06 – Policy Recommendations for School Engagement with Design and Making Pedagogies

A set of policy guidelines for the sustainable integration and institutionalisation of Design Thinking and Maker Education pedagogies in European schools

Erasmusplus project	DESIGN FUTURES: DESIGNers and Makers for Better FUTURES
Project number	2019-1-NL01-KA201-060353
Duration	August 2019 – September 2021
Deliverable code number	O6
Deliverable title	Policy Recommendations for School Engagement with Design and Making Pedagogies
Short description	The main focus of this report is to provide in a comprehensive way evidence-based and critical policy recommendations on how to better integrate and institutionalise DT and ME pedagogies in schools and educational systems of four project countries (Greece, Romania, Italy, the Netherlands) as also around EU. More specifically, with the proposed recommendations, this report seeks to serve as a practical guide so as to motivate the school communities and truly inspire European policy makers for embedding the educational philosophy and potentials of the examined methods within their educational ecosystems.
Consortium partners leading	Stimmuli for Social Change (EL)
Consortium partners contributing	All
Main author(s)	Christina Galani, Ioanna Garefi
Date	30.09.2021
Dissemination level	Public

This project has received funding from Erasmus+ under grant agreement 2019-1-NL01-KA201-060353. This document reflects only the authors' view. The European Commission is not responsible for any use that may be made of the information it contains.

Contents

Chapter 1: Introduction

About 'DESIGN FUTURES' Project

During the DESIGN FUTURES project, funded by Erasmus+, the Design Futures educational method was designed with the aim to enable students in various schools around Europe to contribute to a more sustainable and thus better future through their engagement with activities and experiments focused on the UN Sustainable Development Goals (SDGs) issues. In this way, the young learners are encouraged to become the future changemakers of their educational community, through their exposure to new learning challenges related to specific innovative pedagogies. The project's consortium includes partners from four European countries (Greece, Italy, Netherlands, and Romania) which represent an interesting variety in European landscape and are oriented towards spreading and increasing the impact of the project within the educational curricula of their country, with a focus on primary education level. Another essential objective of the project is to create materials that support teachers to implement **Design Thinking (DT)** and **Maker Education (ME)** methods in their school curricula, under a student-driven process in combination with a multidisciplinary experience. On top of that, throughout the project there has been given emphasis on the development of diverse skills, knowledge, and a more creative way of thinking for the project's beneficiaries, who are mainly two: teachers (direct) on the one hand and students (indirect) on the other hand.

At this stage, it is necessary to make a conceptual and practical distinction between the DESIGN FUTURES project, which refers to the project co-funded by the Erasmus+ Programme of the European Union, and the Design Futures method, which refers to the educational method implemented over the pilot implementation of the project, and for reasons of simplicity is used with the abbreviation DF in the remainder of the text.

Furthermore, the DESIGN FUTURES project has also paid special attention to the teachers' enhancement in area of competence-based education, by **developing and delivering teaching and learning modules** that have enabled them to further embed the highly innovative pedagogies of DT and ME in their school setting, thus contributing to the development of the 21st-century skills. Through multiple interactive activities, the teachers' educational practices have been further enriched and boosted new learning outcomes for their students. In parallel, students are supported to develop the skills, knowledge, and attitudes they need to actively engage with the world in their professional and personal futures. Under this prism, the project consortium focuses on engaging teachers, students, school-staff, parents, and policymakers in co-creating an ecosystem, in which students are introduced to DT and ME approaches from an early age. As a result, students have gained self-confidence through making while simultaneously they will exercise in practice their collaborative spirit by developing new and creative ways for a contemporary problem's solution under a "learn by doing" approach. In this way, through DESIGN FUTURES customized curriculum and training activities, there is a unique opportunity to develop students' 21st-century skills, such as creative thinking, problem-solving, teamwork, communication, and basic ICT competencies.

Shaping such competences in combination with a behavioural change in the area of sustainable development from a young age is more than important for current and future students so as to later thrive in their everyday life. They have the chance to be more empowered to adapt to their communities and to find solutions to various societal challenges via a collaborative and reflective approach. In order for the students' skills to be leveraged successfully, the DF method has developed, tested, and reflected, through user-centred design methods, upon a creative **Student Curriculum** that incorporates DT and ME activities. Also, a **Teacher Training** package that enables teachers to implement the activities in their curriculum, and an **Assessment**

methodology that supports the teachers into assessing the students' learning outcomes have been elaborated, facilitating the partners to validate and evaluate the learning outcomes of the curriculum.

Overview of report

The overarching aim of this policy report, which concludes the project as part of the final Intellectual Output (IO6) and contributes through its rich findings to the exploitation of its legacy, is to provide in a comprehensive way evidence-based and critical policy recommendations on how to better integrate and institutionalise DT and ME pedagogies in schools and educational systems of four project countries (Greece, Romania, Italy, the Netherlands) as also around EU. More specifically, these recommendations, addressed to stakeholders of policy making area from each participating country, serve as a practical guide so as to motivate the school communities and truly inspire European policy makers (including national governments) for embedding the educational philosophy and potentials of the examined methods within their educational ecosystems. Another aspiration of this report is to transform the schools into agents of innovation within the educational communities. This can be achieved through the report's policy suggestions, based on cross-country insights under a combination of a specific deployed methodology which is analysed in the next section. The transferable character of this report lies in its long-term utilization, as it can directly navigate schools, governments and policy makers to move beyond any traditional or conservative standards posed in school curricula, by designing and implementing new activities and generating essential changes for incorporating more systematically DT and ME into their local or regional context. In this way, their institutionalization in European schools will be facilitated and achieved more widely in the European reality of formal education.

Regarding the structure of the report, **Chapter 1** presents an overview of the methodology, outlining the steps and process that were followed for collecting all necessary insights that contributed to the synthesis of concrete policy recommendations per country. Regarding the core analysis and the subsequently developed policy suggestions, **Chapters 2 to 5** are dedicated to each out of four pilot countries, following an identical approach. First, for each country, there is an emphasis on its national policy profile, exploring further the way through which its educational system is structured, some existing trends of relevant initiatives and steps for the diffusion and integration of DT and ME mainly at primary level and the key policy stakeholders that play a critical role in this issue. Regarding the remaining parts of the core analysis, the report continues with specific and relevant national recommendations for the integration and institutionalisation of DT and ME, including findings from a series of already carried out focus groups and interviews that emphasize on crucial topics and themes that need to be further taken into account. After the core analysis which includes specific recommendations per country, **Chapter 6** closes the report by displaying a comparative overview at aggregate level that draws on all the previously presented important national recommendations. In this way, the opportunities included in this synopsis will facilitate any future knowledge exchange and deliberation among national stakeholders from the public educational policy sector for the wider institutionalisation of DT and ME in different European educational settings.

Finally, the report provides in the Annex part the templates used for carrying out the focus groups with teachers and interviews with relevant policy makers about the examined issue.

Methodology and process

This policy report has followed a mixed methodology for the collection and analysis of its insights, which have been gradually gathered during the last months of the project. The methodology was operationalised under the coordination of Stimmuli, with all partners contributing to each step of the whole process. To begin with, as already shown in the previous overview, the focus of the report has not been confined to the national level, in a general sense, but has zoomed into the institutional specificities that are illustrated at the school level of each national context, thus adding an extra layer of complexity to better inform educational policy makers.

At this point, it must be mentioned that a mixed-research method was deployed. As such, a blend of exploratory desk-based research preceded a series of qualitative focus groups with teachers and semi-structured interviews with educational policy makers and policy experts in each country. The importance of yielding both secondary data (desk-based research) and primary data (focus groups and semi-structured interviews) lies in the necessity to use real-life data and original sources to essentially inspire and effectively convince policy makers for the significant role of hitherto largely underutilized DT and ME pedagogies in educational area.

