

>Teacher training for Data Literacy & Computer Science competences D3.6 Final experience report

train-dl.eu

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1. Executive summary

This document presents the experience of the project from different perspectives. How the emergence of ChatGPT, as well as Lithuania's renewed curriculum, have influenced the project. The collected experiences from the interventions carried out. Also the reflections of teachers who have participated in the training sessions of the project, and their views on AI and data literacy training and the TrainDL project itself.

2. Best practices from primary school interventions

In this section, we will look at the different experiences we have gathered from both pilot and validated interventions. Some of the experiences are related to the didactic side of the subject, others to the organisation of the event itself, or to the administrative side.

2.1. Connection with informatics curricula in Lithuania

The national curricula in Lithuania have been updated from the 2023 school year. Integrated informatics/computer science learning has been made compulsory in primary schools (<https://emokykla.lt/bendrosios-programos/pradinis-ugdymas/3?st=1>). Data mining or data literacy (DL) and artificial intelligence (AI) are included in the general informatics curriculum. The following topics are included in the informatics / computer science curriculum for primary schools:

- Learning about data.
- Data collection and management.
- Representing data in drawings and diagrams.
- Reliability of data and information.
- Patterns in data.

As we can see from the topics above, the new curriculum in the primary grades focuses heavily on data, but pattern recognition is already a precursor or introduction to the algorithms used by artificial intelligence.

The curricula have been updated after the TrainDL project started. As the National Agency of Education, which is a partner in this project, is responsible for updating the curricula, this project has had an impact on the inclusion of data and artificial intelligence in the general curricula.

2.2. DL and AI from Bebras Challenge perspective

The Bebras Challenge is popular among students and teachers in Lithuania and partner countries. Thus, one of the activities used in the interventions was the Bebras Challenge tasks that are related to artificial intelligence or data. The Bebras Challenge tasks are well known to students, do not take much time to solve, and develop computational thinking. Using them to learn about data and artificial intelligence was

a very good choice for the intervention. As described in document D3.5. at the end of the project, a new set of Bebras cards was released, which exclusively contains tasks on the topics of artificial intelligence and data mining.



Figure 1 New Bebras tasks cards including AI and data mining topics

2.3. ChatGPT impact on teaching AI and DL

At the start of the project, teachers did not know much about AI. They even had some fears and beliefs that robots could take over the world. While this refers to the first pilot interventions in December 2021 and April 2022, in the already validated interventions in April 2023, teachers were much more knowledgeable and motivated to learn more about AI, thanks to the launch of Chat GPT in November 2022. Our partners at the Free University of Berlin (WP2) have even prepared special activities that show how text generation works. Our partners from Austria (OCG), also found that ChatGPT influenced teachers' motivation to attend workshops on AI. In a second intervention in Vienna in October 2023, they included general information about ChatGPT in the programme and used the text generation activities (Grimm's Fairy Tales) mentioned above among the activities developed in WP2.

2.4. Activities framework for primary education

After the pilot interventions, it was decided that the activities are suitable for primary school pupils and should not last longer than 10-15 minutes, as longer activities are difficult to concentrate on at this age. In the pilot interventions, we used one activity that our partners in WP2 used with computer science teachers (a game of robots and monkeys that defines the principles of reinforced machine learning). However, due to

the time required for this activity (more than 45-60 minutes), it was decided not to do this activity.

After the pilot interventions, more information about primary school teachers has emerged. As primary school teachers do not have a background in informatics, not only the practical activities have to be adapted, but also the presentation of theory related to artificial intelligence or data mining has to take this into account and to start with the introduction of general informatics concepts that will be needed to further develop these topics. In WP2, the materials developed for the interventions for informatics teachers focus on the different types of machine learning. In the theoretical material for the primary classroom interventions, there was not much exploration of the types of machine learning and similar nuances, and the main focus was on the understanding that artificial intelligence can learn according to predefined algorithms. The aim was for teachers to understand that AI does not think on its own and to dispel stereotypes about robots conquering the world.



Figure 2 Moments from the intervention, teachers doing cards sorting activity

2.5. Schools' experience on AI and Data Literacy

As mentioned in the previous chapters, teachers' knowledge and experience in artificial intelligence and data mining has been dramatically changed by the emergence of ChatGPT. While at the beginning of the project, in 2021, teachers were

not very familiar with the field, by 2023, many teachers had heard of or had already used some AI tools.

