their classes. For primary teachers where students need more teacher involvement, some activities can be difficult to implement due to large classes.

Following this, there is unanimous support among all interviewees for incorporating these topics into the framework curriculum and teacher education, with many considering it crucial. All three target groups emphasize that the integration into the framework curriculum must be carefully executed, for example, depending on existing content or the feasibility of new content. All groups emphasize the need for additional training opportunities beyond teacher education to enhance knowledge. CS teachers noted that the framework curricula are not up to date and need improvement, potentially exploring integration opportunities in other subjects. A common result across all three interview groups is the necessity for technical infrastructure, resources like materials, which must be established, as inadequate availability of these means poses an obstacle for teachability. A further challenge mentioned by all three groups at various points is the high workload (e.g., other priorities) of or time constraints for teachers. These can already currently hinder the integration of these topics. CS teachers expressed a desire to make CS a mandatory subject, with AI as a compulsory theme in secondary education. Primary teachers highlight large class sizes as a potential challenge when integrating the new topics. Primary teachers also recommended to introduce CS as a separate subject in primary education but also incorporate DL and AI in teacher education in all respective subjects.

As potential changes in learning from DL and AI are seen positive results for students and society in all three groups. Only in STEAM and CS groups are possible risks

mentioned, regarding overloading students and the over-automation of tasks by AI and possible job replacement in society.

The results of the third evaluation round in the qualitative interviews highlight some differences between the possibilities and commonalities for the integration of DL and AI. Some CS teachers (and primary teachers) could immediately integrate some of the topics into their teaching, whereas for STEAM interviewees, such notions were non-existent or unclear. All groups, especially for a more extended treatment of these topics in their classes, would need to develop their knowledge, have better materials and sufficient time at hand, and better infrastructure in place.

4.   Discussion of key findings across the trainings

The training evaluation encompassed a diverse participant group across several educational levels and subject areas, with the majority falling within the age range of 30 to 59 years. The variance in gender distribution highlights a significant trend where traditionally gendered roles persist within the education sector, particularly in primary education in Lithuania and Germany where female participation was markedly high. This contrasts with the Computer Science (CS) trainings in Germany, where female participation was much lower, reflecting broader national trends in the field.

The quantitative Feedback on the training was overwhelmingly positive, with 89% of participants recommending the workshops. This high rate of satisfaction underscores the effectiveness of the training content and delivery, although the desire for longer sessions suggests a need for more in-depth coverage of topics to enhance understanding and application in teaching settings. This is particularly relevant for complex subjects such as regression analysis and decision trees, which were areas of difficulty for participants, indicating that such topics may require more focused and extended engagement.

The differing levels of familiarity with DL and AI prior to the training reveal a gap in foundational knowledge, particularly in DL. While AI was more familiar to participants, the undervaluation of DL highlights a potential area for educational intervention, as a robust understanding of DL is essential for effective teaching and application of AI. The feedback indicating a preference for AI over DL in curriculum inclusion may suggest a misunderstanding of the integral role of DL in underpinning AI concepts, a misconception that educational leaders should aim to correct in future curriculums. The strong motivation among participants to further their understanding of DL and AI is an encouraging sign of the growing recognition of these fields' importance.

Similar to the quantitative feedback, the qualitative feedback was positive; however, participants also noted that the sessions were too short. While they acquired basic knowledge, they articulated a need for more comprehensive training, a sentiment that resonates with findings from the second and third rounds of interviews. CS teachers found the difficulty level of the training appropriate, but some STEAM and primary educators indicated a need for more substantial engagement with the training content post-session, aligning with observations from the round 1 and 2. For primary teachers, practical exercises serve as a valuable foundation for teaching. However, implementing advanced techniques or extending these exercises into longer lesson series would require additional resources. These should ideally be integrated into guidelines or ready-to-use plans that include both theoretical and didactic background information. Critiques from CS and primary education interviews highlighted an issue with too many "black boxes" or unclear elements within the training content, suggesting a need for greater transparency and clarity in training materials.

There is a strong interest among educators from various disciplines for additional training opportunities. Echoing sentiments from previous rounds, diverse training formats such as on-site, online, and face-to-face were proposed in the third round as well. Reflecting on qualitative feedback from earlier rounds, DL and AI are deemed highly relevant for both society and students, though the approach to these subjects

may vary based on factors such as grade level. There is unanimous agreement on the need to integrate these topics into the framework curriculum and teacher education. Challenges such as overloaded curricula, insufficient technical infrastructure, resource limitations, high workload, and key competing priorities from their own subjects hinder the integration of these innovative topics.

The integration of DL and AI topics varied across countries, with some primary and CS teachers finding immediate integration feasible, while STEAM teachers either did not or were unclear about their ability to do the same. The unique challenge that was identified for STEAM and primary teachers was that teachers did not always see a clear connection of DL and AI to their subjects and have to prioritize their curriculum content, leaving no space and no incentives to integrate DL and AI subjects into their classes.

The third evaluation round highlighted both differences and commonalities in the integration possibilities of DL and AI, revealing varying levels of readiness among CS, STEAM, and primary teachers. Feedback from earlier rounds indicated a universal desire for further knowledge development. This includes the need for better or additional materials, sufficient time, and enhanced technical infrastructure to support a more comprehensive treatment of these topics in their classes.

In conclusion, both the quantitative and qualitative feedback from the training evaluation reveal a multifaceted landscape of readiness and needs concerning the integration of DL and AI into teaching curriculums. The quantitative data underscored a general satisfaction with the training provided, marked by a strong endorsement from participants. However, this positive reception was tempered by calls for extended sessions and deeper content exploration, particularly in areas participants found challenging. Similarly, the qualitative feedback emphasized a consistent desire among educators for more comprehensive and engaging training sessions, with clear indications that the current offerings need enhancement to better facilitate the practical application of DL and AI in diverse educational settings.

5. Limitations

Some inherent limitations of the evaluation should be considered:

Low registration numbers for primary/STEAM trainings: there registration numbers for Primary and STEAM trainings were comparatively low. Lithuanian team reached out to schools for the primary trainings, which resulted in a relatively high number of participants for the primary training.

Workshop format variation: Two longer trainings (2.5 days) for STEAM and primary were added to the third round of interventions, in order to assess the potential impact of length. As they were conducted later than the initial phase of the third round (November 11 2023 and January 2024), they are discussed in the final report (D4.7).

Sample size: The small number of participants from each location affects the generalizability of the findings. Expanding the sample size in future studies would contribute to robust and generalisable outcomes.

Validity and reliability of data collection instruments: Due to time and recourses allocation, the quality of the survey and knowledge test instruments was not evaluated prior to their application, which can influence the reliability of the data collected.

Cross-Cultural Challenges: While comparing findings between the countries, one should be aware of the fact that differences could also be traced to cross-cultural differences affecting survey response styles, e.g., differences in acquiescence response styles (Rammstedt, Danner, and Bosnjak 2017).

Differentiation between subjects: Due to small sample sizes, it was not possible to make statements for certain subjects (apart from differentiating CS from STEAM and

primary), yet there might be relevant differences in how DL and AI can be integrated in various STEAM subjects.

6. Conclusion

The TrainDL project's third intervention round has effectively contributed to the strategic goal of developing policy recommendations for integrating DL and AI into teacher trainings. This final evaluation synthesizes outcomes and challenges based on the implemented trainings for the three target groups: CS, STEAM, and primary in-service teachers.

Key achievements:

Broad Reach: The project successfully reached out to all of the three target groups (CS, STEAM, and primary teachers) as planned in the project proposal.

High participant satisfaction: The overwhelming majority of trained teachers (89%) recommended the training sessions, underscoring the effectiveness of the content and delivery methods employed. This high rate of satisfaction indicates that the training was well-received and generally met the expectations of participants.

Effective Training Materials and Exercises: The training exercises were particularly well-received, with most participants rating the introduced activities highly. This indicates that most selected activities were deemed highly suitable and relevant for teaching. This positive response to the training exercises demonstrates their practical applicability and relevance for teaching for all of the three target groups.

Increased Confidence in DL and AI Application: Participants across all of the target groups reported that the TrainDL training served as a valuable introduction to AI and DL. Despite a higher initial familiarity with AI over DL, the training effectively improved

participants' confidence in applying both topics in their teaching practices., suggesting that the sessions effectively addressed some of the foundational gaps in DL and AI knowledge.

Recognition of educational and educational value of DL and AI across all the target groups: Despite varying initial familiarity levels with DL and AI, there was a notable enthusiasm among participants in all of the three target groups to learn further as well as deepen their knowledge, indicating a successful recognition of the importance of these technologies in education. Participants showed a particular interest in integrating AI into the curriculum as well as their teaching, although there was a noted underappreciation of DL's foundational role in understanding AI.

Recognition of value of (further) teacher trainings: Teachers emphasize the need to incorporate DL and AI into the CS framework curriculum, yet merely adding DL and AI to the curriculums won't ensure that teachers are immediately adept at teaching them, the essential prerequisite is sufficient teacher training.

Key Challenges and Possible Solutions:

Difficulty to find the suitable training format single trainings are not sufficient. Yet, the workload is high, hence the time for longer and more intensive training is hard to find. There is a clear need and demand for more teacher trainings in DL and AI not only for CS teachers, but also for secondary STEAM and for primary subject teachers. To address the challenge of teachers' limited time, future trainings could be designed as modular and (where possible) blended learning trainings and spread over multiple sessions. Development of specific course plans and materials tailored for different grade levels is essential. This step will help streamline the integration of DL and AI into teaching, reducing the preparation workload for teachers.

Lacking technical infrastructure and resources: Technical infrastructure sufficient for DL and AI education is lacking in some schools. It is essential to provide stable and sufficient technical infrastructure as well as technical support.

Challenges for integration into framework curriculum: Framework curriculum integration was supported by teachers, but is dependent on addressing other challenges such as overloaded framework curricula, ensuring feasibility of new content sufficient trainings of teachers.

(only STEAM and Primary) Need for more DL and AI applications for the subjects: teachers did not always see a clear connection of DL and AI to their subjects and have to prioritize their curriculum content, leaving no space and no incentives to integrate DL and AI subjects into their classes. Further teacher trainings need to focus on developing and teaching DL and AI applications and materials for concrete STEAM and primary subjects taking into account appropriate (for the level of students) instructional strategies.

Insufficient knowledge and understanding of the role of DL: The data revealed differences in the initial knowledge and attitudes towards DL compared to AI, with a general tendency to undervalue DL. This suggests a need for more foundational trainings on DL as well as linkage between DL and AI.

Disclaimer: Parts of this text could be generated or rephrased by ChatGPT, DeepL Write, LanguageTool, and Google Docs spell checking, but were carefully checked and revised by the authors.

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8. Appendix

8.1 CS training Berlin (18.09.2023), German version of the pre- and post-questionnaire

TrainDL - Vorher-Befragung

Wir danken Ihnen für Ihre Teilnahme an der Fortbildung und den Befragungen/Evaluationen.

In dem EU-Projekt TrainDL werden Konzepte und Kompetenzen zu Data Literacy (DL) und Künstlicher Intelligenz (KI) erarbeitet, um diese in die Lehrkräfte- und Schulbildung zu integrieren und verankern.