This report adheres to a qualitative approach. The epistemological rationale behind this decision stems from the recognition that novel, and occasionally overlooked, pedagogies, such as DT and ME, are experienced, perceived and understood in a different and unique way by each social actor. Qualitative research advocates that there is not an external reality that exists independently and objectively from human beings; reality is rather constructed and interpreted as a product of social process, with multiple interpretations, meaning and emotional investments for the same phenomenon.[1] In simple terms, reality is culturally and socially situated and shaped.[2] This is particularly the case in the world of education, where multiple stakeholders, from teachers and learners to educational policy makers, approach and experience the same processes through different lenses. Therefore, to align the overall rationale with the data collection techniques for this report, a consistency in the research design was prioritized in the form of a qualitative methodology. At the end, the qualitative methods that were leveraged helped partners to elicit personal experiences and subjective perceptions on the potentials and barriers behind the aspiration of further institutionalizing DT and ME in the school curricula.

Broken down in steps, the following interlinked activities were implemented for extracting necessary data for the policy recommendations:

Step 1: Literature review on country policy profiles

Each partner conducted a respective literature review regarding the collection of any relevant datasets (frameworks, national policies, case studies, evaluation results, etc.) about the integration of DT and ME pedagogies in primary schools of their country. For primary level, the age range of 9 to 12 years old students'

[1] Bryman, A. (2016). Social Research Methods. Fourth edition, Oxford University Press; Robson, C. and McCartan, K. (2016). Real World Research. Fourth Edition, John Wiley & Sons Ltd.
[2] Wright, S., O'Brien, B. C., Nimmon, L., Law, M., Mylopoulos, M. (2016). Research Design Considerations. Journal of Graduate Medical Education. DOI: http://dx.doi.org/10.4300/JGME-D-15-00566.1

classes was selected. Specifically, a state-of-the-art literature review – a particular type of desk research that focuses on relatively current issues and sources – was performed as the optimal research avenue for producing rich secondary data on the examined issue. The review was deployed as precursor to the empirical data collection and analysis of the focus groups and interviews.[3] As such, the review served as useful feedback for the relevant policy recommendations of each national context. The aim of this kind of desk research was to explore and capture through online sources the **current degree of integration and maturity level of two pedagogies** under investigation in each country's school system and to understand more generally the feasibility or difficulty of institutionalizing them in national curricula.

Step 2: Focus group with teachers from pilot activities

The second methodological step was a series of focus groups, conducted with teachers that participated in pilot activities of four participating countries. Focus groups were selected as a qualitative method that uses collective intelligence to capture a different range of opinions on an area that is considered relatively novel. As compared with interviews, the focus groups allowed the simultaneous emergence of different opinions on the same topic and followed a semi-structured discussion process.[4]

The focus groups discussions were performed between June and July 2021. The number of focus groups and participants with the groups varied across the four pilot countries. Each partner was responsible for interviewing and discussing with the teachers who participated in the pilot implementation of DESIGN FUTURES curriculum within their schools. Since the focus groups questionnaire combined questions with the previous output (O5 assessment and validation process), the overall duration of the focus group did not exceed 2 hours. In terms of format, partners had to two options: (i) online group interviews, or (ii) In-person group interviews. Given each country's situation amid the Covid-19 pandemic, each partner chose the way that was the most convenient for each national context, either through a face-to-face activity or via virtual groups or individual interviews with teachers. Also, they were given this flexibility according to the number of schools and of participating teachers that they had to contact, as well as their availability and personal preference in the way of implementing the focus group.

Focus groups were divided into three parts. In the first part, a series of semi-structured questions were posed to all participants of the group, with the aim to elicit information about the driving factors of DF method that enabled the successful implementation of pilot activities in the participating schools, any obstacles that appeared and how the teachers dealt with them. The first part was used for the development of O5 – "Design Futures Assessment Methodology and Validation Toolkit". In the second part of focus groups – where there is the focus for O6 policy recommendation's part – a brainstorming interactive session was held. The aim of the activity was to enable the participating teachers to critically think and reflect on which practical steps and changes are needed in schools so that ME and DT can be integrated and institutionalized in the formal school settings. This part operated mainly as a creative pathway where the interviewed teachers were invited to express, according to their personal experience, which changes are needed to institutionalize DT and ME in their school setting. In addition, it is worth mentioning that for this part of focus group discussion some specific information and techniques are taken from the O1 (state-of -the-art) report for inspiring more the

[3] Robson, C. and McCartan, K. (2016). Real World Research. Fourth Edition, John Wiley & Sons Ltd.
[4] Cohen, D., Crabtree, B. (2006). Qualitative Research Guidelines Project. Focus groups. Retrieved from: http://www.qualres.org/HomeFocu-3647.html

participants. For example, there was the opportunity to give the participants as a useful idea the "curricular spiderweb", which is described in the O1 report, so as to think better of the changes and factors that need to be followed for refining and improving with new methods the school curriculum. This connection was really useful as the logic behind the curricular spiderweb had previously guided the creation of the project's curriculum. In the following image, the basic elements for the development of a curriculum are depicted:

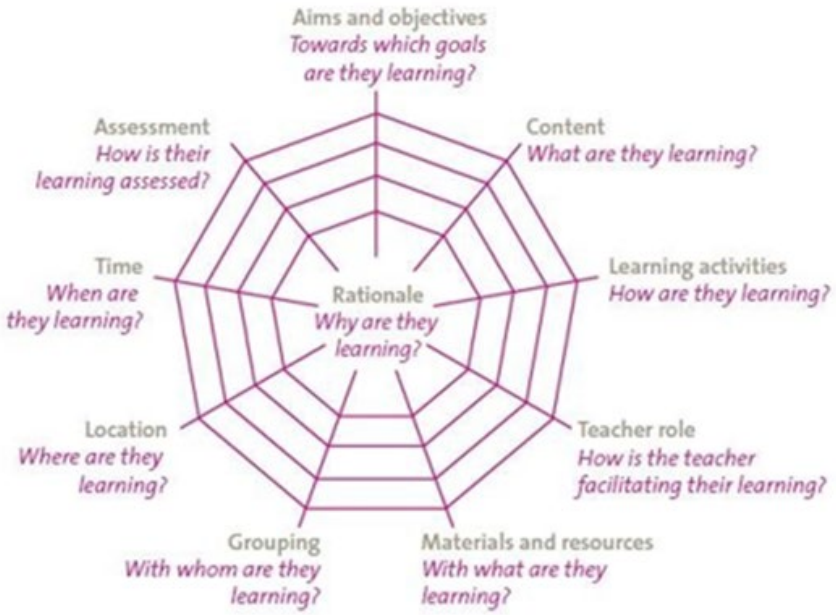

Figure 1: The curricular spiderweb by Van den Akker [5]

Some of the necessary changes that were proposed for the facilitation of effective integration of DF method in their school environment are connected to some extent with the displayed elements in Figure 1 and were considered as required adjustments in terms of:

- training need (more tailor-made trainings for teaching staff as they are not all fully familiarized with these pedagogies even though they have as an experience the pilot activities of DESIGN FUTURES project).
- openness of school in the integration of innovative practices
-resources and materials needed
-support needed (parents, students)
-further enrichment of curriculum that is currently implemented with innovative elements (e.g., with the help of digital tools and other necessary materials)

[5] Akker, J. van den (2003). Curriculum perspectives: an introduction (In J. Van den Akker, W. Kuiper and U. Hameyer (Eds.), Curriculum landscape and trends (pp. 1-10). Dordrecht: Kluwer Academic Publishers.

-teachers' role (flexibility and adaptability to such innovative techniques)
- timing (if it is needed extra time to devote for integrating the DF method in the learning process or in a course of a curriculum as the change that think about may be efficient in terms of content, but it may be time-consuming).

