Train DL

Teacher training for Data Literacy & Computer Science competences

D5.5 - Prototype policy and curricula recommendations (STEAM teachers)

train-dl.eu

Austrian Computer Society *OCG*

1. Executive Summary

This deliverable reports on the policy recommendations for STEAM teachers derived by the TrainDL project in the context of AI&DL education. This deliverable builds on the work done by the project on policy recommendations for CS teachers as reported in deliverable D5.3 "Development of policy and curricula recommendations (CS teachers)". This deliverable will be followed by a third deliverable in this series which will focus on policy recommendations for primary teachers "D5.7 - Development of policy and curricula recommendations (primary teachers)".

For D5.3, the evolution of policy recommendations was based on following steps:

1. Initial definition of policy recommendations, based on
    a. state-of-the-art analysis of relevant policy documents and definition of a policy monitor, as reported in D1.1 and D1.2; and
    b. national policy dialog workshops in the context of WP1 with project relevant stakeholders, as reported in D1.3.
    c. A set of initial recommendations have been assessed by external experts, as reported in D5.4.
2. Refinement of the policy recommendations based on the outcomes of a joint policy building workshop with policy makers and representatives from education institutions from Germany, Austria and Lithuania (D1.6)
3. Refinement of the policy recommendations based on the evaluation of the outcomes of the first round of policy experimentation through interventions conducted in the context of WP2 (reported in D2.3 and D2.4).

Additional evaluations have been conducted for this deliverable D5.5 in order to be able to adopt the policy recommendations to the STEAM teacher target group:

1. Over 10 TrainDL project interventions with participation of STEAM teachers from Austria, Germany and Lithuania (more than 50 participants from STEAM fields) for which feedback was collected in formal and informal discussions. The STEAM interventions were conducted as part of work package 2 according to the guidelines reported in D1.7.
2. Formal qualitative and quantitative evaluation results for interventions with STEAM teacher participation which were reported in D4.5.
3. Research of policies on the European level, as reported in D1.9 (resulting in the extended on-line policy monitor delivered through D1.11).

Contrary to the original representation of the policy recommendations in D5.3 for the CS teacher target group (which comprised a set of concrete policy recommendations including a set of actionable mechanisms to implement each recommendation), the format for this deliverable D5.5 has been adopted to a representation that combines policy recommendation and implementation suggestions. This change has been made after thorough discussions, based on feedback given from both the TrainDL steering committee, the stakeholders, the advisory board and policy makers as well as the target group participants in the various interventions conducted by the project. It has become evident that at this stage of policy recommendation development, a representation that introduces the policy and provides a guiding

direction towards how a concrete implementation would look like is seen more appropriate than a set of actionable items. It should be noted that the TrainDL project will have a concluding deliverable in this series "**D5.9 - Set of consolidated recommendations**" in which the policy recommendations for all three target groups (CS, STEAM, Primary) will be revisited and finalised, providing an opportunity for a further revision of the policy representation format.

The main result of this iteration are the policy recommendations listed in Section 2. The main outcome of the investigation and evaluation with the STEAM target group has shown that it is crucial to have high-quality and ready-to-use teaching material available to allow STEAM teachers to teach mainly application and societal/ethical related aspects to their students. STEAM teachers in general neither have the CS background to derive their own materials, nor do curricula allow for sufficient time to integrate AI&DL topics in the already full schedules. In order to successfully integrate AI&DL into the curricula of STEAM teachers, two types of mechanisms are necessary:

1. The provision of materials and recommended content for lessons
2. Training for in-service teachers as well as education for pre-service teachers

The policy recommendations listed in Section 2 are based on those outcomes.

2. Policy recommendations – STEAM

The results presented in this Section are a set of policy recommendations for the STEAM teacher target group, derived according to the steps presented in the executive summary. The primary source of input for the STEAM teacher target group were of course the STEAM interventions conducted by the project (WP 2), allowing to gather qualitative and quantitative input from more than 50 STEAM teachers from Germany, Austria and Lithuania, which was formally evaluated and validated by the project, as reported in WP4 (D4.5.). It should further be noted that recent policy documents identified in the latest round of policy research, like the very recent publication (August 2023) by the Austrian Federal Ministry of Education, Science and Research, provided valuable new insights regarding the state of policy support in AI education[1].