From the experience of our partners in Austria, we can also see that ChatGPT had an impact on teachers' knowledge and motivation.

Two interventions were conducted in Vienna to assess the impact and understanding of Artificial Intelligence (AI) among teachers. The first intervention took place in April with the participation of five teachers, while the second intervention occurred on October 10th, with the attendance of eleven teachers.

In the initial intervention, conducted in April, it was observed that most teachers had limited knowledge about AI, having only heard about it without prior experience. However, one teacher had engaged with ChatGPT and incorporated exercises related to it into the seminar. Despite this effort, some participants still had numerous questions regarding ChatGPT. Notably, the Ligretto like card game performed well during this session, but the unplugged monkey game encountered some difficulties. There was a concern that not all participants fully grasped the notion that AI is not infallible. Feedback indicated a strong interest in unplugged activities that could be implemented in their teaching practices. Additionally, the concept of Teachable Machine was introduced, which was entirely new to all participants.

In contrast, the second intervention, held in October, revealed a shift in participants' attitudes and experiences with AI. With a larger group of eleven teachers, it was noted that most had gained more exposure to AI tools. While only two participants hadn't tried ChatGPT, they lacked an understanding of its underlying mechanisms. The Ligretto-like card game was omitted due to time constraints, and the focus was shifted to the Teachable Machine and unplugged activities such as the monkey classification game.

Throughout both interventions, various discussions emerged regarding the ethical implications of AI, including concerns about the authenticity of student work produced with ChatGPT, issues surrounding image generation and fake news, and copyright matters. Despite these concerns, teachers expressed a desire to incorporate AI into their teaching practices, feeling a sense of obligation to introduce it to their students.

Overall, both interventions provided valuable insights into teachers' perceptions and understanding of AI, highlighting the need for continued support and training in this rapidly evolving field. The differing levels of experience and engagement observed between the two interventions underscore the importance of tailoring educational initiatives to meet the diverse needs of educators.

In Lithuania, we also had one exceptional experience, one school (Druskininkai Saulės Basic School), in which we organised four workshops during the project. The very first one was a pilot one, then a follow-up one a year later to see how the implementation of these subjects was going. Then a validated intervention and again after a good six months a follow-up one for a review and additionally for the presentation of new

activities. During the last workshop, we heard that some primary school teachers are already confidently using various artificial intelligence applications in their lessons. They are integrating them in different lessons, for example in science in primary school or in the arts. It was interesting to hear that the ethical issues mentioned in our workshop were the first time that the teachers had heard of them, and that it made them realise how important these topics are.

2.6. Timetable of the interventions

We had 3 interventions with primary school teachers in Lithuania (2023) in different cities/towns, also 2 interventions in Austria and 1 intervention in Germany:

- Vilnius: Barboros Radvilaitės progymnasium (2023 04);
- Pilviškiai: Vilkiškis region Pilviškių gymnasium (2023 04);
- Druskininkai; Druskininkų Saulės middle school (2023 04);
- Intervention in Vienna in spring (2023 04)
- Intervention in Vienna in autumn (2023 04)
- Intervention in Düsseldorf (2023 09)

Before these interventions we had pilot interventions:

- Druskininkai school – Druskininkai Saulės middle school (2021 12)
- Vilnius seminar for teachers (2021 12)
- Vilnius NAE (National Agency of Education) (2022 04)
- Klaipėda school – Klaipėdos Gedminai progymnasium (2022 04)
- Kretinga school – Kretingos Marijono Daujoto progymnasium (2022 04)
- Vilnius pre-service teachers – Vilnius University (2022 05)
- Tallin, Estonia seminar (2022 06)
- Druskininkai school – Druskininkai Saulės middle school (2022 12)
- Short presentations or seminars on data literacy (DL) and artificial intelligence (AI) in other conferences or seminars.