Step 3: Semi-structured interviews with policy makers and experts

A series of semi-structured interviews were held as final step to complement the findings from the policy briefs and the focus groups with teachers. Generally speaking, a semi-structured interview remains the most popular tool in the qualitative methods kit because the flexibility that is granted through open-ended questions allows the interviewees to emphasise on and analyse the issues and dimensions that are most important to them, rather than having to comply with pre-fixed questions.[6] The goal of the interviews for the policy report was to capture the different opinions of interviewed policy and decision makers regarding the needed long-term adaptations that must be carefully considered in order for ME and DT to be successfully integrated in each educational system and the various curricula. A series qualitative interviews were selected as the optimal data collection tool. The order of the questions was not fixed but functioned as baseline point for the discussion with the interviewee. Given that the aim of the interviews was to generate new insights, a semi-structured interview guide was selected as the most appropriate tool.[7]

The target groups of the semi-structured interviews were policy and decision makers, educational experts, headteachers, policymakers of Regional Departments and any person who was considered to be in the meso or top tiers of decision-making process in each of the four pilot countries of the project. The interviews served as a consultation channel, ensuring an interesting variety of engaged stakeholders. In terms of interview numbers and the format of implementation, in total 9 interviews were conducted with most of them being carried out virtually because of the pandemic restrictions.

In the next chapters, the results of al the previous methodological steps and the respective policy recommendations, as anticipated, are presented for each country.

Enjoy the reading!

[6] Bardour (2008). Introducing Qualitative Research: A Student's Guide. Sage. Second Edition.
[7] Bryman, A. (2016). Social Research Methods. Fourth edition, Oxford University Press.

Chapter 2: Greece

Country policy profile

1. Overview of the educational system

In Greece, the educational system is structured in such a way that it can occasionally allow for the incorporation of new pedagogies in teaching and learning process, while it remains generally centralized in the curriculum's development as also in the overall pedagogical procedure. In the primary education level, the curriculum is drawn up by the Institute for Educational Policy (IEP). The latter is in charge of delivering opinions or recommendations on issues related to primary education programmes, school textbooks and other teaching material. The curriculum is implemented at all schools across the country while the existing National Curriculum for primary education level is modeled on the basis of the "Cross Thematic Curriculum Framework for Compulsory Education (DEPPS)"[8].

On another note, what regards the elaboration of educational goals, pedagogical practices, types of exams and the assessment process is formed by school units and groups of schools with the co-operation of:

- Educational and Counselling Centres (KESY)

- Environmental Education Centres (KPE)

- Regional Centres for Educational Planning (PEKES).[9]

Concerning the level of embeddedness and incorporation of DT and ME in the primary education curriculum, no specific subject or thematic area, exclusively dedicated to these two pedagogical methods, has been foreseen yet in the educational system and in the primary educations' curriculum. Nevertheless, in accordance with the Presidential decree 79/2017, in the current school subjects, there is a course titled as "**Flexible Zone- Experiential Activities**", which can be considered as a more open subject and can theoretically include a variety of innovative elements from various pedagogies. Within the context of both the Flexible Zone – which is a mandatory course taught between 2 and 3 hours per week – and other optional school activities, schoolteachers usually are entitled to undertake actions with focus on three basic thematic areas:

1) **Environmental education**
2) **Health education**
3) **Culture and arts-oriented issues**.

For the development of the above educational programs, teachers utilize the "*Guide for the development of interdisciplinary environmental education activities*" and are further supported in their work by the heads of environmental education, health education, cultural affairs and school activities, in collaboration with the pedagogical relevant KPE (Environmental Education Centers).

[8] EC, Eurydice. (2021). Teaching and Learning in Primary Education. Retrieved from: https://eacea.ec.europa.eu/national-policies/eurydice/content/teaching-and-learning-primary-education-20_en
[9] Ibid.

2. Existing trends and key stakeholders for the integration of DT and ME in primary schools

The key policy stakeholders in Greece that have the means to promote more effectively the integration of innovative pedagogies in school education (including the primary education) do not come only from national actors and agents that fall under the official educational mechanisms. Equally valuable and important actions and initiatives can also come from non-governmental organisations or private actors that are active in boosting students' skills and in advancing the learning process, even though extracurricular activities, pilot actions or a collaboration scheme between the formal and the non-formal education sector.

To begin with, a first educational stakeholder who can take over an activity focused on an innovative approach is the ***Greek Ministry of Education and Religious Affairs*** and its inferior departments and responsible offices. In particular, the Ministry occasionally promotes the organisation and diffusion of interactive pilot actions, such the action "Skills Workshops" which was designed to be implemented during the 2020-2021 school year, under the Ministerial Decision 79511/DG4/24-06-2020. These workshops aim to enhance the cultivation of soft skills, life skills, IT and science skills and the incorporation of new thematic courses within the Primary School curriculum. Also, IEP organizes periodically several workshops addressed to students with emphasis on fields such as innovation, entrepreneurship and creative thinking. However, such initiatives are designed to take place in a pilot phase during the whole school year, that is to say as complementary to the school curriculum, not as an integral part of it. In these actions, no specific section or thematic focus has devoted until now on DT and ME.

Cross-thematic and creative approaches cannot be adopted only under the power of a formal actor but also under a mutual cooperation and contribution between formal and non-formal settings as new educational interventions. For example, in the framework of the implementation of the P.S.D. (Panhellenic School Network[10]), which is the is the national network and internet services provider (ISP) of the Greek Ministry of Education and Religious Affairs, the school units can:

- cooperate with public organizations, local self-government bodies, HEIs, other governmental or non-governmental bodies, etc., which implement programs / actions;
- utilize approved educational material of institutions;
- participate in thematic networks of environmental education (PE), health education (A.Y.), cultural issues, approved by the Ministry of Education.[11]

An indicative case of a collaboration between a formal actor (such as a Regional Unit of Educational Planning (P.E.K.E.S) and external European actors comes from the Regional Unit of Thessaly (South Greece) which has been quite active in introducing the school community into the creative world of innovative methods. For instance, two years ago the Regional Unit of Thessaly organised a very interesting event in which the main topic was titled as "**The DT in education**" ("Η σχεδιαστική σκέψη στη μάθηση" in Greek). The aim of this inspiring event was to inform teachers of primary and secondary education of Thessaly region about the main principles of DT pedagogy as well as the skills that are promoted by DT and its effective impact to the learning

[10] The website of Panhellenic School Network: https://www.sch.gr/
[11] EC, Eurydice. (2021). Teaching and Learning in Primary Education.

needs and development of users (in this case of students), as a collaborative pedagogy[12]. This event was promoted thanks to the participation of the University of Thessaly in the EU-project "Design-IT", offering educational material for teaching staff' training and awareness campaign on how to implement into practice the DT pedagogy.[13]

Despite the existence of valuable but scattered initiatives to promote DT and ME approaches in the area of primary education, it seems that it sometimes depends on each school unit or on each educator's experience (if he/she is familiarized with the implementation of such methods or if they are facilitated by the existing educational legislature) about how effectively they can diffuse and integrate in a long-term perspective DT and ME into their school setting. As such, these pedagogies are not implemented per se as formal practices as they have not been institutionalized or incorporated as part of the official school curriculum or as separate subjects.

Apart from the formal sector, it is true that the examined pedagogical methods are often promoted also by **external actors** (usually in the non-formal sector). DT and ME are conceived as non-formal practices incorporated in schools through the cooperation between external actors and schoolteachers in the form of extracurricular activities. Most of such activities are innovative interventions, usually targeted to children at schools, in collaboration with their teachers. An indicative example of such an educational approach specifically for the method of DT is the action "**Designers of Future**" («Σχεδιαστές του Μέλλοντος»)[14]. It is about a pedagogical action which was born in 2014 as an interactive and creative activity and has been tested to children of **primary education** and students of **secondary education level.** It seeks to introduce students in the notions of "creativity", "design" and DT through an experiential approach that facilitate children as well as educators on how to think and act more creatively and going beyond the basic learning methods they are taught in a typical classroom process.[15]

In the area of ME pedagogy, most educational interventions come from non-formal policy interventions which are implemented as a form of **synergy between schoolteachers and a private or civil society's actor**. This means that there are not official guidelines or policy framework related to DT and ME, published and diffused by the national government.