Zentral dafür ist die am 18.09.23 stattfindende Fortbildung "KI-Expedition: mit lernenden Maschinen durch das Land der Daten". Bevor diese startet, möchten wir Ihnen kurz einige Fragen stellen

1. zu Ihrem Kenntnisstand zu KI und DL und möglichen bisherigen Erfahrungen damit und
2. Fragen zu Ihrer Person, z. B. Ihrer Fachrichtung

Außerdem bitten wir Sie, am Ende einen kurzen, unverfänglichen Wissenstest zu absolvieren.

Die Ergebnisse geben uns die Möglichkeit, die Fortbildung zu bewerten, nachfolgende Fortbildungen zu optimieren und Eindrücke zu den Themengebieten zu sammeln. Es gibt Ihnen die Möglichkeit, an der Policy-Bildung mitzuwirken.

Die gleich startende Vorher-Befragung wird eine Zeit von ca. 10 Minuten in Anspruch nehmen.

Die Grundlagen zum Schutz personenbezogener Daten, Datenschutz und zu anderen Rechtsgrundlagen werden dabei gewahrt, insbesondere:

- Die erhobenen Daten können Ihrer Person durch Verwendung eines Pseudonymisierungscodes nicht zugeordnet werden. Der Code dient lediglich der Zuordnung evtl. weiterer Befragungen zu der von Ihnen heute ausgefüllten.
- Die Fragebögen werden während der Laufzeit des Projekts (voraussichtlich Ende Februar 2024) auf Arbeitsplatzrechnern von Mitgliedern des Projektteams sowie auf einem Server der Universität Potsdam gespeichert. Auf diesen Server haben nur Mitarbeiter*innen Zugriff, die an der Studie arbeiten. Nach Projektende werden die Daten auf den Arbeitsplatzrechnern gelöscht.
- Die Datensätze werden gemäß den Anforderungen des Fördermittelgebers für mindestens weitere 10 Jahre nach Projektende auf dem Server gespeichert. Zudem ist eine Veröffentlichung der anonymisierten Datensätze (ohne personenbezogene Daten wie Alter, Geschlecht, Bundesland, Fächer etc.) in einem Forschungsdaten-Repositorium vorgesehen, um eine Sekundärauswertung für künftige, derzeit noch nicht benennbare Forschungsvorhaben zu ermöglichen.

Durch Klicken auf „Befragung beginnen" willigen Sie in die eben beschriebene Nutzung Ihrer Daten ein.

- Ihre Einwilligung können Sie jederzeit ohne Angaben von Gründen widerrufen ohne dass Ihnen Nachteile daraus entstehen.
- Aus dem Widerruf Ihrer Einwilligungserklärung folgt, dass die Verarbeitung Ihrer personenbezogenen Daten für die Zukunft unzulässig wird und die bis zu diesem Zeitpunkt erfassten Daten unverzüglich gelöscht werden.

Pseudonymisierungscode

Ihre Daten werden durch den unten von Ihnen angegebenen Code pseudonymisiert. Durch die Verwendung eines Pseudonymisierungscodes können die erhobenen Daten nicht Ihrer Person zugeordnet werden. Darüber hinaus wird der Code verwendet, um verschiedene von Ihnen ausgefüllte Befragungen miteinander zu verknüpfen.

Die ersten beiden Buchstaben des Vornamens Ihrer Mutter

Geben Sie bitte für den Pseudonymisierungscode die ersten beiden Buchstaben des Vornamens Ihrer Mutter ein. Wenn Sie diesen nicht wissen, geben Sie XX ein. Bsp.: Marie = MA; Umlaute werden zu Vokalen Ö = O, Ü = U, Ä = A

XX

Bitte wählen Sie Ihren Geburtstag aus

Wenn Sie beispielsweise am 01.12.1969 geboren sind wählen Sie die 01.

[bitte wählen] ▾

Die letzten beiden Buchstaben Ihres Geburtsorts

Geben Sie die letzten beiden Buchstaben Ihres Geburtsorts ein. Wenn Sie diesen nicht wissen, geben Sie bitte XX ein. Bsp.: Berlin = IN; Umlaute werden zu Vokalen Ö = O, Ü = Ü, Ä = A

XX

-

Einstellung und Anwendung DL und KI

DL steht im Folgenden immer für **Data Literacy**.
Es ist die Fähigkeit, mit Daten planvoll umzugehen und sie im jeweiligen Kontext bewusst nutzen und hinterfragen zu können. Dazu gehören die Kompetenzen, Daten zu sammeln, zu erkunden, zu verwalten, zu analysieren, zu visualisieren, zu interpretieren, zu kontextualisieren, zu bewerten und anzuwenden.

KI steht für **Künstliche Intelligenz**.
Damit werden verschiedene Technologien und Verfahren beschrieben, die sich mit der Automatisierung intelligenten Verhaltens (z. B. Entscheidungsfindung, Problemlösung, Lernen) und dem maschinellen Lernen befassen.

Für jedes der folgenden Themen wählen Sie bitte die Option aus, die Ihre Erfahrung am besten beschreibt:

	Ich habe noch nie davon gehört.	Ich habe davon gehört, aber erinnere mich nicht/weiß nicht, was es ist.	Ich habe eine Vorstellung davon, aber nicht sehr deutlich.	Ich weiß, was es ist und wofür es benutzt wird/werden könnte.	Ich bin mit dessen Verwendung vertraut und weiß, wie es im Untericht umgesetzt werden kann.
Data Literacy (DL)	○	○	○	○	○
Künstliche Intelligenz (KI)	○	○	○	○	○

Einstellung und Anwendung DL und KI

Wie sehr stimmen Sie den folgenden Aussagen zu?

	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich weiß, wie man Inhalte über Data Literacy (DL) im Unterricht einsetzen kann.	○	○	○	○	○	○
Die Vermittlung von DL wird zukünftig den Schüler*innen einen Mehrwert bringen.	○	○	○	○	○	○
Ich weiß, wie man Inhalte über Künstliche Intelligenz (KI) im Unterricht einsetzen kann.	○	○	○	○	○	○
Die Vermittlung von KI wird zukünftig den Schüler*innen einen Mehrwert bringen.	○	○	○	○	○	○

Wie oft tun Sie Folgendes?

	nie	einmalig	wenige Male im Schuljahr	monatlich	wöchentlich
Ich vermittle Wissen über KI in meinem Unterricht.	○	○	○	○	○
Ich vermittle Wissen über DL in meinem Unterricht.	○	○	○	○	○

Persönliche Angaben

Welcher Altersgruppe gehören Sie an?

○ 20 - 29
○ 30 - 39
○ 40 - 49
○ 50 - 59
○ 60 - 69
○ über 69

Welchem Geschlecht ordnen Sie sich selbst zu?

○ weiblich
○ männlich
○ anderes Geschlecht
○ keine Angabe

Wie viele Jahre haben Sie schon unterrichtet?

Jahre

In welchem Bundesland sind Sie tätig?

[bitte wählen] ▼

Wie viel Stunden unterrichten Sie durchschnittlich pro Woche?
ohne Vor- und Nachbereitung

h

Wie viele Stunden pro Woche verbringen Sie durchschnittlich mit Vor- und Nachbereitung des Unterrichts?

h

In welcher Phase des beruflichen Werdegangs befinden Sie sich bzw. auf welchen Ebenen sind Sie tätig?
Mehrfachnennungen sind möglich.

☐ Studium
☐ Referendariat / berufsbegleitender Einstieg
☐ Abgeschlossene Ausbildung / Lehrkraft im Schuldienst

Welche Klassenstufen unterrichten Sie?

Mehrfachnennungen sind möglich.

☐ 13   ☐ 12

☐ 11   ☐ 10

☐ 9   ☐ 8

☐ 7   ☐ 6

☐ 5   ☐ 4

☐ 3   ☐ 2

☐ 1   ☐ sonstige

Welche Fächer unterrichten Sie?

Mehrfachnennungen sind möglich.

☐ Informatik   ☐ Deutsch

☐ Mathematik   ☐ Fremdsprachen

☐ Biologie   ☐ Chemie

☐ Physik   ☐ Kunst

☐ Sport   ☐ Politik

☐ Wirtschaft   ☐ LER

☐ WAT   ☐ Musik

☐ Sonstiges (bitte angeben)

_____

Deutsch

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Deutsch.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Deutsch.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Deutsch sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Deutsch sehr wichtig ist.	○	○	○	○	○	○

Informatik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	**2**	**3**	**4**	**5**	**6**
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Informatik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Informatik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Informatik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Informatik sehr wichtig ist.	○	○	○	○	○	○

Mathematik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	**2**	**3**	**4**	**5**	**6**
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Mathematik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Mathematik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Mathematik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Mathematik sehr wichtig ist.	○	○	○	○	○	○

Physik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	**2**	**3**	**4**	**5**	**6**
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Physik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Physik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Physik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Physik sehr wichtig ist.	○	○	○	○	○	○

Kunst

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	**2**	**3**	**4**	**5**	**6**
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Kunst.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Kunst.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Kunst sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Kunst sehr wichtig ist.	○	○	○	○	○	○

Biologie

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Biologie.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Biologie.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Biologie sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Biologie sehr wichtig ist.	○	○	○	○	○	○

Chemie

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Chemie.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Chemie.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Chemie sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Chemie sehr wichtig ist.	○	○	○	○	○	○

Wirtschaft

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Wirtschaft.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Wirtschaft.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Wirtschaft sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Wirtschaft sehr wichtig ist.	○	○	○	○	○	○

Politik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Politik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Politik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Politik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Politik sehr wichtig ist.	○	○	○	○	○	○

Sport

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Sport.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Sport.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Sport sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Sport sehr wichtig ist.	○	○	○	○	○	○

Musik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Musik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Musik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Musik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Musik sehr wichtig ist.	○	○	○	○	○	○

LER

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach LER.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach LER.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach LER sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach LER sehr wichtig ist.	○	○	○	○	○	○

WAT

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach WAT.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach WAT.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach WAT sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach WAT sehr wichtig ist.	○	○	○	○	○	○

Fremdsprachen

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan in meinem Fremdsprachenfach.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan in meinem Fremdsprachenfach.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL in meinem Fremdsprachenfach sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI in meinem Fremdsprachenfach sehr wichtig ist.	○	○	○	○	○	○

Sonstiges

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Platzhalter: 'Welche Fächer unterrichten Sie?'.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Platzhalter: 'Welche Fächer unterrichten Sie?'.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Platzhalter: 'Welche Fächer unterrichten Sie?' sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Platzhalter: 'Welche Fächer unterrichten Sie?' sehr wichtig ist.	○	○	○	○	○	○

Im Rahmen der Evaluation möchten wir Ihnen im Folgenden sechs kurze Wissensfragen zum Thema KI und Datenanalyse stellen. Keine Sorge, wenn Sie die Antworten nicht wissen - wir erwarten nicht, dass Sie über Expertise auf diesem Gebiet verfügen. Bitte antworten Sie nach bestem Wissen und Gewissen. Wenn Sie die Antwort auf eine Frage nicht wissen, wählen Sie einfach die Option "Ich weiß die Antwort nicht". Ihre Antworten sind für unsere Evaluation und Verbesserung zukünftiger Angebote von großer Bedeutung.

