

- > Teacher training for Data Literacy & Computer Science competences
- > D3.4 Report on primary school teacher interventions

train-dl.eu

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1. Executive summary

Work Package 3 conducted field trials and analyses, with a specific emphasis on primary education.

This document provides an overview of the results of the analysis carried out at this stage (D3.4 DL and AI teaching methodologies and primary teacher education formats research summary). The aim of this review is to better understand and clarify the current approaches to teaching Artificial Intelligence (AI) and Data Literacy (DL) and to analyse the teaching materials provided in primary education. This information was used in the following phases of WP3.

In the Train DL project, WP3 leverages the insights and outcomes from WP2, given that WP2 focuses on secondary education while WP3 concentrates on primary education. This collaboration extended to the utilization of WP2's expertise in training activities and methodologies related to data literacy and artificial intelligence. Various sources, including existing online learning practices, literature reviews, books, articles, and reports, were explored to develop AI teaching approaches for both primary and secondary education. Practical examples from different countries showcased current applications in AI training for primary education. Vilnius University's experience in crafting practical tasks for data literacy education in primary schools, demonstrated through initiatives like the computational thinking challenge Bebras, further enriched the project's resources. The following sections delve into the experiences from the primary school teacher interventions.

2. Organizing interventions

WP 3 took up the guidelines for interventions of secondary education as had provided by WP 1 and WP 2, based on the outcomes of the policy building workshops. In turn, WP 3 provided data collection on primary education to WP 2 to complete interventions and observations. WP 3 together with WP 2 contributed to WP 4 as results of the inventions of each intervention cycle as input for the further evaluations.

The work package 3 was in tight connection to WP 2, actually it is continuation of the WP 2 (after two rounds of interventions and parallel to the third round of intervention of secondary schools) with focus on primary school teachers. The field research involved various intervention courses and workshops with primary school teachers and teacher trainers in primary education, focusing on data literacy, artificial intelligence, and didactics. This aimed to gather insights through input, consolidate observations and experiences, and collect data.

National workshops were conducted, involving selected groups of primary education in-service and pre-service teachers, educators, didacticians, and trainers. Participants were identified through their engagement with computer societies (Germany, Austria)

and participating universities (Germany, Lithuania), as well as the extensive networks of project partners in their respective countries.

2.1 Preparatory workshops for interventions with primary school teachers in Lithuania

Before the official interventions, we arranged several pilot interventions/seminars in schools to better understand the situation and prepare framework and material for the interventions.

The first seminar on DL and Ai was held in December , 2021 in Saules middle school.

On December 10, the first trial TrainDL project seminar on artificial intelligence and data literacy for primary school teachers took place in Lithuania. Due to the difficult situation of Covid, the seminar was held at Druskininkai “Saulė” middle school and was attended only by primary school teachers of that school.

The seminar was led by partners from Vilnius University, prof. Valentina Dagienė and Vaida Masiulionytė-Dagienė. In addition, Viktoriya Olari, a project partner from the Freie Universität Berlin, took part in the seminar.

At first, an introductory presentation to artificial intelligence were held with questions and discussion involving teachers. Teachers were enthusiastic, participated in all the activities carried out during the workshop. The discussion provided a wide range of insights into how the learning material on data literacy and artificial intelligence could be improved: what actors to use through hands-on activities to make it more interesting for pupils, how to present the content better, and so on. It was also mentioned that the activities presented during the workshop were not only useful for introducing artificial intelligence to children but could also be used as board games for children at home with the whole family.



Figure 1 Preparatory workshops for interventions with primary school teachers in Lithuania

In early April (7th and 8th), the Vilnius University team, consisting of Prof. Valentina Dagienė, doctoral student Vaida Masiulionytė-Dagienė, and volunteer Alvida Lozdienė, visited Marijonas Daujotas Progymnasium in Kretinga and Gedminai Progymnasium in Klaipėda. The purpose of the trip was to introduce primary school teachers to the possibilities of teaching artificial intelligence and data literacy. The seminars conducted in Kretinga and Klaipėda progymnasiums focused on providing information and practical activities related to artificial intelligence. In Kretinga,

teachers were initially introduced to artificial intelligence in general, followed by an overview of its history and development. Practical tasks were then presented, utilizing playful activities without computers as effective means for young students. Board games were employed to illustrate how artificial intelligence can learn on its own and how game results change based on the knowledge accumulated by artificial intelligence. The seminar in Klaipėda followed a similar approach, offering theoretical information first and then engaging in practical games. The seminars were attended by around 20 teachers from both primary and subject-specific education. The feedback from teachers in both Kretinga and Klaipėda indicated that presenting tasks through various games facilitated a better understanding and absorption of fundamental artificial intelligence principles. Teachers also provided valuable insights on how the tasks could be improved.