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[1] „Auseinandersetzung mit Künstlicher Intelligenz im Bildungssystem", https://www.bmbwf.gv.at/Themen/schule/zrp/ki/ki_asbs.html

Policy Recommendation 1 (Focus and Methods)

- **Ready-to-use material:** The integration of AI&DL into STEAM teachers' curricula requires ready-to-use materials developed by qualified experts.
- **Connection of AI&DL to the STEAM subjects**: It is also essential to emphasize the connection of AI&DL to the teachers' specific subjects to prevent the topics of AI&DL from becoming additional obligations. Making the connection between STEAM subjects and AI&DL is important, as without background knowledge this may be difficult for a STEAM teacher to recognize. In order to achieve this goal, the provision of tools and instructions on how to use them and what benefits they could bring to the respective STEAM subjects is of central importance.
- **Raising awareness:** It is important to make teachers aware of the importance of AI&DL in teacher training courses in order to enable them to pass this knowledge on to their students in an appropriate way. For STEAM teachers the content of the teacher trainings should not focus solely on technical aspects but also on the application of the knowledge as well as risks and opportunities of AI.
- **Potential benefits**: The courses for teacher training should point out potential benefits of using AI&DL in their lectures as well as for preparing teaching materials, collecting ideas for a topic in class or for teachers' course planning.
- **Potential risks, ethical aspects & data protection:** It is essential that teachers also inform students about the potential risks and ethical aspects that the use of AI&DL can entail. In this context, the topic of data protection should also be part of the teacher training.
- **Tinkering**: In general, both teacher training and the use of AI&DL as well as corresponding tools should be based on a tinkering approach (hands-on, based on constructionism). For STEAM teachers and students, trying things out, playing around (also using unplugged methods) and gaining their own experience with AI&DL and the corresponding tools is a promising approach to getting started with the topic.

Policy Recommendation 2 (Teacher Training formats for in-service STEAM teachers)
• **Course formats**: There are various options for organizing the courses for teacher trainings. In any case, a combination of different course formats should be used for STEAM teachers. Overall, there is the option of on-site education, online education, hybrid settings, blended-learning or flipped classrooms.   • **Teaching process**: The training of STEAM teachers should focus on a combination of mandatory on-site courses for the introduction to the topics of AI&DL and the general concepts and course content as well as supplementary online course modules. Online formats can be used to optimally supplement teacher training and teachers can gain in-depth knowledge of the topics at their own pace and investigate tools and activities independently.   • **Course structure**: In order to keep motivation high in the courses, a clear structure should be presented whereas each course unit should have clearly defined goals which teachers will achieve at the end of the unit.   • **Feedback mechanisms**: Incorporating feedback sessions into teacher training programs, whether in-person or virtual, allows educators to provide constructive feedback on the integration of AI&DL concepts into their actual teaching practices.
Policy Recommendation 3 (Education for pre-service teachers)
• The topics of AI&DL should already be included in the training of pre-service teachers at university and should become an integral part of the teacher training curriculum.
Policy Recommendation 4 (School Curricula)
• AI&DL subjects should carefully be integrated into school curricula, as these are already mostly overcrowded. It is important to be careful not to risk a loss of interest in AI&DL by further overfilling the compulsory courses.
Policy Recommendation 5 (Certification for schools)
• A qualification/certification in the field of AI&DL for entire schools should be considered. Such AI&DL certifications confirm – for instance - that the teaching staff of a school have completed all necessary trainings in the field of AI&DL.

3. Discussion and Conclusion

The main outcome of formally validating the qualitative and quantitative input provided by STEAM teachers in the context of TrainDL project activities was that, it is crucial for STEAM teachers as well to have ready-to-use materials available which they can use in teaching. It is likely that neither STEAM teachers nor their students have the background of related CS topics available to teach or learn in-depth technical aspects of AI&DL topics. Furthermore, there is usually not sufficient time to integrate AI&DL topics in the already packed curricula. In the STEAM context, teachers should enable students to understand and use AI&DL, especially with regard to the benefits but also the risks (especially application related aspects and societal/ethical aspects). To achieve this, it is essential to provide well-prepared teaching materials and curricula that integrate the topics of AI&DL in a meaningful way. In order to enable teachers to teach students about AI&DL, it is essential to integrate the topics into teacher training and further education.

The topic of proper teacher training in AI&DL is essential to avoid the spread of superficial knowledge about AI&DL among teachers and students. Therefore, teachers must be adequately qualified to pass on knowledge about AI&DL. In order to successfully integrate AI&DL into the curricula of STEAM teachers, two types of mechanisms are necessary: On the one hand, the provision of materials and recommended content for lessons. And on the other hand, training for in-service teachers as well as education for pre-service teachers.

It should be noted that the recommendations of this round of policy experimentation are still in a draft state. The project has further actions of development and experimentation planned. Subsequent rounds will focus on primary education (reported in deliverable D5.7). The recommendations for both STEAM and primary education will undergo an expert review and the outcomes of this review will be presented in deliverables D7.6 and D7.8 respectively. A final deliverable D5.9 which will report on the last iteration of policy experimentation, with a consolidated set of policy recommendations and actionable mechanisms for CS, STEAM and primary education target groups is to be delivered towards the end of the project . This last iteration will further elaborate, revise and extend the recommendations. A draft set of consolidated recommendations will be presented to stakeholders and policy makers within the scope of the final policy dialogue (D1.12) as part of the TrainDL Final Summit (WP7), with expert feedback considered in the final version of D5.9.