Lineare Regression wird verwendet, um …
Mehrfachnennungen sind möglich.

☐ ...Trends in Daten zu erkennen.

☐ ...Muster in Bildern zu erkennen.

☐ ...die Beziehung zwischen einer abhängigen und einer unabhängigen Variablen zu schätzen.

☐ …Datenpunkte mit ähnlichen Eigenschaften zu clustern.

☐ Ich weiß die Antwort nicht.

Wozu wird das Widget "Scatter Plot" in Orange3 verwendet?
Mehrfachnennungen sind möglich.

☐ Datenkomprimierung

☐ Visualisierung der Normalverteilung eines Datensatzes

☐ Visualisierung von Beziehungen zwischen zwei numerischen Variablen

☐ Zur Erkennung von Ausreißern

☐ Ich weiß die Antwort nicht.

Was ist eine gute umgangssprachliche Beschreibung für "überwachtes Lernen"?

○ Lernen durch Belohnen

○ Lernen durch Bestrafen

○ Lernen aus Erfahrung

○ Lernen aus Beispielen

○ Ich weiß die Antwort nicht.

Welche Phasen werden bei einer Bilderkennung, die nach dem Prinzip des "überwachten Lernens" funktioniert, unterschieden?
Mehrfachnennungen sind möglich.

☐ Auswahl und Bereinigung der Daten

☐ Trainingsphase

☐ Selbstreflexionsphase

☐ Testphase

☐ Ich weiß die Antwort nicht.

Welche der folgenden Eigenschaften kennzeichnen intelligente Agenten?
Mehrfachnennungen sind möglich.

☐ Sie lernen aus Erfahrung.

☐ Sie handeln autonom.

☐ Sie nehmen ihre Umgebung wahr.

☐ Sie besitzen die Fähigkeit, Lösungen für nicht definierte Probleme zu finden.

☐ Ich weiß die Antwort nicht.

Was sind Beispiele für intelligente Agenten?
Mehrfachnennungen sind möglich.

☐ ein Virenscanner

☐ eine Bilderkennung

☐ ein autonomes Fahrzeug

☐ ein Gegner aus einem Computerspiel, der auf die Reaktionen des Spielers reagiert

☐ Ich weiß die Antwort nicht.

Fragebogen absenden

TrainDL - Nachher-Befragung

Wir danken Ihnen für Ihre Teilnahme an der Fortbildung und den Befragungen/Evaluationen.

In dieser Befragung geht es vor allem um Eindrücke über die gerade absolvierte Fortbildung "KI-Expedition: mit lernenden Maschinen durch das Land der Daten". Genauer werden Sie hier

1. zur Fortbildung selbst sowie
2. zu auf Ihre Person bezogene Einschätzungen (z. B. Anwendbarkeit der Themen) befragt.

Außerdem bitten wir Sie, am Ende einen kurzen, unverfänglichen Wissenstest zu absolvieren.

Die Ergebnisse geben uns die Möglichkeit, die Fortbildung zu bewerten, nachfolgende Fortbildungen zu optimieren und Eindrücke zu den Themengebieten zu sammeln. Es gibt Ihnen die Möglichkeit, an der Policy-Bildung mitzuwirken.

Die gleich startende Befragung wird eine Zeit von ca. 10 Minuten in Anspruch nehmen.

Die Grundlagen zum Schutz personenbezogener Daten, Datenschutz und zu anderen Rechtsgrundlagen werden dabei gewahrt, insbesondere:

- Die erhobenen Daten können Ihrer Person durch Verwendung eines Pseudonymisierungscodes nicht zugeordnet werden. Der Code dient lediglich der Zuordnung evtl. weiterer Befragungen zu der von Ihnen heute ausgefüllten.
- Die Fragebögen werden während der Laufzeit des Projekts (voraussichtlich Ende Februar 2024) auf Arbeitsplatzrechnern von Mitgliedern des Projektteams sowie auf einem Server der Universität Potsdam gespeichert. Auf diesen Server haben nur Mitarbeiter*innen Zugriff, die an der Studie arbeiten. Nach Projektende werden die Daten auf den Arbeitsplatzrechnern gelöscht.
- Die Datensätze werden gemäß den Anforderungen des Fördermittelgebers für mindestens weitere 10 Jahre nach Projektende auf dem Server gespeichert. Zudem ist eine Veröffentlichung der anonymisierten Datensätze (ohne personenbezogene Daten wie Alter, Geschlecht, Bundesland, Fächer etc.) in einem Forschungsdaten-Repositorium vorgesehen, um eine Sekundärauswertung für künftige, derzeit noch nicht benennbare Forschungsvorhaben zu ermöglichen.

Durch Klicken auf „Befragung beginnen" willigen Sie in die eben beschriebene Nutzung Ihrer Daten ein.

- Ihre Einwilligung können Sie jederzeit ohne Angaben von Gründen widerrufen ohne dass Ihnen Nachteile daraus entstehen.
- Aus dem Widerruf Ihrer Einwilligungserklärung folgt, dass die Verarbeitung Ihrer personenbezogenen Daten für die Zukunft unzulässig wird und die bis zu diesem Zeitpunkt erfassten Daten unverzüglich gelöscht werden.

Pseudonymisierungscode

Ihre Daten werden durch den unten von Ihnen angegebenen Code pseudonymisiert. Durch die Verwendung eines Pseudonymisierungscodes können die erhobenen Daten nicht Ihrer Person zugeordnet werden. Darüber hinaus wird der Code verwendet, um verschiedene von Ihnen ausgefüllte Befragungen miteinander zu verknüpfen.

Die ersten beiden Buchstaben des Vornamens Ihrer Mutter

Geben Sie bitte für den Pseudonymisierungscode die ersten beiden Buchstaben des Vornamens Ihrer Mutter ein. Wenn Sie diesen nicht wissen, geben Sie XX ein. Bsp.: Marie = MA; Umlaute werden zu Vokalen Ö = O, Ü = U, Ä = A

XX

Bitte wählen Sie Ihren Geburtstag aus

Wenn Sie beispielsweise am 01.12.1969 geboren sind wählen Sie die 01.

[bitte wählen] ▾

Die letzten beiden Buchstaben Ihres Geburtsorts

Geben Sie die letzten beiden Buchstaben Ihres Geburtsorts ein. Wenn Sie diesen nicht wissen, geben Sie bitte XX ein. Bsp.: Berlin = IN; Umlaute werden zu Vokalen Ö = O, U = Ü, Ä = A

XX

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Einstellung und Anwendung DL und KI

DL steht im Folgenden immer für **Data Literacy**.
Es ist die Fähigkeit, mit Daten planvoll umzugehen und sie im jeweiligen Kontext bewusst nutzen und hinterfragen zu können. Dazu gehören die Kompetenzen, Daten zu sammeln, zu erkunden, zu verwalten, zu analysieren, zu visualisieren, zu interpretieren, zu kontextualisieren, zu bewerten und anzuwenden.

KI steht für **Künstliche Intelligenz**.
Damit werden verschiedene Technologien und Verfahren beschrieben, die sich mit der Automatisierung intelligenten Verhaltens (z. B. Entscheidungsfindung, Problemlösung, Lernen) und dem maschinellen Lernen befassen.

Wie sehr stimmen Sie den folgenden Aussagen zu?

	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich weiß, wie man Inhalte über Data Literacy (DL) im Unterricht einsetzen kann.	○	○	○	○	○	○
Die Vermittlung von DL wird zukünftig den Schüler*innen einen Mehrwert bringen.	○	○	○	○	○	○
DL-bezogene Themen sind gesellschaftlich wichtig genug, um Sie in den Lehrplan aufzunehmen.	○	○	○	○	○	○
Ich weiß, wie man Inhalte über Künstliche Intelligenz (KI) im Unterricht einsetzen kann.	○	○	○	○	○	○
Die Vermittlung von KI wird zukünftig den Schüler*innen einen Mehrwert bringen.	○	○	○	○	○	○
KI-bezogene Themen sind gesellschaftlich wichtig genug, um Sie in den Lehrplan aufzunehmen.	○	○	○	○	○	○

Welche Fächer unterrichten Sie?

*Bitte nennen Sie nochmal Ihr Fach/Ihre Fächer, sodass wir erfahren können, wie Sie fehlende Inhalte zu DL und KI **nach** der Fortbildung einschätzen.*
Mehrfachnennungen sind möglich.

☐ Informatik   ☐ Deutsch   ☐ Mathe

☐ Fremdsprachen   ☐ Biologie   ☐ Chemie

☐ Physik   ☐ Kunst   ☐ Sport

☐ Politik   ☐ Wirtschaft   ☐ LER

☐ WAT   ☐ Musik   ☐ Sonstiges (bitte angeben)

Informatik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Informatik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Informatik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Informatik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Informatik sehr wichtig ist.	○	○	○	○	○	○

Deutsch

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Deutsch.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Deutsch.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Deutsch sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Deutsch sehr wichtig ist.	○	○	○	○	○	○

Mathematik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Mathematik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Mathematik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Mathematik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Mathematik sehr wichtig ist.	○	○	○	○	○	○

Fremdsprachen

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan in meinem Fremdsprachenfach.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan in meinem Fremdsprachenfach.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL in meinem Fremdsprachenfach sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI in meinem Fremdsprachenfach sehr wichtig ist.	○	○	○	○	○	○

Biologie

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Biologie.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Biologie.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Biologie sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Biologie sehr wichtig ist.	○	○	○	○	○	○

Chemie

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Chemie.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Chemie.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Chemie sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Chemie sehr wichtig ist.	○	○	○	○	○	○

Physik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Physik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Physik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Physik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Physik sehr wichtig ist.	○	○	○	○	○	○

Kunst

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Kunst.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Kunst.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Kunst sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Kunst sehr wichtig ist.	○	○	○	○	○	○

Sport

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Sport.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Sport.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Sport sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Sport sehr wichtig ist.	○	○	○	○	○	○

Politik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Politik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Politik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Politik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Politik sehr wichtig ist.	○	○	○	○	○	○

Wirtschaft

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Wirtschaft.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Wirtschaft.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Wirtschaft sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Wirtschaft sehr wichtig ist.	○	○	○	○	○	○

LER

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach LER.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach LER.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach LER sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach LER sehr wichtig ist.	○	○	○	○	○	○

Musik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Musik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Musik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Musik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Musik sehr wichtig ist.	○	○	○	○	○	○

WAT

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach WAT.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach WAT.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach WAT sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach WAT sehr wichtig ist.	○	○	○	○	○	○

Sonstiges

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Platzhalter: 'Welche Fächer unterrichten Sie?'.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Platzhalter: 'Welche Fächer unterrichten Sie?'.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Platzhalter: 'Welche Fächer unterrichten Sie?' sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Platzhalter: 'Welche Fächer unterrichten Sie?' sehr wichtig ist.	○	○	○	○	○	○

Wie geeignet fanden Sie die in der Fortbildung behandelten Themen für Ihren Unterricht?

	kann nicht beur-teilen	gar nicht geeignet					sehr gut geeignet
		1	2	3	4	5	6
Einführung in KI	○	○	○	○	○	○	○
Intelligente Agenten (klassische KI)	○	○	○	○	○	○	○
Überwachtes Lernen: Bilderkennung	○	○	○	○	○	○	○
Überwachtes Lernen: Lineare Regression	○	○	○	○	○	○	○

Bei welchen der folgenden Stationen haben Sie teilgenommen?