Figure 2 Adapted material for machine learning game which were used in pilot interventions

Before these interventions one pilot intervention on the 4th of April were organized together with National Education Agency for the different schools of Vilnius and Vilnius region primary school teachers. The idea was also to collect feedback from teachers about the material presented during seminar and how to improve that it would be fully understandable for the primary school children what is data and AI.





Figure 3 Moments from the pilot interventions

After these interventions we had one intervention with pre-service teachers and one seminar in Tallin, Estonia with teachers and university lectures from different countries. The feedback we got after seminar was very useful for planning our interventions.

2.2 Interventions with primary school teachers in Lithuania

After the feedback collected, we developed activities for the primary interventions. The main idea of the activities was that it has to be short in time, that small children do not lose their focus. That means that one activity has to be no longer than 10-15 minutes.

We had 3 interventions with primary school teachers in Lithuania in different cities, also two interventions in Austria with the help of our partners OCG and one intervention for primary school was organised in Germany. All the details about the participants and dates of interventions are presented in delivery 3.5.



Figure 4 Moments from Lithuania primary school interventions

The length of the intervention was chosen 3-4hours (3 hours in Austria according to their regulations). The length was chosen also from the feedback from the pilot interventions primary school teachers.

Below you can see detailed planned program of the interventions. Small adjustments were made per each intervention paying attention to the participants knowledge or the questions they raised. So some parts could be longer and some shorter and vice versa.

TrainDL primary intervention Lithuania, Austria, Germany

Agenda

Duration	Activity
20 min	Welcome, short introduction of participants
40 min	Introduction to AI, short history of AI, ethical part of AI, why data is so important in AI
20-30 min	Presentation of the Bebras tasks for primary education which and why they are connected with data literacy and task solving activity
20 min	Break
30-40 min	Introduction of the Ligretto like card game and explanation how it is connected with data literacy. Also game playing activity.
30 min	Theoretical explanation of AI aspects (like decision trees) and Monkey sorting game activity
20 min	Presentation of the Bebras tasks for primary education which and why they are connected with artificial intelligence and task solving activity
10 min	Introduction to resources available to teach AI for primary education
20 min	Wrap up and discussion
Total time: ~3,5-4hours	

Figure 5 Preliminary agenda for the interventions

In the agenda theoretical part are mixed with hands on activities. All the parts take quite short periods of time as mentioned before this was made after the feedback from pilot interventions. Primary school students are not able to focus on long activities and lose their interest and attention. Also, hands on activities were chosen/adapted as game-based learning activities, for the same reason to keep young students focus and motivation on this topic.

In the picture below is presented sorting cards game (Ligretto like cards) we developed for the data mining activity to introduce how important are the features which every data object has and what can be done with them. Also this activity introduce importance of the data correctness. More info and rules of this activity is presented in D3.5:



Figure 6 Sorting cards game (Ligretto like card) activity

Before and after each intervention, teachers were asked to complete a questionnaire. The questionnaire consisted of two parts, a generic questionnaire prepared by our partners Potsdam University (WP4) and a knowledge questionnaire prepared by Vilnius University. More details on the questions in the knowledge test questionnaire and the results obtained are presented in document D3.5.

After each intervention, Vilnius University presented the teachers with in-service training certificates confirming their active participation and training of digital competence. An example of a certificate registered at the Centre for Teacher Competence and Development is given below.