A form of non-typical educational intervention from civil society in Greece regarding ME is the "Open Lab project", which has been initiated by EELLAK. EELLAK (Organisation of Open Technologies) is a non-formal association, set up in 2008, which represents a range of research centers and non-profit organisations. In particular, EELLAK contributes to the **promotion of maker movement** and culture ("Do-It-Yourself") in the field of school education, among others, and strives for instilling active learning pedagogies, such as the

[12] ΠΕ.Κ.Ε.Σ. ΘΕΣΣΑΛΙΑΣ. (2021). *Η σχεδιαστική σκέψη στη μάθηση*. Retrieved from: http://pekesthess.sites.sch.gr/index.php/news-events/69-i-sxediastiki-skepsi-sti-mathisi
[13] The presentation of the main thematic area of the aforementioned event: https://drive.google.com/file/d/1WBMiaVv_OhuSWrPfl1kdRaR5HWBzUtW6/view
[14] Facebook page of "Designers of the Future": https://www.facebook.com/groups/sxediastes/
[15] About the profile of the creator of "Designers of Future" initiative: https://www.innovathens.gr/speakers/%CE%B4%CE%B7%CE%BC%CE%AE%CF%84%CF%81%CE%B7%CF%82-%CE%B3%CF%81%CE%B1%CE%BC%CE%BC%CE%AD%CE%BD%CE%BF%CF%82/

philosophy of "**learning by doing**". The Open Lab project refers to a type of fabrication lab (fablab), promoted by EELLAK in collaboration with Greek regional authorities and municipalities. [16]

Furthermore, ELLAK promotes the integration of ME in Greek schools by supporting formal education teachers through the provision of online guidelines, openly accessible, on how to set up and operationalize a "School Make Faire". Via its website, ELLAK describes a handy step-by-step methodology on how to organize a "School Make Faire" from A to Z, which schoolteachers can further leverage for initiating and adapting ME techniques to their school setting.[17]

To sum up, according to what the existing literature reveals, it seems that in Greece both public and private actors promote the integration of innovative methods in area of education. However, the existing supportive actions remain scattered, not always facilitating the systematic incorporation of DT and ME pedagogies into school system and into the learning methods. Consequently, these experiential methods have not been institutionalized yet in the Greek schools by the Ministry of Education, or any other official authority that could take an initiative towards that direction.

Relevant national recommendations for the integration and institutionalisation of DT and ME

Drawing on the rich insights that were generated through the literature review, the focus groups and the interviews with policy makers, a set of high-level policy recommendations are provided below for the Greek case. These recommendations aspire to form the basis for future and long-term initiatives in Greek schools, indicating the most crucial themes that need to be taken into consideration for a more effective institutionalization of DT and ME pedagogies in the current school curriculum.

Policy recommendation 1: **Invest in human resources and training opportunities for teachers**

During the performance of focus groups, a part of Greek teachers highlighted the essential role of human resources for the long-term integration of DT and ME into the school curriculum via as many teachers as possible. As clearly stated by a couple of teachers of the two Greek schools that participated in pilot activities, today there is not sufficient human capital in some public schools, as happens in the Plati school where "*there is only 1 teacher for 23 children for watching and intervening in each team in the project's activities*". This evidence shows the **necessity of including more teachers in activities** related to new teaching and learning approaches, especially in **the Making part**, as many of them endorsed. As already known, ME is a practical approach, so it sometimes requires more dedicated staff to be involved in the creation of an artifact or a tangible solution. Consequently, the factor of wider teachers' involvement can really influence the effectiveness of any handy activities with respect to the number of students which is under their responsibility and supervision.

[16] OPEN LAB. (2021). Retrieved from: https://opendesign.ellak.gr/2017/12/21/open-lab/
[17] Moraitopoulou. (2018*). School Make Faire: τι είναι & πως να διοργανώσετε ένα στο σχολείο σας*. Retrieved from: https://edu.ellak.gr/2018/04/30/school-make-faire-ti-ine-pos-na-diorganosete-ena-sto-scholio-sas/

Apart from the human capital, another factor that was considered vital to be further looked upon and leveraged by the policy makers for facilitating the embeddedness of DT and ME in school system is the **teachers' training**. Various practical suggestions were provided for putting into effect this necessity. A first idea focused on **teachers' assessment** for the integration of these innovative methods in schools before the initiation of any training, so as to indicate what are the current gaps about their skills or their used methods by now. Secondly, it was supported teacher training opportunities can be created by **urging the teaching staff to train in turn students** (in combination or after their own training) to be more open to participate in projects like DESIGN FUTURES and generally in initiatives that include such innovative methods, because the younger the students the more recipient they are in such new experiments. This practical recommendation can really facilitate every learner, given that not all students have the same level of performance in the school activities and learning methods. The training of teachers as an essential change for institutionalizing DT and ME was supported also by the interviewed policy makers, claiming that there have been some teachers' trainings for "Skill Labs", organized by IEP (a national actor), and will continue during the next school year. The majority of participants expressed that such training sessions will help **change the teachers' culture**, motivating them to **become** facilitators of students in the delivering of knowledge related to such innovative methods. The alignment of such methods with the exiting teaching style and national learning objectives can be additionally facilitated by the **adoption of a teachers' reflective mindset in STEM subjects** (e.g., in courses for Robotics to help students think critically and creatively) so as to offer a new learning orientation into school environment of primary schools. Finally, the suggestion of **applying handy activities beyond the typical classes**, especially in subjects related to environmental education and geography, was considered very important for help teachers follow an alternative approach for sustainably integrating DT and ME. As a policy maker stated: "*with practical activities students will be really supported to think of ideas and solutions under an approach that follows an "outside the box" way of thinking. Sometimes one teacher's manual or handbook is not sufficient…more materials and* ***experiential tools for skills' development are required*** *to foster such methods*".

Overall, it seems that teachers should be more recipient and adaptive to these new pedagogies. This requires a behavioural change from their side in both learning and teaching methods. At the teaching level, the transmission of knowledge to students should be done in a reflective way, by incorporating the DT and ME values. At the learning level, teachers should support students to systematically practice their skills related to DT and ME, as 21st century competences. Both qualitative and quantitative upgrade is needed for promoting DT and ME in school. Moreover, the investment of higher human capital should be sought, and increase of teachers' numbers, especially those who are experts in these methodologies, is needed and can impact positively on less experienced personnel's training.

Policy recommendation 2: **Promote the openness of schools and proactiveness of the school management**

The second crucial suggestion for the integration of DT and ME is the level of a school's **openness.** According to some pilot teachers from both participating Greek schools, **more flexibility is required at school level**, while values such as proactiveness, willingness and innovative culture are necessary changes for a school community to achieve the institutionalization of these pedagogies. The school system can become more open through its personnel and mainly through the role of school management and principals because they can contribute to the motivation of teaching staff and integration of new materials in the curriculum. What is more, although it is suggested for the teachers to be more flexible in new approaches, they usually follow specific guidelines by the Ministry that should be followed during school hours. In this way, **teachers do not**

have power to always move on different direction or to include very autonomously any pedagogical approach as a specific subject or course in the curriculum. In addition to this, school principals often meet **communication barriers** by the Directorate of Primary Education or the Ministry of Education and Religious Affairs regarding the approval of the school's participation in extracurricular projects and activities. This is also related to DT and ME methods because these approaches are usually taught or presented to students as part of extracurricular activity, not as formal practices that should be followed by the curriculum. Despite some critical obstacles for facilitating the openness of schools and their orientation to new approaches like the examined ones, the role of headteachers is for the majority of participants really essential, as their support to adopt such methods can influence teachers in a positive way, not only these ones who may not be so enthusiastic or motivated to follow and incorporate a new pedagogy but also a part of elderly teaching staff that sometimes is not so motivated or active to delve into and apply such pedagogies.

Policy recommendation 3: **Promote direct consultation with parents**

Another pivotal factor that needs to be further examined regards the **parental support and consultation** for the promotion and the integration of such pedagogies within the school curriculum. Being inspired by their own experience from the project, some teachers expressed that such innovative methods were not considered so important by all parents. Besides this, some parents' requirements are increasing, mainly in private school, and some of them are not always willing to leave their children in the school to focus on such methods after school hours. This necessitates the initiation and systematization of consultation between teachers and parents, so as to allow the former present to the latter the benefits of these pedagogies.