Mehrfachnennungen sind möglich.

☐ Abalone

☐ Teachable Machine

☐ SuperCodingBall

Wie geeignet fanden Sie die Station "Abalone" für die folgenden Klassenstufen?

	kann nicht beur-teilen	gar nicht geeignet					sehr gut geeignet
		1	2	3	4	5	6
Klassenstufen 7-8	○	○	○	○	○	○	○
Klassenstufen 9-10	○	○	○	○	○	○	○
Klassenstufen 11-13	○	○	○	○	○	○	○
Sonstige Lerngruppen (bitte spezifizieren):	○	○	○	○	○	○	○

Wie geeignet fanden Sie die Station "Teachable Machine" aus der Fortbildung für die folgenden Klassenstufen?

	kann nicht beur-teilen	gar nicht geeignet					sehr gut geeignet
		1	2	3	4	5	6
Klassenstufen 7-8	○	○	○	○	○	○	○
Klassenstufen 9-10	○	○	○	○	○	○	○
Klassenstufen 11-13	○	○	○	○	○	○	○
Sonstige Lerngruppen (bitte spezifizieren):	○	○	○	○	○	○	○

Wie geeignet fanden Sie die Station "SuperCodingBall" aus der Fortbildung für die folgenden Klassenstufen?

	kann nicht beurteilen	gar nicht geeignet					sehr gut geeignet
		1	2	3	4	5	6
Klassenstufen 7-8	○	○	○	○	○	○	○
Klassenstufen 9-10	○	○	○	○	○	○	○
Klassenstufen 11-13	○	○	○	○	○	○	○
Sonstige Lerngruppen (bitte spezifizieren):	○	○	○	○	○	○	○

Wie sehr stimmen Sie den folgenden Aussagen zu?

	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich wünschte, die Fortbildung hätte länger gedauert.	○	○	○	○	○	○
Ich wünschte, in der Fortbildung würden mehr Inhalte vermittelt werden.	○	○	○	○	○	○
Das interaktive Format der Fortbildung ist angemessen.	○	○	○	○	○	○
Die Fortbildung hat mir gezeigt, welche Kompetenzen mir zur Vermittlung entsprechender Inhalte im Unterricht fehlen.	○	○	○	○	○	○
In der Fortbildung habe ich genug Kompetenzen erworben, um die gelernten Inhalte im Unterricht zu vermitteln.	○	○	○	○	○	○
Nach der Fortbildung bin ich zuversichtlich, dass ich die gelernten Inhalte selbstständig im Unterricht umsetzen kann.	○	○	○	○	○	○
Durch die Fortbildung habe ich gelernt, Regressionsanalyse mit Orange3 im Unterricht einzusetzen.	○	○	○	○	○	○
Durch die Fortbildung konnte ich mein Wissen in blockbasierter Programmierung vertiefen.	○	○	○	○	○	○
Durch die Fortbildung ist mein Interesse an das Thema KI und Datenanalyse gestiegen.	○	○	○	○	○	○

Ich möchte weiterhin im Bereich DL & KI dazulernen.

○ Ja
○ Nein

Würden Sie die heutige Veranstaltung weiterempfehlen?

○ Ja
○ Nein

Welche Anregungen möchten Sie dem Schulungsteam mitgeben?

Angabe ist freiwillig

Im Rahmen der Evaluation möchten wir Ihnen im Folgenden die sechs Wissensfragen aus der Vorher-Befragung zum Thema KI und Datenanalyse erneut stellen. Keine Sorge, wenn Sie die Antworten nicht wissen - wir erwarten nicht, dass Sie über Expertise auf diesem Gebiet verfügen. Bitte antworten Sie nach bestem Wissen und Gewissen. Wenn Sie die Antwort auf eine Frage nicht wissen, wählen Sie einfach die Option "Ich weiß die Antwort nicht". Ihre Antworten sind für unsere Evaluation und Verbesserung zukünftiger Angebote von großer Bedeutung.

Lineare Regression wird verwendet, um ...

Mehrfachnennungen sind möglich.

☐ ...Trends in Daten zu erkennen.

☐ ...Muster in Bildern zu erkennen.

☐ ...die Beziehung zwischen einer abhängigen und einer unabhängigen Variablen zu schätzen.

☐ ...Datenpunkte mit ähnlichen Eigenschaften zu clustern.

☐ Ich weiß die Antwort nicht.

Wozu wird das Widget "Scatter Plot" in Orange3 verwendet?

Mehrfachnennungen sind möglich.

☐ Datenkomprimierung

☐ Visualisierung der Normalverteilung eines Datensatzes

☐ Visualisierung von Beziehungen zwischen zwei numerischen Variablen

☐ Zur Erkennung von Ausreißern

☐ Ich weiß die Antwort nicht

Was ist eine gute umgangssprachliche Beschreibung für "überwachtes Lernen"?

○ Lernen durch Belohnen

○ Lernen durch Bestrafen

○ Lernen aus Erfahrung

○ Lernen aus Beispielen

○ Ich weiß die Antwort nicht.

Welche Phasen werden bei einer Bilderkennung, die nach dem Prinzip des "überwachten Lernens" funktioniert, unterschieden?

Mehrfachnennungen sind möglich.

☐ Auswahl und Bereinigung der Daten

☐ Trainingsphase

☐ Selbstreflexionsphase

☐ Testphase

☐ Ich weiß die Antwort nicht.

Welche der folgenden Eigenschaften kennzeichnen intelligente Agenten?

Mehrfachnennungen sind möglich.

- ☐ Sie lernen aus Erfahrung.
- ☐ Sie handeln autonom.
- ☐ Sie nehmen ihre Umgebung wahr.
- ☐ Sie besitzen die Fähigkeit, Lösungen für nicht definierte Probleme zu finden.
- ☐ Ich weiß die Antwort nicht.

Was sind Beispiele für intelligente Agenten?

Mehrfachnennungen sind möglich.

- ☐ ein Virenscanner
- ☐ eine Bilderkennung
- ☐ ein autonomes Fahrzeug
- ☐ ein Gegner aus einem Computerspiel, der auf die Reaktionen des Spielers reagiert
- ☐ Ich weiß die Antwort nicht.

[Fragebogen absenden]

8.2 STEAM training Berlin (23.08.2023), German version of the pre- and post-questionnaire

TrainDL - Vorher-Befragung

Wir danken Ihnen für Ihre Teilnahme an der Fortbildung und den Befragungen/Evaluationen.

In dem EU-Projekt TrainDL werden Konzepte und Kompetenzen zu Data Literacy (DL) und Künstlicher Intelligenz (KI) erarbeitet, um diese in die Lehrkräfte- und Schulbildung zu integrieren und verankern.

Zentral dafür ist die heute am 23.08.23 stattfindende Fortbildung. Bevor diese startet, möchten wir Ihnen kurz einige Fragen stellen

1. zu Ihrem Kenntnisstand zu KI und DL und möglichen bisherigen Erfahrungen damit und
2. Fragen zu Ihrer Person, z. B. Ihrer Fachrichtung

Die Ergebnisse geben uns die Möglichkeit, die Fortbildung zu bewerten, nachfolgende Fortbildungen zu optimieren und Eindrücke zu den Themengebieten zu sammeln. Es gibt Ihnen die Möglichkeit, an der Policy-Bildung mitzuwirken.

Die gleich startende Vorher-Befragung wird eine Zeit von ca. 5 bis 10 Minuten in Anspruch nehmen.

Die Grundlagen zum Schutz personenbezogener Daten, Datenschutz und zu anderen Rechtsgrundlagen werden dabei gewahrt, insbesondere:

- Die erhobenen Daten können Ihrer Person durch Verwendung eines Pseudonymisierungscodes nicht zugeordnet werden. Der Code dient lediglich der Zuordnung evtl. weiterer Befragungen zu der von Ihnen heute ausgefüllten.
- Die Fragebögen werden während der Laufzeit des Projekts (voraussichtlich Ende Februar 2024) auf Arbeitsplatzrechnern von Mitgliedern des Projektteams sowie auf einem Server der Universität Potsdam gespeichert. Auf diesen Server haben nur Mitarbeiter*innen Zugriff, die an der Studie arbeiten. Nach Projektende werden die Daten auf den Arbeitsplatzrechnern gelöscht.
- Die Datensätze werden gemäß den Anforderungen des Fördermittelgebers für mindestens weitere 10 Jahre nach Projektende auf dem Server gespeichert. Zudem ist eine Veröffentlichung der anonymisierten Datensätze (ohne personenbezogene Daten wie Alter, Geschlecht, Bundesland, Fächer etc.) in einem Forschungsdaten-Repositorium vorgesehen, um eine Sekundärauswertung für künftige, derzeit noch nicht benennbare Forschungsvorhaben zu ermöglichen.

Durch Klicken auf „Befragung beginnen" willigen Sie in die eben beschriebene Nutzung Ihrer Daten ein.

- Ihre Einwilligung können Sie jederzeit ohne Angaben von Gründen widerrufen ohne dass Ihnen Nachteile daraus entstehen.
- Aus dem Widerruf Ihrer Einwilligungserklärung folgt, dass die Verarbeitung Ihrer personenbezogenen Daten für die Zukunft unzulässig wird und die bis zu diesem Zeitpunkt erfassten Daten unverzüglich gelöscht werden.

Pseudonymisierungscode

Ihre Daten werden durch den unten von Ihnen angegebenen Code pseudonymisiert. Durch die Verwendung eines Pseudonymisierungscodes können die erhobenen Daten nicht Ihrer Person zugeordnet werden. Darüber hinaus wird der Code verwendet, um verschiedene von Ihnen ausgefüllte Befragungen miteinander zu verknüpfen.

Die ersten beiden Buchstaben des Vornamens Ihrer Mutter

Geben Sie bitte für den Pseudonymisierungscode die ersten beiden Buchstaben des Vornamens Ihrer Mutter ein. Wenn Sie diesen nicht wissen, geben Sie XX ein. Bsp.: Marie = MA; Umlaute werden zu Vokalen Ö = O, Ü = U, Ä = A

XX

Bitte wählen Sie Ihren Geburtstag aus

Wenn Sie beispielsweise am 01.12.1969 geboren sind wählen Sie die 01.