After the official interventions, additional workshops/seminars on the request of the schools or teachers were organized. Additional workshops/seminars:

- Vilnius pre-service primary teachers – Vilnius University (2023 05)
- Vilnius primary and other teachers – Vilnius private Saulės gymnasium (2023 11).
- Druskininkai school - Druskininkai Saulės middle school (2023 12).
- Online seminar for pre-service primary teachers (2024 02)

More detailed information on all the interventions with participant numbers are provided in Annex 1.

3. Feedback from teachers

This section contains feedback from teachers who participated in TrainDL workshops. It also includes their practices in applying artificial intelligence and data literacy topics in the classroom. At the end of the project, the project team asked a few teachers to give their insights into the TrainDL project and the topics they were introduced to during the project.

Informatics expert teacher Snieguolė Bagočienė:

The TrainDL project's experience with data mining and artificial intelligence (AI) has opened up new perspectives on how these technologies can be used in education, not only with primary school children, but also with older pupils in grades 5 to 7.

As a teacher of computer science, I have tried various applications such as PictoBlox, Micro:bit, Google AI Experiments and other AI platforms, which have allowed not only primary school children but also older students to delve deeper into modern technologies, encouraging them to think critically and apply their knowledge in a creative way. The TrainDL project provided an opportunity to look at the learning process through the prism of innovation, emphasising the importance of personalised learning. For pupils in grades 5 to 7, it was an opportunity to explore more complex AI systems, learning the basics of data analysis and programming through practical tasks and projects. This experience showed the importance of presenting older students with more complex challenges that require not only technical skills but also the ability to critically assess the impact of technology, ethical dilemmas and possible social consequences.

In the future, I would like to develop this integrative approach even further, with even more interdisciplinary projects where students can apply the principles of AI and data analysis to solve real-world problems.

This includes both practical tasks that allow the application of the principles taught, as well as discussions on the role of technology in our society, ethical issues and the potential for future innovation. The TrainDL project has highlighted to me the importance of not only teaching students technological skills, but also developing their critical thinking, problem-solving and interpersonal communication skills. Integrating technology into the learning process must be done responsibly, taking into account the age, abilities and individual needs of the students, as well as encouraging their creativity and innovation. "The TrainDL project has shown me how important it is to enable students not only to learn about technology, but also to learn how to apply it to different tasks and problems, which is crucial for their personal and professional development.

The TrainDL project has also shown that teachers should not only be transmitters of knowledge, but also managers of the learning process, encouraging students to question, explore and seek answers.

This means that teachers should continuously improve their knowledge of the latest technologies and teaching methods in order to integrate them effectively into the teaching process. However, it is important to note that the use of technology in teaching should not be an end in itself. The key is to ensure that technology is used as a tool to stimulate students' critical thinking, creativity and problem-solving skills. This means creating learning situations in which students can actively participate and create their own knowledge, rather than just passively absorb it.

The TrainDL project has not only given me valuable insights into how technology can be used in teaching, but also inspired me to continue to innovate in education. My goal for the future is to continue to work with both primary and upper primary students, encouraging them not only to learn new technologies, but also to learn to think like creators and innovators who can use this knowledge to solve real problems and make a positive difference in the world.

Primary school teacher Daiva Gaučytė:

Artificial intelligence is invisibly permeating and shaping school life, students' learning activities and daily routines.

Students use AI every day and share their data, consciously or unconsciously. Pupils are exposed to AI technologies everywhere.

It is essential that teachers become familiar with the concepts of literacy related to data and artificial intelligence. The TrainDL project has provided topics that can be offered to younger pupils and even primary school children. Primary school teachers do not have much IT experience.

It is good that Prof. Dr Valentina Dagienė pays a lot of attention to primary school teachers. On her initiative, training courses are organised. The training combines theory with practical tasks. Teachers feel more courageous, more confident and not afraid to include data analysis and artificial intelligence in their lessons. The workshops provided engaging and comprehensible activities for children. Teachers were provided with methodological reference material not only on artificial intelligence or data literacy.

The TrainDL project is based on non-computer activities for teaching about AI. Board games can be used to introduce artificial intelligence. This is particularly appealing for primary school children, as such activities make it easier to understand how artificial intelligence works. The cards also contain "Bebras" activities, which are very handy and attractive for younger children.