Consulting and securing buy-in from teachers can also help overcome another problem. As stated by some interviewed teachers, the integration of DT and ME should be done **in combination with delivering of school subjects** so as to apply a more completed teaching method in the learning process. Otherwise, it is more difficult to dedicate much extra time exclusively to each one of these two approaches within school hours, as the regulation of the curriculum's operation is more rigid and usually gives priority to the fixed subjects defined by the Ministry of Education. Therefore, widespread parental support can help teachers collectively strive for embedding directly DT and ME into existing subjects, by providing the argument that dedicating extra time for the two pedagogies is an alternative that most parents oppose.

Policy recommendation 4: **Incorporate systemic changes within schools**

The fourth policy suggestion emphasizes on institutional changes that are needed to sustain and scale-up DT and ME. From the side of pilot teachers, it was supported that there is a strong willingness from many teachers to consider in the future the opportunity to **accelerate their teaching methods by incorporating these pedagogies** in a long-term perspective. As stated by a part of teachers, "*all teachers can change the way of teaching that they had been initially taught at the university or the learning methods after this experience with the DF method*". The change in the way of teaching has been considered essential especially for the area of ME, because it is considered to be easier in its utilization by teachers and the students have shown a higher interest about it. Another institutional change that can ensure the alignment of DF method (including both DT and ME) with existing/current methods used in the current curriculum, most teachers declared that DT and ME can be taught separately from the school subjects or alternatively they could be integrated by each teacher in specific subjects (like in History, Physics etc.). The group of policy makers provided its own interpretation to the examined issue, supporting that the incorporation of these methods

into the learning process can be achieved either by proceeding with a **restructuring of the curriculum** or by attempting to integrate these pedagogies in the form of a regular workshop.

Although these methods are not absolutely and officially integrated in schools, in the curriculum there are some directions for more "active learning" and more creative engagement of students (e.g. in some subjects like Physics). There was also the information that during the last school year in around 40 schools a pilot process of integrating these methods has already begun for the further development of students' skills through the "Skill labs" process, coordinated by IEP (Institute of Educational Policy) under the Ministry of Education and Religious Affairs. Furthermore, there is to some extent an attempt to incorporate them in one or another way through a polynomial bill that is currently voted by the Greek parliament. According to this bill, all teachers will be obliged to implement in the curriculum the "Skill labs" (that until now are implemented in a pilot phase) whereby such methods can be taught and applied. The Skills Labs will be divided in four thematic areas, with one of them being focused on the topic "Research and Entrepreneurship" where these methods can be included in various classes of primary education. In light of this, it is commonly suggested through the interviews that **DT and ME should be officially considered a part of a LLL** (*LifeLong Learning*) **process** not only in the school settings but also in the academic environment and in the university courses for the future teachers who are going to teach in the upcoming years. The future teachers will need more innovative methods to apply so as to advance the whole educational process and improve their students' broader 21st century skills, their performance and their professional development. Regarding the school curriculum of primary education, some policy makers suggested that the sustainability of DT and ME nationwide should be promoted through the creation of a centralized policy, for example via the creation of a tailored planning that will focus on the integration of DT and ME in the upcoming governmental planning for refining the educational curriculum of primary education, especially by including DT and ME more systematically and not only through pilot actions in 'Skills Workshops', which will substitute the hitherto subject of 'Flexible Zone'. The achievement of most of the previous recommendations depend on a great extent on specific barriers that exist at national level and may impede the systematic integration of DT and ME within Greek schools. These are attributed to some bureaucratic problems and a lack of proper interest from the Ministry of Education regarding the formal integration of these methods in Greek schools. What is more, some teachers expressed that an additional difficulty at school level is the structure of the current syllabus and materials of the current curriculum which are considered by many teachers too big, as many times they struggle to cover them within school hours, without having free 'space' for performing frequently experiential methods.

Policy recommendation 5: **Foster synergies between formal and non-formal education providers**

Given that in the Greek educational curriculum of the primary level there are specific school hours dedicated to the delivering of the already regulated syllabus, usually teachers do not have sufficient time to devote for effectively integrating DT and ME, as many events are planned to perform during the official schedule. According to some teachers, a worth-mentioning suggestion at national level would be to **invest in the support of external collaborators** in order to promote new ideas through more innovative projects so as to sustain the methods of DT and ME. Otherwise, without this non-formal support, schools should add extra hours after the curriculum's implementation. It is imperative that multi-stakeholder alliances must be encouraged between formal and non-formal actors to boost schools drive positive change and exploit new opportunities offered by external experts. This can be materialised through synergies between private agents, parents, CSOs and schoolteachers in one school or between two schools of the same region. This in turn

requires a more open and positive attitude from schoolteachers, while the role of principals is critical in encouraging such collaboration schemes.

Policy recommendation 6: Develop better infrastructure inside schools

According to teachers and policy makers' viewpoint, there is an urgency to allocate more resources and creative spaces inside schools for carrying out a DT and ME activity. This is particularly the case for public schools that usually do not have suitable learning spaces or lack innovative materials, thus being unable to put into practice more experiential activities, especially those that require the creation of an artifact or a more specialised making. Some of the most indicative suggestions provided by the participants are that first the government could contribute to better infrastructure by subsidizing schools to develop new libraries for more research activities and creative thinking and second schools could reorganize some existing labs for STEM subjects in order to implement more often activities related to DT and ME elements, like the ideation and making of a product. As declared by an interviewed policymaker: "*In some schools, there is neither modern technological equipment nor laboratories for collective activities or "creative" experiments*". Talking about better infrastructure does not mean that DT and ME always require costly materials and unsustainable patterns for their integration in the school curriculum. Such methods can also be applied through cost-efficient initiatives, since the school covers a minimum level of equipment and can offer some basic materials for facilitating both teachers and students to participate in handy activities with practical steps that these methods can offer, even with the help of digital information or other paradigms.

Chapter 3: Italy

Country policy profile

1. Overview of the educational system

In Italy, the education system is organized according to the principles of subsidiarity and of autonomy of institutions. The State has **exclusive legislative competences** on the general organization of the education system (e.g., minimum standards of education, school staff, quality assurance, State financial resources). The Ministry of Education and the Ministry of University and Research are responsible for the general administration of education at national level for the relevant fields, respectively. The Ministry of Education has decentralized offices (Regional School Offices - USRs) that guarantee the application of general provisions and the respect of the minimum performance requirements and of quality standards in each Region. At a regional level, regions have joint responsibility with the State in some sectors of the education system (e.g., organization of ECEC[18] (0-3), school calendar, distribution of schools in their territory, right to study at higher level). Moreover, regions have exclusive legislative competence in the organization of the **regional vocational education** and training system. Local authorities organize the processes (e.g., maintenance of premises, merging or establishment of schools, transport of pupils) from ECEC to upper secondary education at local level.

The Ministry of Education and the Ministry of University and Research (MIUR - Ministero dell'Istruzione dell'Università e della Ricerca) define the educational program for the whole country. Regarding primary schools, the program is more focused on the students' skills development, instead in the secondary school the program is more focused on the knowledge acquisition. The educational program has the form of concrete guidelines for the initial definition of the curricula.

At institutional level, schools have a **high degree of autonomy** as they can define curricula, widen the educational offer or organize under more independent ways the teaching (school time and groups of pupils) process. Every three years, schools draw up their own 'three-year educational offer plan' (Piano triennale dell'offerta formativa - PTOF).

As it is revealed by the existing literature, the Ministry of Education is constantly working on the promotion of specific contemporary topics in schools, like sustainability issues. In this case, the Ministry grants recognition to big national organizations/ Institutes which usually develop educational courses for schools and teachers, while the schools are free to try the educational methodology in their setting. These specific topics are first defined by the Ministry of Education with the help of INDIRE. INDIRE is the "National Institute for Documentation, Innovation and Educational Research" and the Italian Ministry of Education's oldest research organization. Regarding the DT pedagogy, INDIRE is promoting the methodology "IDeAL - Iterative Design for Active Learning". Based on design cycles, IDeAL proposes a learning path that revolves around the creation of a physical, virtual, or conceptual product. Oriented towards accompanying the work of teachers in the construction of artifacts in the classroom, this method is designed for contexts in which there is a teaching approach based on problem solving and creative and analytical skills, including the use of technology. Within this context, the teacher assumes the role of facilitator and observes the entire learning

[18] ECEC stands for Early Childhood Education and Care

process; students work in small groups, even comparing themselves with the whole class. In the working group, decisions, responsibility, mistakes, and implementation processes are commonly shared. What is of utmost importance is that the design activity becomes the central point of the teaching-learning process, and the student is personally involved in the conception and realization of a product and in evaluating possible solutions to a problem. In this process, the student activates prior knowledge (disciplinary and non-disciplinary) and at the same time develops new knowledge, even confronting his own mistakes.