[bitte wählen] ▾

Die letzten beiden Buchstaben Ihres Geburtsorts

Geben Sie die letzten beiden Buchstaben Ihres Geburtsorts ein. Wenn Sie diesen nicht wissen, geben Sie bitte XX ein. Bsp.: Berlin = IN; Umlaute werden zu Vokalen Ö = O, Ü = U, Ä = A

XX
-

Einstellung und Anwendung DL und KI

DL steht im Folgenden immer für **Data Literacy**.
Es ist die Fähigkeit, mit Daten planvoll umzugehen und sie im jeweiligen Kontext bewusst nutzen und hinterfragen zu können. Dazu gehören die Kompetenzen, Daten zu sammeln, zu erkunden, zu verwalten, zu analysieren, zu visualisieren, zu interpretieren, zu kontextualisieren, zu bewerten und anzuwenden.

KI steht für **Künstliche Intelligenz**.
Damit werden verschiedene Technologien und Verfahren beschrieben, die sich mit der Automatisierung intelligenten Verhaltens (z. B. Entscheidungsfindung, Problemlösung, Lernen) und dem maschinellen Lernen befassen.

Für jedes der folgenden Themen wählen Sie bitte die Option aus, die Ihre Erfahrung am besten beschreibt:

	Ich habe noch nie davon gehört.	Ich habe davon gehört, aber erinnere mich nicht/weiß nicht, was es ist.	Ich habe eine Vorstellung davon, aber nicht sehr deutlich.	Ich weiß, was es ist und wofür es benutzt wird/werden könnte.	Ich bin mit dessen Verwendung vertraut und weiß, wie es im Unterricht umgesetzt werden kann.
Data Literacy (DL)	○	○	○	○	○
Künstliche Intelligenz (KI)	○	○	○	○	○

Einstellung und Anwendung DL und KI

Wie sehr stimmen Sie den folgenden Aussagen zu?

	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich weiß, wie man Inhalte über Data Literacy (DL) im Unterricht einsetzen kann.	○	○	○	○	○	○
Die Vermittlung von DL wird zukünftig den Schüler*innen einen Mehrwert bringen.	○	○	○	○	○	○
Ich weiß, wie man Inhalte über Künstliche Intelligenz (KI) im Unterricht einsetzen kann.	○	○	○	○	○	○
Die Vermittlung von KI wird zukünftig den Schüler*innen einen Mehrwert bringen.	○	○	○	○	○	○

Wie oft tun Sie Folgendes?

	nie	einmalig	wenige Male im Schuljahr	monatlich	wöchentlich
Ich vermittle Wissen über KI in meinem Unterricht.	○	○	○	○	○
Ich vermittle Wissen über DL in meinem Unterricht.	○	○	○	○	○

Persönliche Angaben

Welcher Altersgruppe gehören Sie an?

○ 20 - 29
○ 30 - 39
○ 40 - 49
○ 50 - 59
○ 60 - 69
○ über 69

Welchem Geschlecht ordnen Sie sich selbst zu?

○ weiblich
○ männlich
○ anderes Geschlecht
○ keine Angabe

Wie viele Jahre haben Sie schon unterrichtet?

Jahre

In welchem Bundesland sind Sie tätig?

[bitte wählen] ▼

Wie viel Stunden unterrichten Sie durchschnittlich pro Woche?
ohne Vor- und Nachbereitung

h

Wie viele Stunden pro Woche verbringen Sie durchschnittlich mit Vor- und Nachbereitung des Unterrichts?

h

In welcher Phase des beruflichen Werdegangs befinden Sie sich bzw. auf welchen Ebenen sind Sie tätig?
Mehrfachnennungen sind möglich.

☐ Studium

☐ Referendariat / berufsbegleitender Einstieg

☐ Abgeschlossene Ausbildung / Lehrkraft im Schuldienst

☐ Schulmanagement (z. B. Schulleitung, Mittelstufenkoordination)

☐ Lehrkräftebildung (z. B. Fachseminarleitung)

Welche Klassenstufen unterrichten Sie?

Mehrfachnennungen sind möglich.

☐ 13 ☐ 12

☐ 11 ☐ 10

☐ 9 ☐ 8

☐ 7 ☐ 6

☐ 5 ☐ 4

☐ 3 ☐ 2

☐ 1 ☐ sonstige

Welche Fächer unterrichten Sie?

Mehrfachnennungen sind möglich.

☐ Informatik   ☐ Deutsch

☐ Mathematik   ☐ Fremdsprachen

☐ Biologie   ☐ Physik

☐ Chemie   ☐ Kunst

☐ Sport   ☐ Religion/Ethik

☐ Politik   ☐ Erdkunde

☐ Musik   ☐ Geschichte

☐ Sonstiges (bitte angeben)   ☐ Philosophie

Mathematik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Mathematik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Mathematik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Mathematik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Mathematik sehr wichtig ist.	○	○	○	○	○	○

Physik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Physik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Physik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Physik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Physik sehr wichtig ist.	○	○	○	○	○	○

Biologie

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Biologie.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Biologie.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Biologie sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Biologie sehr wichtig ist.	○	○	○	○	○	○

Chemie

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Chemie.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Chemie.	○	○	○	○	○	○
Unterfragen-Text	○	○	○	○	○	○
Unterfragen-Text	○	○	○	○	○	○

Informatik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Informatik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Informatik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Informatik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Informatik sehr wichtig ist.	○	○	○	○	○	○

Geschichte

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Geschichte.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Geschichte.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Geschichte sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Geschichte sehr wichtig ist.	○	○	○	○	○	○

Religion/Ethik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Religion/Ethik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Religion/Ethik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Religion/Ethik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Religion/Ethik sehr wichtig ist.	○	○	○	○	○	○

Politik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Politik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Politik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Politik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Politik sehr wichtig ist.	○	○	○	○	○	○

Erdkunde

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Erdkunde.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Erdkunde.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Erdkunde sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Erdkunde sehr wichtig ist.	○	○	○	○	○	○

Kunst

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Kunst.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Kunst.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Kunst sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Kunst sehr wichtig ist.	○	○	○	○	○	○

Musik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Musik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Musik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Fach Musik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Fach Musik sehr wichtig ist.	○	○	○	○	○	○

Sport

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Sport.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Sport.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Sport sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Sport sehr wichtig ist.	○	○	○	○	○	○

Deutsch

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Deutsch.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Deutsch.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Deutsch sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Deutsch sehr wichtig ist.	○	○	○	○	○	○

Fremdsprachen

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan in meinem Fremdsprachenfach.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan in meinem Fremdsprachenfach.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL in meinem Fremdsprachenfach sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI in meinem Fremdsprachenfach sehr wichtig ist.	○	○	○	○	○	○

Philosophie

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Philosophie.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Philosophie.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Philosophie sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Philosophie sehr wichtig ist.	○	○	○	○	○	○

Sonstiges

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Platzhalter: 'Welche Fächer unterrichten Sie?'.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Platzhalter: 'Welche Fächer unterrichten Sie?'.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Platzhalter: 'Welche Fächer unterrichten Sie?' sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Platzhalter: 'Welche Fächer unterrichten Sie?' sehr wichtig ist.	○	○	○	○	○	○

Fragebogen absenden

TrainDL - Vorher-Befragung

Vielen Dank für Ihre Teilnahme.

Zum ordnungsgemäßen Beenden klicken Sie bitte auf "Befragung beenden".

Befragung beenden

TrainDL - Nachher-Befragung

Wir danken Ihnen für Ihre Teilnahme an der Fortbildung und den Befragungen/Evaluationen.

In dieser Befragung geht es vor allem um Eindrücke über die gerade absolvierte Fortbildung. Genauer werden Sie hier

1. zur Fortbildung selbst sowie
2. zu auf Ihre Person bezogene Einschätzungen (z. B. Anwendbarkeit der Themen) befragt.

Die Ergebnisse geben uns die Möglichkeit, die Fortbildung zu bewerten, nachfolgende Fortbildungen zu optimieren und Eindrücke zu den Themengebieten zu sammeln. Es gibt Ihnen die Möglichkeit, an der Policy-Bildung mitzuwirken.

Die gleich startende Befragung wird eine Zeit von ca. 5 bis 10 Minuten in Anspruch nehmen.

Die Grundlagen zum Schutz personenbezogener Daten, Datenschutz und zu anderen Rechtsgrundlagen werden dabei gewahrt, insbesondere:

- Die erhobenen Daten können Ihrer Person durch Verwendung eines Pseudonymisierungscodes nicht zugeordnet werden. Der Code dient lediglich der Zuordnung evtl. weiterer Befragungen zu der von Ihnen heute ausgefüllten.
- Die Fragebögen werden während der Laufzeit des Projekts (voraussichtlich Ende Februar 2024) auf Arbeitsplatzrechnern von Mitgliedern des Projektteams sowie auf einem Server der Universität Potsdam gespeichert. Auf diesen Server haben nur Mitarbeiter*innen Zugriff, die an der Studie arbeiten. Nach Projektende werden die Daten auf den Arbeitsplatzrechnern gelöscht.
- Die Datensätze werden gemäß den Anforderungen des Fördermittelgebers für mindestens weitere 10 Jahre nach Projektende auf dem Server gespeichert. Zudem ist eine Veröffentlichung der anonymisierten Datensätze (ohne personenbezogene Daten wie Alter, Geschlecht, Bundesland, Fächer etc.) in einem Forschungsdaten-Repositorium vorgesehen, um eine Sekundärauswertung für künftige, derzeit noch nicht benennbare Forschungsvorhaben zu ermöglichen.

Durch Klicken auf „Befragung beginnen" willigen Sie in die eben beschriebene Nutzung Ihrer Daten ein.

- Ihre Einwilligung können Sie jederzeit ohne Angaben von Gründen widerrufen ohne dass Ihnen Nachteile daraus entstehen.
- Aus dem Widerruf Ihrer Einwilligungserklärung folgt, dass die Verarbeitung Ihrer personenbezogenen Daten für die Zukunft unzulässig wird und die bis zu diesem Zeitpunkt erfassten Daten unverzüglich gelöscht werden.

Pseudonymisierungscode

Ihre Daten werden durch den unten von Ihnen angegebenen Code pseudonymisiert. Durch die Verwendung eines Pseudonymisierungscodes können die erhobenen Daten nicht Ihrer Person zugeordnet werden. Darüber hinaus wird der Code verwendet, um verschiedene von Ihnen ausgefüllte Befragungen miteinander zu verknüpfen.

Die ersten beiden Buchstaben des Vornamens Ihrer Mutter

Geben Sie bitte für den Pseudonymisierungscode die ersten beiden Buchstaben des Vornamens Ihrer Mutter ein. Wenn Sie diesen nicht wissen, geben Sie XX ein. Bsp.: Marie = MA; Umlaute werden zu Vokalen Ö = O, Ü = U, Ä = A

XX

Bitte wählen Sie Ihren Geburtstag aus

Wenn Sie beispielsweise am 01.12.1969 geboren sind wählen Sie die 01.