Artificial intelligence is also becoming more frequently used by teachers to test students' knowledge. Thanks to AI, teachers can instantly access and analyse the results of tests and assignments. So teachers can see where a student needs help right here and now. Not only can the student's weaknesses be spotted, but also their strengths. These can help the teacher to personalise tasks.

Artificial Intelligence is changing our world, which is why it is so important for the teaching of computer science in schools.

The activities presented in the TrainDL workshops are not only useful for introducing children to artificial intelligence, but can also be used as board games for the whole family in their free time.

Primary school teacher Alina Bikulč:

The TrainDL project has been beneficial. More projects and activities like this are needed to spread education to teachers about data mining and artificial intelligence. The more we go on, the more we find that pupils learn and understand things faster than teachers. Children find learning with digital technologies interesting and useful. And to use them, teachers need to know the possibilities of technology.

It is interesting to participate in the project because by communicating and sharing you can always find something you can apply in your work in practice.

In the future, we would like to see more cooperation and sharing between teachers from different countries. We could share lesson ideas, children's work...

Teachers would need specific materials for teaching and integrating computer science (teacher books). At the moment, teachers jump from one to the other in the integration of computer science (especially in the primary grades). As everywhere, consistency and clarity would be needed, and then maybe more teachers would be willing to try out innovations. Teachers need a lot of preparation and time to integrate computer science, it should be simpler.

4. Insights from interventions

This section will briefly mention the main takeaways from the workshops. These experiences are of two types: on the administrative side, the organisation of the workshops, and on the educational side.

The key messages from the administrative side are as follows:

- Half day trainings are good for primary school teachers (we got the feedback from them, that it would be good to have more, but short 3-4hours seminars).
- Tests took quite a big part of time during the intervention.
- Primary school teachers are not very willing to give interviews. It was quite difficult to encourage them. The reasons why teachers are not willing to give interviews are not clear.
- Friday afternoon is not good day for the interventions, as teachers are already tired after work week and are not so motivated to participate in the seminar.
- To save printing paper, it is good to ask teachers to take photo of the slides with the instructions or other information.

Key messages from the educational experience are:

- Primary school teachers do not have computer science background, so material prepared for the seminars, have to include introductory topics of CS.

- For primary school children activities have to be very short 10-15 minutes, not to lose their attention.
- CS unplugged activities works very well with primary school teachers to explain AI and data topics.
- Teachers are very interested in this topic, especially when it is included in new curriculum.
- From the interviews, everybody agreed that it would be good if this topic would be taught at university.
- Teachers wants more material, and activities related with this topic, especially in Lithuanian language.

All other project recommendations in more detailed way are presented by our partners as policy recommendations.

Annex 1 Interventions list

Date	City	Country	Format	Participants	Type
2021 12	Druskininkai	Lithuania	3 hours	6	Pilot intervention
2021 12	Vilnius	Lithuania	1 hour	~25	Presentation, introduction about project
2022 04	Vilnius	Lithuania	4 hours	~20	Pilot intervention
2022 04	Kretinga	Lithuania	4 hours	25	Pilot intervention
2022 04	Klaipėda	Lithuania	4 hours	18	Pilot intervention
2022 05	Vilnius	Lithuania	2 hours	~20 (pre-service teachers)	Pilot intervention
2022 06	Tallinn	Estonia	1,5 hours	22	Pilot intervention
2022 12	Druskininkai	Lithuania	2 hours	13	Follow up after pilot intervention
2023 04	Vilnius	Lithuania	4 hours	38	Intervention
2023 04	Pilviškiai	Lithuania	4 hours	25	Intervention
2023 04	Druskininkai	Lithuania	4 hours	23	Intervention
2023 04	Vienna	Austria	3 hours	5	Intervention
2023 05	Vilnius	Lithuania	2 hours	~15 (pre-service teachers)	Additional intervention on request
2023 09	Düsseldorf	Germany	4 hours	12	Intervention
2023 10	Vienna	Austria	3 hours	11	Intervention
2023 11	Vilnius	Lithuania	4 hours	39 (all teachers including STEAM and CS)	Additional intervention on request
2023 12	Druskininkai	Lithuania	2 hours	24	Follow up intervention
2024 02	Vilnius	Lithuania	1,5 hours	23 (pre-service teachers)	Additional intervention on request