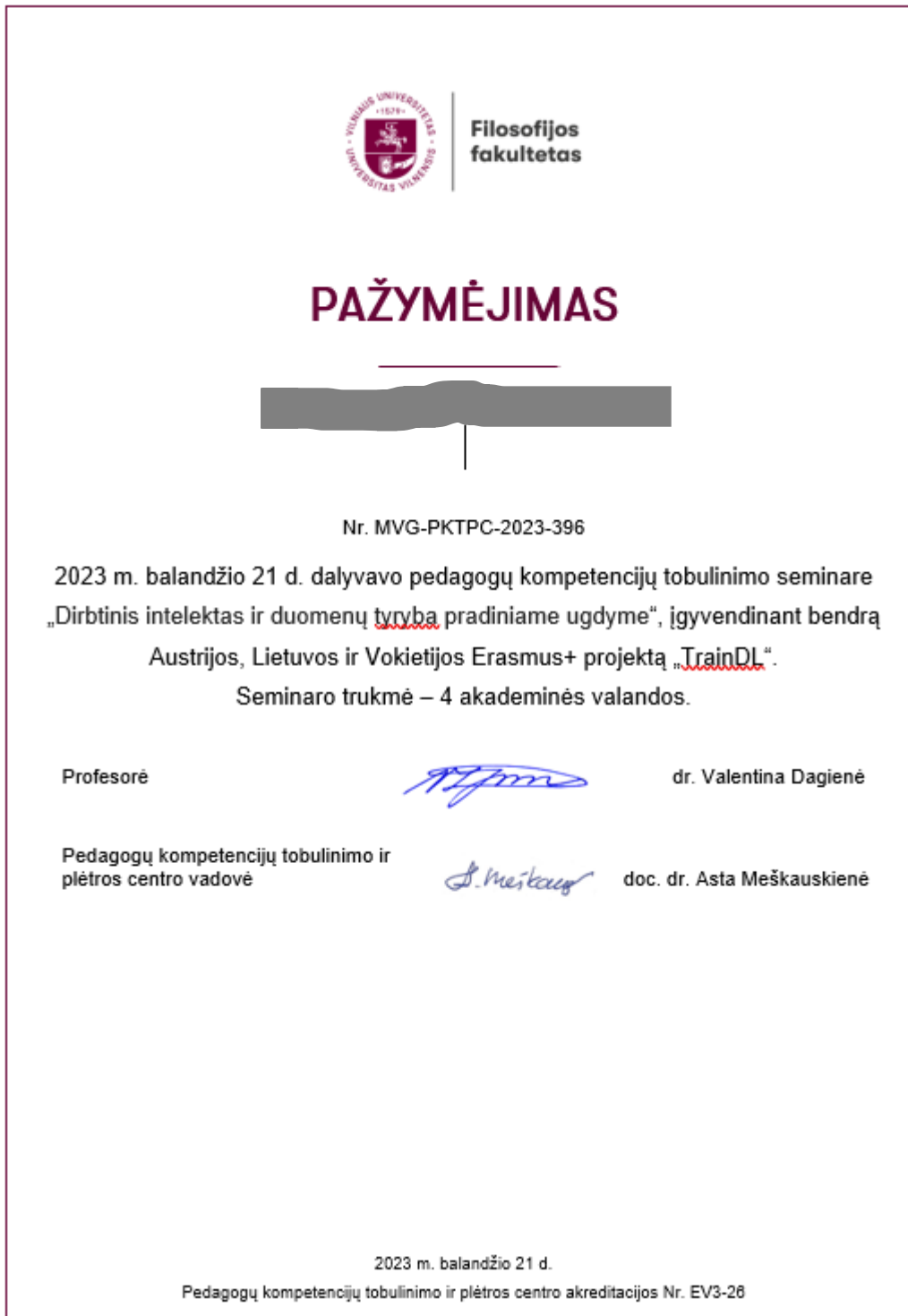


Figure 7 Certificate of the participation in TrainDL project intervention

We would also like to highlight one school where we did not have a one-off intervention, but had ongoing activities. At the Saulės Middle School in Druskininkai we visited for the first time in December 2021 with a pilot intervention. Then a year later in December 2022 we had a workshop to find out how things were going and

whether there had been any attempts to teach artificial intelligence and data literacy. Then in April 2023 we had the main intervention and in December 2023 we had a couple of hours workshop where we presented the new developments that have emerged in the field of artificial intelligence and data literacy and we had a discussion and interviews with teachers on how they are doing in teaching these topics. For more details and teacher feedback, see document D3.6.

3. Discussion and challenges

The analysis conducted in the Data Literacy (DL) and Artificial Intelligence (AI) teaching methodologies and primary teacher education formats research provides valuable insights into current approaches to teaching DL and AI in primary education. Several key conclusions can be drawn from this analysis:

1. **Integration of DL and AI in Primary Education:** The analysis underscores the importance of integrating Data Literacy and Artificial Intelligence education into primary school curricula. Various sources, including online learning practices, literature reviews, and practical examples from different countries, highlight the necessity of equipping students with the skills to navigate and thrive in an increasingly data-driven and technologically advanced society. In Lithuania, for example, DL is incorporated in primary school curricula (Grades 1-4) as well as teacher education study programs.
2. **Diverse Teaching Approaches:** The examination of diverse teaching approaches emphasizes the need for tailored methodologies to effectively teach DL and AI concepts in primary education. Practical examples from different countries demonstrate the versatility of AI training methods, reinforcing the importance of adopting adaptable approaches that cater to the unique needs and contexts of primary school students.
3. **Collaboration and Knowledge Sharing:** The collaboration between stakeholders such as educators, researchers, and policymakers is essential for developing and disseminating effective DL and AI teaching methodologies. Sharing experiences, resources, and best practices fosters collaboration and enhances the quality of DL and AI education in primary schools.
4. **Continuous Professional Development:** Ongoing professional development opportunities for teachers are crucial for the successful implementation of DL and AI education in primary schools. Workshops, conferences, and other activities play a vital role in equipping teachers with the knowledge and skills needed to integrate DL and AI concepts into their teaching practices.
5. **Significance of Ongoing Activities:** The examples of Druskininkai Saulės Middle school illustrates the importance of ongoing activities in certain schools. Through a series of interventions and workshops, the school received continuous support and collaboration, enhancing the implementation of DL and AI education effectively. This

ongoing engagement highlights the value of sustained efforts in fostering DL and AI education in primary schools.

The conclusions drawn from the analysis emphasize the importance of prioritizing DL and AI education in primary schools and highlight the need for collaborative efforts, diverse teaching approaches, and continuous professional development to ensure successful implementation.