[bitte wählen] ▾

Die letzten beiden Buchstaben Ihres Geburtsorts

Geben Sie die letzten beiden Buchstaben Ihres Geburtsorts ein. Wenn Sie diesen nicht wissen, geben Sie bitte XX ein. Bsp.: Berlin = IN; Umlaute werden zu Vokalen Ö = O, U = Ü, Ä = A

XX

-

Einstellung und Anwendung DL und KI

DL steht im Folgenden immer für **Data Literacy**.
Es ist die Fähigkeit, mit Daten planvoll umzugehen und sie im jeweiligen Kontext bewusst nutzen und hinterfragen zu können. Dazu gehören die Kompetenzen, Daten zu sammeln, zu erkunden, zu verwalten, zu analysieren, zu visualisieren, zu interpretieren, zu kontextualisieren, zu bewerten und anzuwenden.

KI steht für **Künstliche Intelligenz**.
Damit werden verschiedene Technologien und Verfahren beschrieben, die sich mit der Automatisierung intelligenten Verhaltens (z. B. Entscheidungsfindung, Problemlösung, Lernen) und dem maschinellen Lernen befassen.

Wie sehr stimmen Sie den folgenden Aussagen zu?

	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich weiß, wie man Inhalte über Data Literacy (DL) im Unterricht einsetzen kann.	○	○	○	○	○	○
Die Vermittlung von DL wird zukünftig den Schüler*innen einen Mehrwert bringen.	○	○	○	○	○	○
Ich bin bereit zeitlichen Aufwand zu investieren, um DL-bezogene Themen in meinen Unterricht einzubauen.	○	○	○	○	○	○
DL-bezogene Themen sind gesellschaftlich wichtig genug, um Sie in den Lehrplan aufzunehmen.	○	○	○	○	○	○
Ich kann mir vorstellen, dass meine Schüler*innen Begeisterung für das Gesamtthema DL aufbringen.	○	○	○	○	○	○
Ich weiß, wie man Inhalte über Künstliche Intelligenz (KI) im Unterricht einsetzen kann.	○	○	○	○	○	○
Die Vermittlung von KI wird zukünftig den Schüler*innen einen Mehrwert bringen.	○	○	○	○	○	○
Ich bin bereit zeitlichen Aufwand zu investieren, um KI-bezogene Themen in meinen Unterricht einzubauen.	○	○	○	○	○	○
KI-bezogene Themen sind gesellschaftlich wichtig genug, um Sie in den Lehrplan aufzunehmen.	○	○	○	○	○	○
Ich kann mir vorstellen, dass meine Schüler*innen Begeisterung für das Gesamtthema KI aufbringen.	○	○	○	○	○	○

Wie sehr stimmen Sie den folgenden Aussagen zu?

	stimme gar nicht zu	stimme eher nicht zu	stimme eher zu	stimme voll und ganz zu
	1	2	3	4
Ich traue mir zu, die Schüler*innen für Projekte im Bereich DL zu begeistern.	○	○	○	○
Ich traue mir zu, die Schüler*innen für Projekte im Bereich KI zu begeistern.	○	○	○	○

Welche Fächer unterrichten Sie?

*Bitte nennen Sie nochmal Ihr Fach/Ihre Fächer, sodass wir erfahren können, wie Sie fehlende Inhalte zu DL und KI **nach** der Fortbildung einschätzen.*
Mehrfachnennungen sind möglich.

- ☐ Informatik
- ☐ Mathematik
- ☐ Biologie
- ☐ Chemie
- ☐ Sport
- ☐ Politik
- ☐ Musik
- ☐ Sonstiges (bitte angeben)

- ☐ Deutsch
- ☐ Fremdsprachen
- ☐ Physik
- ☐ Kunst
- ☐ Religion/Ethik
- ☐ Erdkunde
- ☐ Geschichte
- ☐ Philosophie

[   ]

Mathematik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Mathe.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Mathe.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Mathe sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Mathe sehr wichtig ist.	○	○	○	○	○	○

Informatik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Informatik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Informatik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Informatik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Informatik sehr wichtig ist.	○	○	○	○	○	○

Deutsch

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Deutsch.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Deutsch.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Deutsch sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Deutsch sehr wichtig ist.	○	○	○	○	○	○

Fremdsprachen

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan in meinem Fremdsprachenfach.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan in meinem Fremdsprachenfach.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL in meinem Fremdsprachenfach sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI in meinem Fremdsprachenfach sehr wichtig ist.	○	○	○	○	○	○

Biologie

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Biologie.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Biologie.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Biologie sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Biologie sehr wichtig ist.	○	○	○	○	○	○

Chemie

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Chemie.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Chemie.	○	○	○	○	○	○
Unterfragen-Text	○	○	○	○	○	○
Unterfragen-Text	○	○	○	○	○	○

Religion/Ethik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Religion/Ethik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Religion/Ethik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Religion/Ethik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Religion/Ethik sehr wichtig ist.	○	○	○	○	○	○

Physik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Physik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Physik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Physik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Physik sehr wichtig ist.	○	○	○	○	○	○

Kunst

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Kunst.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Kunst.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Kunst sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Kunst sehr wichtig ist.	○	○	○	○	○	○

Sport

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Sport.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Sport.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Sport sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Sport sehr wichtig ist.	○	○	○	○	○	○

Erdkunde

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Erdkunde.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Erdkunde.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Erdkunde sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Erdkunde sehr wichtig ist.	○	○	○	○	○	○

Politik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Politik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Politik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Politik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Politik sehr wichtig ist.	○	○	○	○	○	○

Geschichte

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Geschichte.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Geschichte.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Geschichte sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Geschichte sehr wichtig ist.	○	○	○	○	○	○

Musik

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Musik.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Musik.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Fach Musik sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Fach Musik sehr wichtig ist.	○	○	○	○	○	○

Philosophie

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Philosophie.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Philosophie.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Philosophie sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Philosophie sehr wichtig ist.	○	○	○	○	○	○

Sonstiges

Wie sehr stimmen Sie den folgenden Aussagen zu?	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan im Fach Platzhalter: ".	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan im Fach Platzhalter: ".	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von DL im Fach Platzhalter: " sehr wichtig ist.	○	○	○	○	○	○
Ich finde, dass die Integration und Vermittlung von KI im Fach Platzhalter: " sehr wichtig ist.	○	○	○	○	○	○

Wie geeignet fanden Sie die Themenwahl der Fortbildung für die Einführung von KI in Ihrem Unterricht?

	kann mich nicht erinnern	gar nicht geeignet					sehr gut geeignet
		1	2	3	4	5	6
Einführung in die grundlegenden Konzepte von KI	○	○	○	○	○	○	○
Prompt Engineering mit ChatGPT	○	○	○	○	○	○	○

Wie geeignet fanden Sie die Aktivitäten aus der Fortbildung für Ihren Unterricht?

	habe nicht daran teilgenommen	gar nicht geeignet					sehr gut geeignet
		1	2	3	4	5	6
Prompt-Engineering mit ChatGPT	○	○	○	○	○	○	○
Musterkunden	○	○	○	○	○	○	○
Schlag den Roboter	○	○	○	○	○	○	○
Grimms erste Sätze	○	○	○	○	○	○	○
Teachable Machine	○	○	○	○	○	○	○
KI und Musik	○	○	○	○	○	○	○

Wie sehr stimmen Sie den folgenden Aussagen zu?

	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich wünschte, die Fortbildung hätte länger gedauert.	○	○	○	○	○	○
Ich wünschte, in der Fortbildung würden mehr Inhalte vermittelt werden.	○	○	○	○	○	○
In der Fortbildung wurden zu viele Unterrichtsmaterialien vorgestellt.	○	○	○	○	○	○
Das interaktive Format der Fortbildung ist angemessen.	○	○	○	○	○	○
Ich bräuchte viel Vorbereitung, um die Themen und Anwendungsbeispiele in meinem Unterricht zu vermitteln.	○	○	○	○	○	○
Die Fortbildung hat mir gezeigt, welche Kompetenzen mir zur Vermittlung entsprechender Inhalte im Unterricht fehlen.	○	○	○	○	○	○
In der Fortbildung habe ich genug Kompetenzen erworben, um die gelernten Inhalte im Unterricht zu vermitteln.	○	○	○	○	○	○
Nach der Fortbildung bin ich zuversichtlich, dass ich die gelernten Inhalte selbstständig im Unterricht umsetzen kann.	○	○	○	○	○	○
Durch die Fortbildung ist mein Interesse an den Themen DL und KI gestiegen.	○	○	○	○	○	○
Ich habe Grundwissen über den Umgang mit Daten für den Unterricht erworben.	○	○	○	○	○	○
Ich habe Grundwissen über die Anwendung von KI im Unterricht erworben.	○	○	○	○	○	○
Durch die Fortbildung wurde ich für ethische Aspekte von KI sensibilisiert.	○	○	○	○	○	○
Nach der Fortbildung bin ich in der Lage, gängige Mythen über KI zu widerlegen.	○	○	○	○	○	○

Ich habe Wissen über Unterstützungsmöglichkeiten durch KI im Unterrichtsalltag erworben.	○	○	○	○	○	○
Ich bin mir sicher, dass ich Lehrkräfte im Umgang mit KI-Anwendungen beraten kann.	○	○	○	○	○	○
Ich fühle mich sicher im Umgang mit datenschutzrechtlichen Fragen im Zusammenhang mit der Nutzung von Sprachmodellen.	○	○	○	○	○	○

Ich möchte weiterhin im Bereich von DL & KI dazulernen.

○ ja
○ nein

Gründe für den Wunsch zum Weiterlernen

Ich möchte weiterhin im Bereich von DL & KI dazulernen, ...	stimme gar nicht zu	stimme eher nicht zu	stimme eher zu	stimme voll und ganz zu
	1	2	3	4
... weil sie einen wichtigen Beitrag zur Ausbildung von Kindern und Jugendlichen leisten.	○	○	○	○
... weil das interessante Inhalte für meine Schüler*innen sind.	○	○	○	○
... weil sie mich selbst interessieren.	○	○	○	○
... weil ich diese Inhalte für mein Fach/für meine Fächer als wichtig erachte.	○	○	○	○

Würden Sie die heutige Veranstaltung weiterempfehlen?

○ Ja
○ Nein

Welche Anregungen möchten Sie dem Schulungsteam/den Organisator*innen mitgeben?
Angabe ist freiwillig

Fragebogen absenden

TrainDL - Nachher-Befragung

Vielen Dank für Ihre Teilnahme.

Zum ordnungsgemäßen Beenden klicken Sie bitte auf "Befragung beenden".

Befragung beenden

8.3   Primary training Berlin (13.09.2023), German version of the pre- and post-questionnaire

TrainDL - Vorher-Befragung

Wir danken Ihnen für Ihre Teilnahme an der Fortbildung und den Befragungen/Evaluationen.

In dem EU-Projekt TrainDL werden Konzepte und Kompetenzen zu Data Literacy (DL) und Künstlicher Intelligenz (KI) erarbeitet, um diese in die Lehrkräfte- und Schulbildung zu integrieren und verankern.

Zentral dafür ist die am 13.09.23 stattfindende Fortbildung "Künstliche Intelligenz und Datenkompetenz in der Grundschule". Bevor diese startet, möchten wir Ihnen kurz einige Fragen stellen

1. zu Ihrem Kenntnisstand zu KI und DL und möglichen bisherigen Erfahrungen damit und
2. Fragen zu Ihrer Person, z. B. Ihrer Fachrichtung

Außerdem bitten wir Sie, am Ende einen kurzen unverfänglichen Wissenstest zu absolvieren.