The IDeAL methodology guides the teacher to use teaching strategies useful to organize the class group in such a way that discussion, sharing of ideas and development of transversal skills are evidently promoted, in a student-centered environment suitable to develop deep learning. It is important to notice that all necessary materials are also offered digitally, in the official website of INDIRE[19]. This means that schoolteachers have the opportunity to access to them and apply anything they consider innovative for applying this method within the teaching and learning process which has the element of iteration and can be combined also to the DT process, which is inherently iterative.

Apart from any existing initiatives with emphasis on the DT method (like the aforementioned one), INDIRE, as national Institute, occasionally promotes the organisation of other specific actions in favor of the DT process. For example, in the past it organized two immersive workshops dedicated to "DT and the IDeAL methodology - Iterative Design for Active Learning" at Fiera Didacta Italia[20]. An additional information that proves the ongoing attempt to integrate the method of DT in education is that it can enter school system through the "Tinkering". Tinkering is now considered, in educational circles at an international level, an innovative approach to STEM education, and is mentioned in the National Digital School Plan as an important tool for the development of 21st century skills and for STEM education. Some Italian preschool teachers have integrated this innovative type of activity into the curricula.

With regard to the ME and the level for its adoption or implementation in Italy, it is true that it has been much more spread in schools than the DT method. This happens due to the birth and broader diffusion of Maker spaces and Fablabs in the Italian territory as well as to the communicative power of the Maker movement. This is justified also by the fact that every year in Rome the organisation of the European Maker Faire takes place. It is about an event that brings together people from various areas, such as Science, Technology, Innovation and Education and is held in a place where people of all ages come together to show what they are doing, where they share, what they are learning, and where they validate their prototypes.[21]

2. Existing trends and key policy stakeholders for the integration of DT and ME in primary schools

[19] INDIRE. (2020). Ideal methodology. Retrieved from: https://lab.indire.it/metodologia-ideal

[20] Niewint J. (2019). Design thinking at school. Two workshops on the IDeAL methodology at Fiera Didacta. Retrieved from: https://www.indire.it/2019/08/30/design-thinking-a-scuola-a-fiera-didacta-due-workshop-sulla-metodologia-ideal/

[21] Make Faire Rome. (2021). WHAT IS MAKER FAIRE. Retrieved from: https://makerfairerome.eu/en/what-is-maker-faire/

With regard to the key policy stakeholders who usually facilitate the diffusion of DT and ME nationwide but also within the school system of the country, it is observed that first national actors and educational offices that fall under the official education mechanisms often promote the organisation and incorporation of such innovative approaches in the educational area. A list of indicative national stakeholders pertained to these processes is presented as follows:

- **INDIRE**: Apart from the information displayed previously, it is worth mentioning that INDIRE is undoubtedly the benchmark for educational research in Italy that **develops new teaching models**, tries out new technology for training courses, and fosters innovation for redefining the relationship between space and time of learning and teaching. The Institute also has a consolidated experience in the in-service training of teachers, headmasters as well of administrative, technical, and auxiliary staff, and has been a leading player in some of the most important e-learning experiences in Europe. Also, it observes and documents the development of technical and vocational education and training curricula, and school-to-work transition, by means of quantitative and qualitative monitoring, data banks and research reports.
- **INVALSI (National Institute for the Evaluation of the Education and Training system):** It is again about a national actor/ stakeholder who prepares tests to assess learning for schools of all levels and the periodic national standards surveys.
- **SISTEMA NAZIONALE DI VALUTAZIONE (SNV- English: The National System of Evaluation):** it is about a strategic resource to orient school and education policies towards the cultural, economic and social growth of the country and to encourage the full implementation of the autonomy of educational institutions. To improve the quality of education and learning, the mechanism of SNV evaluates the efficiency and effectiveness of the educational system of education and training. The SNV is developed in three dimensions: the evaluation of educational institutions, evaluation of school management, and evaluation of the professional merit of teachers.

The spread of various observed initiatives through which DT and ME are promoted in the educational area by national actors (through INDIRE and the Ministry of Education mostly) across Italy is justified by the large dissemination channels such actors have, although it is really difficult to get in touch with them. Another gateway through which DT and ME can be further integrated is through schools and related initiatives they may develop but in comparison with the Ministry or other Institutes with greater range and bigger influencing power, **schools usually tend to have smaller local dissemination impact**. A third stakeholder through whom the dissemination and integration of DT and ME can be valuably facilitated is related to the organisations – usually outside school – that provide teachers' training. In Italy, it is known that all teachers are obliged to do a certain number of training each year. For example, during the last years, PACO organisation from Milano organised a training on DT for a public school's teachers which was part of their compulsory training. At this point, it should be clarified that although a certain level of this school's openness to collaborate with an external organisation for the enhancement of teachers' skills and knowledge on DT, it is not possible for this training to include the use of the curriculum material in class.

The previous example shows that despite the obvious existence of valuable initiatives and actions that have been initiated by national actors (INDIRE, INVALSI), the **role of stakeholders from the civil society seems to be equally important**, especially in the teaching staff' skills development or capacity building. A final observation by the collected information aw an existing trend is that there is to some extent flexible pathways through which these methods can be further promoted and taught, either through a public stakeholder (like

INDIRE promotes DT and ME through the "Indire LAB"[22]) or through a meso-level actor of such as a school that may be open to make a synergy with an external actor for the diffusion of DT and ME into the school system.

On another note, with regard to the way these methods are understood and integrated in the schools, it is supported that some private schools, such as the International School of Milan, have a Design Lab inside the school, as an integral part of its STEAM program. In more detail, **teachers collaborate with professional designers to develop design workshops that can stimulate children's curiosity and creativity**, while the Design Labs are aligned with the topics that students face in the classroom, providing them with the opportunity to exercise critical and creative thinking. This experiment reflects to a great extent the logic and philosophy of DT at first level, and it is not accident that is promoted by a private school where it usually has more resources and materials to apply than public schools. Regarding the public schools, the utilisation of DT and ME methods depends a lot on the **teachers' willingness** in attempting to apply something new inside the classroom. An interesting insight from the literature review is that **bringing innovative methods into public school is a much slower process** than what happens in private schools but the impact of these methods in the former can be proven bigger at the end, considering that the Italian public schools are considered high level schools and they are populated by the big majority of students. An additional significant trend in Italy is STEAM education is a promising area which has attracted the interest of many school actors regarding the application of experiential educational approaches (including Tinkering approach and ME) and today is something already and widely known by the teaching staff community.

To sum up, according to the existing trends integration observed by the literature review process as well as the level of integration progress about DT and ME, there have been valuable initiatives (workshops, methodology for DT) in Italy both from national actors and from civil society organisation to promote DT and ME. In addition, teachers in Italy collaborate with professional designers to create design workshops for children or they are engaged in training related to their professional development and capacity budling. Nevertheless, the particularity of Italian system to give autonomy to each school at regional level to develop their curricula differentiates the level of integration of such methods in each educational setting.