Die Ergebnisse geben uns die Möglichkeit, die Fortbildung zu bewerten, nachfolgende Fortbildungen zu optimieren und Eindrücke zu den Themengebieten zu sammeln. Es gibt Ihnen die Möglichkeit, an der Policy-Bildung mitzuwirken.

Die gleich startende Vorher-Befragung wird eine Zeit von ca. 10 Minuten in Anspruch nehmen.

Die Grundlagen zum Schutz personenbezogener Daten, Datenschutz und zu anderen Rechtsgrundlagen werden dabei gewahrt, insbesondere:

- Die erhobenen Daten können Ihrer Person durch Verwendung eines Pseudonymisierungscodes nicht zugeordnet werden. Der Code dient lediglich der Zuordnung evtl. weiterer Befragungen zu der von Ihnen heute ausgefüllten.
- Die Fragebögen werden während der Laufzeit des Projekts (voraussichtlich Ende Februar 2024) auf Arbeitsplatzrechnern von Mitgliedern des Projektteams sowie auf einem Server der Universität Potsdam gespeichert. Auf diesen Server haben nur Mitarbeiter*innen Zugriff, die an der Studie arbeiten. Nach Projektende werden die Daten auf den Arbeitsplatzrechnern gelöscht.
- Die Datensätze werden gemäß den Anforderungen des Fördermittelgebers für mindestens weitere 10 Jahre nach Projektende auf dem Server gespeichert. Zudem ist eine Veröffentlichung der anonymisierten Datensätze (ohne personenbezogene Daten wie Alter, Geschlecht, Bundesland, Fächer etc.) in einem Forschungsdaten-Repositorium vorgesehen, um eine Sekundärauswertung für künftige, derzeit noch nicht benennbare Forschungsvorhaben zu ermöglichen.

Durch Klicken auf „Befragung beginnen" willigen Sie in die eben beschriebene Nutzung Ihrer Daten ein.

- Ihre Einwilligung können Sie jederzeit ohne Angaben von Gründen widerrufen ohne dass Ihnen Nachteile daraus entstehen.
- Aus dem Widerruf Ihrer Einwilligungserklärung folgt, dass die Verarbeitung Ihrer personenbezogenen Daten für die Zukunft unzulässig wird und die bis zu diesem Zeitpunkt erfassten Daten unverzüglich gelöscht werden.

Pseudonymisierungscode

Ihre Daten werden durch den unten von Ihnen angegebenen Code pseudonymisiert. Durch die Verwendung eines Pseudonymisierungscodes können die erhobenen Daten nicht Ihrer Person zugeordnet werden. Darüber hinaus wird der Code verwendet, um verschiedene von Ihnen ausgefüllte Befragungen miteinander zu verknüpfen.

Die ersten beiden Buchstaben des Vornamens Ihrer Mutter

Geben Sie bitte für den Pseudonymisierungscode die ersten beiden Buchstaben des Vornamens Ihrer Mutter ein. Wenn Sie diesen nicht wissen, geben Sie XX ein. Bsp.: Marie = MA; Umlaute werden zu Vokalen Ö = O, Ü = U, Ä = A

XX

Bitte wählen Sie Ihren Geburtstag aus

Wenn Sie beispielsweise am 01.12.1969 geboren sind wählen Sie die 01.

[bitte wählen] ▾

Die letzten beiden Buchstaben Ihres Geburtsorts

Geben Sie die letzten beiden Buchstaben Ihres Geburtsorts ein. Wenn Sie diesen nicht wissen, geben Sie bitte XX ein. Bsp.: Berlin = IN; Umlaute werden zu Vokalen Ö = O, U = Ü, Ä = A

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-

Einstellung und Anwendung DL und KI

DL steht im Folgenden immer für **Data Literacy.**
Es ist die Fähigkeit, mit Daten planvoll umzugehen und sie im jeweiligen Kontext bewusst nutzen und hinterfragen zu können. Dazu gehören die Kompetenzen, Daten zu sammeln, zu erkunden, zu verwalten, zu analysieren, zu visualisieren, zu interpretieren, zu kontextualisieren, zu bewerten und anzuwenden.

KI steht für **Künstliche Intelligenz.**
Damit werden verschiedene Technologien und Verfahren beschrieben, die sich mit der Automatisierung intelligenten Verhaltens (z. B. Entscheidungsfindung, Problemlösung, Lernen) und dem maschinellen Lernen befassen.

Für jedes der folgenden Themen wählen Sie bitte die Option aus, die Ihre Erfahrung am besten beschreibt:

	Ich habe noch nie davon gehört.	Ich habe davon gehört, aber erinnere mich nicht/weiß nicht, was es ist.	Ich habe eine Vorstellung davon, aber nicht sehr deutlich.	Ich weiß, was es ist und wofür es benutzt wird/werden könnte.	Ich bin mit dessen Verwendung vertraut und weiß, wie es im Untericht umgesetzt werden kann.
Data Literacy (DL)	○	○	○	○	○
Künstliche Intelligenz (KI)	○	○	○	○	○

Einstellung und Anwendung DL und KI

Wie sehr stimmen Sie den folgenden Aussagen zu?

	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich weiß, wie man Inhalte über Data Literacy (DL) im Unterricht einsetzen kann.	○	○	○	○	○	○
Die Vermittlung von DL wird zukünftig den Schüler*innen einen Mehrwert bringen.	○	○	○	○	○	○
Ich weiß, wie man Inhalte über Künstliche Intelligenz (KI) im Unterricht einsetzen kann.	○	○	○	○	○	○
Die Vermittlung von KI wird zukünftig den Schüler*innen einen Mehrwert bringen.	○	○	○	○	○	○

Wie oft tun Sie Folgendes?

	nie	einmalig	wenige Male im Schuljahr	monatlich	wöchentlich
Ich vermittle Wissen über KI in meinem Unterricht.	○	○	○	○	○
Ich vermittle Wissen über DL in meinem Unterricht.	○	○	○	○	○

Persönliche Angaben

Welcher Altersgruppe gehören Sie an?

○ 20-29
○ 30-39
○ 40-49
○ 50-59
○ 60-69
○ über 69

Welchem Geschlecht ordnen Sie sich selbst zu?

○ Weiblich
○ Männlich
○ Anderes Geschlecht
○ Keine Angabe

Wie viele Jahre haben Sie schon unterrichtet?

Jahre

In welchem Bundesland sind Sie tätig?

[bitte wählen] ▼

Wie viel Stunden unterrichten Sie durchschnittlich pro Woche?

ohne Vor- und Nachbereitung

h

Wie viele Stunden pro Woche verbringen Sie durchschnittlich mit Vor- und Nachbereitung des Unterrichts?

h

In welcher Phase des beruflichen Werdegangs befinden Sie sich?"

○ Studium
○ Referendariat / berufsbegleitender Einstieg
○ Abgeschlossene Ausbildung / Lehrkraft im Schuldienst

Welche Klassenstufen unterrichten Sie?

Mehrfachnennungen sind möglich.

☐ 13 ☐ 12

☐ 11 ☐ 10

☐ 9 ☐ 8

☐ 7 ☐ 6

☐ 5 ☐ 4

☐ 3 ☐ 2

☐ 1 ☐ sonstige

Welche Fächer unterrichten Sie?

Mehrfachnennungen sind möglich.

☐ Informatik   ☐ Deutsch

☐ Mathematik   ☐ Fremdsprachen

☐ Biologie   ☐ Physik

☐ Chemie   ☐ Kunst

☐ Sport   ☐ Religion/Ethik

☐ Politik   ☐ Erdkunde

☐ Musik   ☐ Geschichte

☐ Philosophie   ☐ Lernbereich Ästhetische Erziehung

☐ Lernbereich Mathematische Grundbildung   ☐ Lernbereich Natur- und Gesellschaftswissenschaften

☐ Lernbereich Sprachliche Grundbildung   ☐ Sonstiges (bitte angeben)

Wie sehr stimmen Sie den folgenden Aussagen zu?

	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan in meinen Fächern/in meinem Fach.	○	○	○	○	○	○
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Die Integration und Vermittlung von DL in meinen Fächern/in meinem Fach ist sehr wichtig.	○	○	○	○	○	○
Die Integration und Vermittlung von KI in meinen Fächern/in meinem Fach ist sehr wichtig.	○	○	○	○	○	○

Im Rahmen der Workshop-Evaluation möchten wir Ihnen im Folgenden die sieben Wissensfragen zum Thema KI und DL stellen. Keine Sorge, wenn Sie die Antworten nicht wissen - wir erwarten nicht, dass Sie über Expertise auf diesem Gebiet verfügen. Bitte antworten Sie nach bestem Wissen und Gewissen. Wenn Sie die Antwort auf eine Frage nicht wissen, wählen Sie einfach die Option "Ich weiß die Antwort nicht". Ihre Antworten sind für unsere Evaluation und Verbesserung zukünftiger Angebote von großer Bedeutung.

Wie unterscheidet sich ein KI-System von einem gewöhnlichen Computerprogramm?

Wählen Sie die passendste Option

○ KI-Systeme sind lernfähig, während gewöhnliche Computerprogramme nicht lernfähig sind.

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Was ist ein Beispiel für Mustererkennung im täglichen Leben?

○ Die Berechnung des kürzesten Wegs zum Bahnhof.

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○ Ein Schachcomputer.

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Was ist ein Entscheidungsbaum?

○ Ein System, das Daten zufällig auswählt.

○ Ein Weg, Daten in einer baumartigen Struktur zu organisieren, um Entscheidungen zu treffen.

○ Ein System, das Muster in bereitgestellten Daten analysiert.

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Wie verwendet KI Entscheidungsbäume?

○ Um Muster in Daten zu analysieren.

○ Um neue Daten auf der Grundlage vorhandener Daten zu generieren.

○ Um Daten basierend auf ihren Attributen zu klassifizieren.

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Was ist der Unterschied zwischen klassischer KI und lernender KI?

○ Klassische KI ist immer besser als lernende KI.

○ Klassische KI folgt einem Satz von Regeln, während lernende KI sich im Laufe der Zeit verbessern kann.

○ Klassische KI wird nur in Videospielen verwendet, während lernende KI im echten Leben eingesetzt wird.

○ Ich weiß die Antwort nicht.

Fragebogen absenden

TrainDL - Vorher-Befragung

Vielen Dank für Ihre Teilnahme.

Zum ordnungsgemäßen Beenden klicken Sie bitte auf "Befragung beenden".

Befragung beenden

TrainDL - Nachher-Befragung

Wir danken Ihnen für Ihre Teilnahme an der Fortbildung und den Befragungen/Evaluationen.

In dieser Befragung geht es vor allem um Eindrücke über die absolvierte Fortbildung "Künstliche Intelligenz und Datenkompetenz in der Grundschule". Genauer werden Sie hier

1. zur Fortbildung selbst sowie
2. zu auf Ihre Person bezogene Einschätzungen (z. B. Anwendbarkeit der Themen) befragt.

Außerdem bitten wir Sie, am Ende einen kurzen unverfänglichen Wissenstest zu absolvieren.

Die Ergebnisse geben uns die Möglichkeit, die Fortbildung zu bewerten, nachfolgende Fortbildungen zu optimieren und Eindrücke zu den Themengebieten zu sammeln. Es gibt Ihnen die Möglichkeit, an der Policy-Bildung mitzuwirken.

Die gleich startende Befragung wird eine Zeit von ca. 10 Minuten in Anspruch nehmen.

Die Grundlagen zum Schutz personenbezogener Daten, Datenschutz und zu anderen Rechtsgrundlagen werden dabei gewahrt, insbesondere:

- Die erhobenen Daten können Ihrer Person durch Verwendung eines Pseudonymisierungscodes nicht zugeordnet werden. Der Code dient lediglich der Zuordnung evtl. weiterer Befragungen zu der von Ihnen heute ausgefüllten.
- Die Fragebögen werden während der Laufzeit des Projekts (voraussichtlich Ende Februar 2024) auf Arbeitsplatzrechnern von Mitgliedern des Projektteams sowie auf einem Server der Universität Potsdam gespeichert. Auf diesen Server haben nur Mitarbeiter*innen Zugriff, die an der Studie arbeiten. Nach Projektende werden die Daten auf den Arbeitsplatzrechnern gelöscht.
- Die Datensätze werden gemäß den Anforderungen des Fördermittelgebers für mindestens weitere 10 Jahre nach Projektende auf dem Server gespeichert. Zudem ist eine Veröffentlichung der anonymisierten Datensätze (ohne personenbezogene Daten wie Alter, Geschlecht, Bundesland, Fächer etc.) in einem Forschungsdaten-Repositorium vorgesehen, um eine Sekundärauswertung für künftige, derzeit noch nicht benennbare Forschungsvorhaben zu ermöglichen.

Durch Klicken auf „Befragung beginnen" willigen Sie in die eben beschriebene Nutzung Ihrer Daten ein.

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- Aus dem Widerruf Ihrer Einwilligungserklärung folgt, dass die Verarbeitung Ihrer personenbezogenen Daten für die Zukunft unzulässig wird und die bis zu diesem Zeitpunkt erfassten Daten unverzüglich gelöscht werden.

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[bitte wählen] ▾

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Wie sehr stimmen Sie den folgenden Aussagen zu?

	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich weiß, wie man Inhalte über Data Literacy (DL) im Unterricht einsetzen kann.	○	○	○	○	○	○
Die Vermittlung von DL wird zukünftig den Schüler*innen einen Mehrwert bringen.	○	○	○	○	○	○
DL-bezogene Themen sind gesellschaftlich wichtig genug, um Sie in den Lehrplan aufzunehmen.	○	○	○	○	○	○
Ich weiß, wie man Inhalte über Künstliche Intelligenz (KI) im Unterricht einsetzen kann.	○	○	○	○	○	○
Die Vermittlung von KI wird zukünftig den Schüler*innen einen Mehrwert bringen.	○	○	○	○	○	○
KI-bezogene Themen sind gesellschaftlich wichtig genug, um Sie in den Lehrplan aufzunehmen.	○	○	○	○	○	○

Wie sehr stimmen Sie den folgenden Aussagen zu?

	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich finde, die Inhalte zu DL fehlen im aktuellen Rahmenlehrplan in meinen Fächern/in meinem Fach.	○	○	○	○	○	○
Ich finde, die Inhalte zu KI fehlen im aktuellen Rahmenlehrplan in meinen Fächern/in meinem Fach.	○	○	○	○	○	○
Die Integration und Vermittlung von DL in meinen Fächern/in meinem Fach ist sehr wichtig.	○	○	○	○	○	○
Die Integration und Vermittlung von KI in meinen Fächern/in meinem Fach ist sehr wichtig.	○	○	○	○	○	○

Fortbildung

Wie geeignet fanden Sie die Themenwahl der Fortbildung für die Einführung von DL und KI in Ihrem Unterricht?

	gar nicht geeignet					sehr gut geeignet
	1	2	3	4	5	6
Einführung in den Umgang mit Daten	○	○	○	○	○	○
Einführung in die grundlegenden Konzepte von KI	○	○	○	○	○	○
Einführung in die ethischen Aspekte von KI	○	○	○	○	○	○
Mythen über KI widerlegen	○	○	○	○	○	○

Wie geeignet fanden Sie die Anwendungsbeispiele aus der Fortbildung für Ihren Unterricht?

	kann mich nicht erinnern	gar nicht geeignet					sehr gut geeignet
		1	2	3	4	5	6
Präsentation (Einführung in KI)	○	○	○	○	○	○	○
Übung(en) zu Data Mining	○	○	○	○	○	○	○
Übung mit dem Kartenspiel „Ligretto"	○	○	○	○	○	○	○
Übung „Guter Affe, Böser Affe"	○	○	○	○	○	○	○

Wie sehr stimmen Sie den folgenden Aussagen zu?

	gar nicht					auf jeden Fall
	1	2	3	4	5	6
Ich wünschte, die Fortbildung hätte länger gedauert.	○	○	○	○	○	○
Ich wünschte, in der Fortbildung würden mehr Inhalte vermittelt werden.	○	○	○	○	○	○
Das interaktive Format der Fortbildung ist angemessen.	○	○	○	○	○	○
Die Fortbildung hat mir gezeigt, welche Kompetenzen mir zur Vermittlung entsprechender Inhalte im Unterricht fehlen.	○	○	○	○	○	○
In der Fortbildung habe ich genug Kompetenzen gesammelt, um die gelernten Inhalte im Unterricht zu vermitteln.	○	○	○	○	○	○
Nach der Fortbildung bin ich zuversichtlich, dass ich die gelernten Inhalte selbstständig im Unterricht umsetzen kann.	○	○	○	○	○	○
Durch die Fortbildung ist mein Interesse an den Themen DL und KI gestiegen.	○	○	○	○	○	○
Ich habe Grundwissen über den Umgang mit Daten für den Unterricht erworben.	○	○	○	○	○	○
Ich habe Grundwissen über die Anwendung von KI im Unterricht erworben.	○	○	○	○	○	○
Durch die Fortbildung wurde ich sensibilisiert, ethische Aspekte von KI in meinen Unterricht einzubeziehen.	○	○	○	○	○	○
Nach der Fortbildung bin ich in der Lage, gängige Mythen über KI zu widerlegen.	○	○	○	○	○	○

Ich möchte weiterhin im Bereich von DL & KI dazulernen.

○ ja
○ nein

Würden Sie die heutige Veranstaltung weiterempfehlen?

○ Ja
○ Nein

Welche Anregungen möchten Sie dem Schulungsteam mitgeben?
Angabe ist freiwillig

Im Rahmen der Workshop-Evaluation möchten wir Ihnen im Folgenden die sieben Wissensfragen aus der Vorher-Befragung zum Thema KI und DL nochmal stellen. Keine Sorge, wenn Sie die Antworten nicht wissen - wir erwarten nicht, dass Sie über Expertise auf diesem Gebiet verfügen. Bitte antworten Sie nach bestem Wissen und Gewissen. Wenn Sie die Antwort auf eine Frage nicht wissen, wählen Sie einfach die Option "Ich weiß die Antwort nicht". Ihre Antworten sind für unsere Evaluation und Verbesserung zukünftiger Angebote von großer Bedeutung.

Wie unterscheidet sich ein KI-System von einem gewöhnlichen Computerprogramm?

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Fragebogen absenden

TrainDL - Nachher-Befragung

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Zum ordnungsgemäßen Beenden klicken Sie bitte auf "Befragung beenden".

Befragung beenden

8.4   STEAM training Vilnius (09.01.2024), interview guideline in English

You just attended a teacher training on Data Literacy (DL) and Artificial Intelligence (AI):
1. How did it come about?

If not answered, address the following (follow-up questions):

1.1 What were your expectations of the training?

1.2a How would you rate your previous experience with DL?

1.2b How would you rate your previous experience with AI?

1.3 Was the training appropriately designed according to your previous experience with AI & DL?

1.4 Describe what you liked about the training, if there was anything.

1.5 Describe what you did not like about the training, if there was anything.

1.6 After the training, how would you personally rate the difficulty of the topic for you?

Previous practical experience with topics in continuing education:

2. Have you ever integrated content about AI and/or DL into your teaching?
   (If the answer is "yes":)

2.1 What were your experiences? What was good? Were there any problems?

2.2 Which topics from the field of DL or/and AI did you cover?

2.3 How do you assess the relevance of integrating DL and AI into the teaching your subject(s)?

2.4 Do you feel capable of better integrating work with DL and AI into your teaching after the training?

2.5 How do you assess the teachability of DL and AI to students?

      (If the answer is "no":)

2.6 How do you assess the relevance of integrating DL and AI into the teaching your subject(s)?

2.7 Under what conditions would the topics be integrable into the teaching your subject(s)? (if not clear, specify: on a personal level, school level, political level)

2.8 After this training, how prepared do you feel to integrate DL & AI in the classroom?

2.9 How do you assess the teachability of DL and AI to students?

2.10 In what ways do you see the topics of DL and AI connecting with your non-computer science subject(s)?

 Transition - before teaching side viewed; now other level:

> 3. As a teacher, what do you think about establishing AI and DL in the curricular frameworks[16]?

<u>*If not answered, be sure to address the following (follow-up questions):*</u>

3.1 What do you think about making AI and DL an integral part of the teacher training?
For questions/no answer: module/event, seminars, aspects, etc.

3.2 What steps would be needed to embed AI & DL topics in the classroom?
If questioned/no response: e.g., recommendations, guidelines/directions, curricular framework   changes

3.3 What steps could be taken to integrate the topic of AI and DL into your school's internal curriculum?
in case of questions/no answer: explain internal school curriculum[17] differently, e.g. school action concept (without conveying that respondent would not understand the term)

3.4 To what extent do you anticipate certain institutional obstacles or difficulties?
For questions/no answer: acceptance issues, transition phases, convincing of meaning and purpose would have to be done, etc.

Transition - Consequences of the changes to the curricular frameworks just discussed:

> 4. What changes might the integration of AI and DL bring at different levels?

> 5. How can future training be improved or made more efficient?

<u>*If not answered, be sure to address the following (follow-up questions):*</u>

---

[16] "is a supportive structure to help schools to plan and develop their own curriculum. It comprises a set of interlocking components, including essential learning experiences, generic skills, values, attitudes, and key-learning areas." (https://www.igntu.ac.in/eContent/BEd-04Sem-DrDeviPrasad-%20Knowledge%20and%20Curriculum-unit5.pdf)

[17] School's own pedagogical action concept for the implementation of curricular framework

5.1 Length

5.2 Content

5.3 Learning materials

5.4 What format of training on DL & AI would you prefer?

6. How do you assess the interest among your colleagues for this kind of workshops on DL & AI?

7. If you had one wish for education policy: What would you change about DL & AI in the classroom?

8. Is there anything else you would like to share with us? Do you have any suggestions for the training team?