Relevant national recommendations for the integration and institutionalisation of DT and ME

Compared to Greece, the Italian case appears slightly different in terms of which policy recommendations would be suitable for Italy's educational system. Despite some intuitive commonalities between the two Mediterranean countries, the insights from the qualitative analysis dictate specific measures that must be adopted for integrating, systematising, and sustaining DT and ME into Italian schools. A detailed set of nation-

[22] Indire LAB is a container that brings together many of the realities that were born and grew up around the Technology Area of INDIRE. Through INDIRE lab, the LAB experiments with innovative technologies and methodologies meet the needs of schools and try to predict what are the best tools to adopt. You can find more info here: https://lab.indire.it/indire-lab

wide policy recommendations is displayed below, according to the discussions and collected opinions from focus groups and interviews**:**

Policy recommendation 1: **Familiarise the teaching staff with DT and ME through training and peer guidance**

One of the most essential changes that was recorded both by teachers and policymakers is that teachers need more training opportunities as a means to boost their motivation and interest to apply DT and ME. There is a need to focus on practical and emotional level for helping teachers to start deploying DT and ME and promote innovative methods like the examined ones. Most interviewed policy stakeholders stated that **there is not a centralized training system that focuses on DT and ME**. Nevertheless, the teaching staff is facilitated through their involvement to some scattered national initiatives that help them change to some extent their teaching methods. For example, it was supported that the national Institute INDIRE offers several research projects, in which teachers can join training activities and learn new methodologies together with equally motivated colleagues. However, there is a **great difference and variability amongst schools and regions**. For example, an interviewee supported that in her region there is a training service where schools can book a slot for the labs. Regarding the training of teachers, it is deemed important to also **focus on how to introduce the new activity to the students**, not just how to execute it.

Another crucial factor that seems to not support the bigger engagement of teachers in the promotion of DT and ME in their schools is a **lack of motivation** observed by some of them. The individual level is essential, because teachers are not so knowledgeable, in a professional way, about DT and ME. These pedagogies per se require from teachers a series of demanding activities: answering questions, monitoring lab activities, keep the process under control. This can demotivate several teachers, who often opt for easier and more standardized educational techniques. This obstacle can be coped with by **equipping them with specialised training** on how to handle the pedagogies, not only technically or operationally, but also emotionally (to understand the real added value and essence of such methods in educational area and transmit the same feeling to their students). Teachers from focus groups supported that for what concerns primary schools, although the most recent guidelines provided by the Ministry of Education have marked somehow a shift to a more "competency-based approach", **many teachers find it hard to break the habit of teaching in a more traditional way**, thus continuing to follow more old-fashioned approaches. Based on this reality, a couple of teachers supported that the less open-minded teachers' approach can be changed with the help of training: "*Training is essential to kickstart a transformation process. It is valuable as long as it is practical and helps teachers to feel less 'scared' and be more confident*". Consequently, **more capacity building opportunities and motivation are needed** for the teaching staff so as to be involved in new experiences with their whole class. In addition, another teacher during the discussion commented that: "*More than one teacher per class should be involved and ideally, all teachers should be. This can help to connect the project and both methods to as many (school) subjects as possible. The project should be integrated into the school curriculum and orchestrated with other colleagues*". However, this depends to a big extent on each educator's willingness and engagement and for promote these values an Italian teacher supported the idea of **urging teachers to create a 'support group' among them**.

An effective way for realizing the previous suggestion is to organise meetings between teachers that participated in DESIGN FUTURES project or other similar projects (which may include either DT or ME) and those ones that are not yet experienced or so much interested in such approaches so as to collaborate and exchange new knowledge. This idea will allow **less motivated or more traditional teachers** to learn from the

valuable experience of their colleagues. In general, the suggestion of a **peer guidance** is as beneficial as top-down instruction. Experienced teachers can provide horizontal support and tips to unexperienced ones. This can be done through the creation of horizontal support groups, either through physical (e.g., workshops, discussions, etc.) or virtual (e.g., instructive webinars, online regular meetings) pathways.

Creating a community among teachers around a 'shared purpose' is considered a key factor in sustaining the integration of both pedagogies as integral part of the curriculum. But what really impedes this sustainability? Some teachers supported that the reason that some teachers in Italian primary schools are not so enthusiast or keen on adopting innovative pedagogies with a transdisciplinary approach (like DT and ME really do) is that **some extra-curricular activities** through which innovative projects or methods are often promoted **are not incentivized** – indicatively some teachers who are almost never paid for such activities (or they are paid very low amounts) are not stimulated to adopt new methods. This can hinder the teacher's motivation because they are asked to invest in something that neither is included in the official school hours nor is considered as an exchange for them, not necessarily financially speaking but also for what concerns also their professional development as educators of formal education. The role of regional school management actors, as part of policy making area, is vital in the empowerment of teaching staff, as they can further give guidance to teachers and real incentives (for example offering them free capacity building sessions for their professional development or participation in new projects). In this way, there will be a transformation of school classrooms and the effective integration of 21st century skills in combination to DT and ME in the learning process of national curricula will be more successful in the long-term.

Policy recommendation 2: **Foster parental involvement and leverage local networks**

Apart from the support and provision of training opportunities for the teaching staff, the **parental support** was characterized as **equally important** by the Italian teachers in the process of integrating and embedding in an efficient way DT and ME into schools. Sensitizing the wider community about these relatively new methodologies is a core challenge today. However, by engaging parents to share their opinions and perspectives on the systematic incorporation of these methods into school curricula can help them exert influence over the school and over which initiatives it should put into practice in the future. Hence, the encouragement from the side of parents for triggering schools to apply more experiential and interactive approaches like DT and ME is not an easy case but it can still be proven a great learning experience for their children, by contributing to a more diversified curriculum and to the development of their 21st century skills.

Apart from the role of students' parents, a bottom-up networking can also motivate teachers according to some Italian teachers. Principals and civil servants can play an important role, but an inspiration from local communities or even from informal webs among teachers from different schools and other stakeholders from regional organizations is equally important. Peer learning and word-of-mouth exchange of information among teachers and local stakeholders that support and believe in the benefits of DT and ME can encourage other schools to start related initiatives. However, as mentioned by a policy stakeholder, the reluctancy of some schools to take the initiative to introduce innovative pedagogical methods remains a challenge in some regions. As a result, the uptake of such practices could be facilitated by civil society organisations, which are willing to spread the pedagogies in schools and offer useful feedback for their effective incorporation into the school curriculum. This in turn, would help teachers getting rid of the burden of introducing DT and ME by themselves. A synergy between teachers and civil society actors on co-promoting DT and ME would be beneficial in this respect.

Policy recommendation 3: **Promote the openness of school and autonomous role of school principals**

The level of a school's openness was considered an element to which stakeholders of educational area should pay more attention. In Italy, despite the fact that schools have the possibility and autonomy to choose what and how to teach, a more open and positive approach to experiment with new methodological approaches is needed. Autonomy is an important value for the Italian schools, but it can generate more inequalities in the system since in this context **innovation depends on each school's willingness** and policy to commit to a transformation path in the educational process. The criterion of openness of towards the integration of DT and ME in a school's curriculum and its official plan could be based on the high level of flexibility that is given to each school to define the curriculum and guide the teaching process. Another important step that could be useful for a school to adopt a more open strategy is to connect with other schools and be inspired by innovative methods that those schools adopt, by discussing in parallel what is the best way to apply more directly such methods. Apart from the level of openness, the **role of school management** is also an essential dimension to be further considered by the actors of policy making area, even at regional level. In particular, it has been supported that school directors could play a key role in giving teachers the mandate to change their approach and support a transitional policy from traditional methods to more innovative pathways into teaching and learning process. Furthermore, some policy makers endorsed that a way through which members of school boards can promote officially the importance of DT and ME inside their school is to become themselves more aware of the value of these new methodologies from a pedagogical and didactic standpoint. School directors should not just endorse new initiatives, but they should also actively promote them since they are a part of policymaking area and usually have the power to steer the activities of the school in one or another direction. Motivating a school principal to be an active stakeholder in advancing the school curriculum through the integration of DT and ME can generate real benefits, as they can encourage in turn teachers to create a community around them and act as 'pioneers' or 'innovators'.

The important role of school management was mentioned also by a part of interviewed policy makers. It was stated that: "*there are excellent schools that co-exist next to schools with a very low interest in innovation*". To address the problem of segmentation, a centralised and government-led strategy should strive for adopting and upscaling good practices and new methods at national level. Given that the central government does not intervene in such a way as in the centralised Greek system, this can be achieved through the dynamic role of a school principal who can focus on **re-examination of the current approaches on which their school gives emphasis.** In addition to that, a better coordination between the Ministry of Education and the numerous school principals – who after all have the power to shape their educational curricula – is necessitated.

Policy recommendation 4: **Design of proper evaluation frameworks and simplification of legal regulations**

Successfully integrating DT and ME requires an understanding of their added value and a special focus on the teachers and students' assessment and familiarization with them. Traditional methods of assessment do not suffice for the achievement of this integration. Setting new indicators and monitoring frameworks are highly suggested both from the Italian teacher and the interviewed policy experts for the proper evaluation of DT and ME. Another significant suggestion with a long-term perspective is that there is a **necessity to develop evaluation frameworks for the development of competencies**, without assessing only the students' understanding in terms of the delivery of notions within a subject or the operation of a course itself. By developing specialised evaluation patterns, customized to DT and ME, will facilitate teachers to evaluate better how the DT and ME are conceived by themselves and their students. As a teacher supported: "*Making and coding are much more popular than design thinking…they are seen as more specific and therefore easier*

to implement… the word 'design' is associated with the traditional meaning of this word in Italy". Despite the introduction of new evaluation grids during the last year, there is still **a gap between the current guidelines provided by the Ministry and the evaluation methods** (e.g., national tests like INVALSI still have a more traditional approach and do not focus on 21st-century competencies). The DT and ME pedagogies as well as the 21st century skills that are promoted through them are difficult to be evaluated according to any current traditional methods and many teachers claimed that such skills are often not included in evaluation grids. A specific pathway for adopting successfully new methodological approaches is to **help schools invest in new laboratory spaces** so as to drive this adoption, as methods like DT and ME naturally require dedicated spaces that can render the learning process a truly effective and experiential activity.

Apart from some essential changes related to better evaluation methods for DT and ME, Italian teachers and participating policy makers focused on other institutional and legal barriers that hinder today the 'scaling-up' potential of such methods. More specifically, the bureaucratic malfunction in many regions often block the uptake of innovative elements that these pedagogies entail. Also, the outdated or complex legal clauses hinder the deployment of DT and ME in several schools, and this is justified on GDPR issues. Modernizing the legal framework to accommodate DT and ME in curricula without sacrificing the safety of students should be prioritized, according to some Italian teachers. As it was indicatively stated: "*some innovative didactic activities often end up clashing with the strict requirements of certain laws (e.g., GDPR or safety regulations)*". These laws are based on just and unquestionable principles but are not easy to adhere to them when applied practically. Indicatively, GDPR regulation is a good example of this difficulty, for example when some teachers want to document the work done in class with photos and videos after an experiential activity. So, a **transitional path is required** so as to facilitate every school in each region to balance properly between the offering of highly innovative laboratories and the compliance to safety laws. It seems to be really challenging for schools to embrace innovation paths in parallel to the difficulty and constraints of some exiting terms of legal framework.

Policy recommendation 5: **Apply a competence-based approach through flexible guidelines**

According to the policy makers' perspective, DT and ME are not officially integrated in schools and there are **not general guidelines which are binding or adaptive to every school for their more systematic incorporation.** As stated by a specific interviewee: "*Politics often does not go as far as giving a name to methodologies…people talk about making and fablabs, but they are seen as suggestions for the national curriculum, intended to cover gaps to some contents.. they are not seen so much as methodologies to embrace*..". Despite this observation, there has been a level of motivation to some extent, as it is observed that an ever-increasing number of schools has started to adopt these DT and ME because in general they are deemed very effective, especially in the context of a didactic approach based on laboratories. This is justified by the fact that today any existing guidelines for the curriculum tend to leave more freedom in terms of a **competency-based didactic** approach, as opposed to a notion-based approach, which is what most teachers are all familiar with.

The systematic incorporation of innovative methods like DT and ME into a school environment and into the learning process can differ from school to school in Italy, as it depends to a great extent on the regional educational policy that is implemented in each region. As declared by a teacher: "*For what concerns secondary schools, the programs have changed but the school organization is more fragmented and*

*organized by discipline. It would be important to have **more flexible guidelines**, at the national level, that could help secondary schools to operate in a more flexible way*". Based on this example, it seems that schools lack of an adaptation or a transitional plan both for teachers and for students, irrespective of the education level. This means that the introduction of any innovative teaching method or learning tool requires specific adjustments and a broader approach by which teachers will be able to reflect on their mistakes and improve their whole approach.

By now, teachers were more used to teach about notions and were navigating students to just study a book or even simple a theory. Instead, the competency-based approach (or the laboratory-based didactic approach as it is said in Italy) is based on a more constructivist approach and strives for helping students solving problems by discovering new things. The progressive adoption of new learning methods by several schools could be considered a first, useful step to incorporate elements of DT and ME and this is what other countries name it as "active learning". This process facilitates both teachers and students envision something different from a classic classroom, something with a different layout and configuration.

Although DT and ME are not fully integrated by all Italian schools, this does not mean that the teaching staff is not interested in adopting such methods, upgrading the educational setting, and improving the elements of the curriculum they follow. The core problem is that they are not acquainted to the same extent with DT and ME. As supported by an expert person from INDIRE "***teachers often know what 'making' is,** but **they're not familiar with DT**. It could be that we have a problem with the word 'design*". This information indicates that there is more interest for the making culture and this could be an opportunity for institutionalising ME but this does not apply to DT, which is "*out of sight, as it reminds us of other things which may be misleading and perhaps less evocative*", as stated by the interviewee. It seems that teachers have not become acquainted with the DT method and that is why there is a lack of proper interest from teachers' side to boost the philosophy and its principles or even to combine it with ME pedagogy's elements.

Notwithstanding the different level of preference and knowledge about ME and DT methods by the educational stakeholders, it was also supported that an alternative way for some schools to embed such approaches is **through their participation to EU-funded projects or tenders**. Through these projects, the schools can be more inspired and take the chance to move the learning process a step further, by testing new methods and exploring new approaches under a collaborative and experimental mentality. No matter how, it is true that the curriculum defined in each school still needs to be further enriched with more practical elements there should be given more flexible guidelines that will facilitate more the emphasis on students' competences, boosting and sustaining in the long-term their creative spirit.

Policy recommendation 6: **Build on existing learning spaces in each school**

DT and ME require specific infrastructures, with modern labs and equipment to perform any required activities. This should be accompanied by upgrading existing curricula with more practical elements, such as lab-based and competence-based activities. Policy stakeholders expressed their opinion and recommendations on some necessary complementary tools that could be useful for the systematic incorporation of DT and ME into Italian schools. Specifically, they supported that it would be important to begin this 'institutionalization' by improving the learning environment. This is related to the idea of investing in more practical resources and new artistic spaces, as the school architecture is a key element in this transformative process from a traditional to a more innovative learning process. Setting up modern

'laboratories' close to DT and ME vision in the schools is one of the main drivers of any innovative change or adjustment in learning process, as it offers teachers a place where they can change the way they teach and facilitates students to be taught under a "learn by doing" philosophy. Especially with what regards ME, for a practical and 'making' activity, different spaces are usually required than the typical classrooms, because the innovative learning process needs tools that are not always part of a regular classroom. However, it should be underlined that some Italian schools currently have labs because of dedicated funds offered to schools. Still, these labs focus mainly on the ME method. There is not so much focus on creative spaces dedicated to DT goals and it is time for schools to improve their spaces and make them more suitable for interactive and collaborative activities.

Chapter 4: the Netherlands

Country policy profile

1. Overview of the educational system

Regarding the Dutch case, the educational system is structured in such a way that everything starts from the macro-level, as the Primary Education Act states, but not every responsibility appertains to the primary and top public stakeholders and governors. According to this Act, the central government bears the systemic responsibility for the entire primary educational system. This responsibility means that the central government is ultimately in charge of forming the realization of a coherent and effective educational system. The central government should give direction to all actors involved in and around the school, with the aim of **jointly achieving high-quality and accessible education**. At **macro-level,** there is the Government and the Ministry of Education, Culture and Science. At the same scale, there is also a mechanism named DUO (*Dienst Uitvoering Onderwijs),* which implements regulations for the Ministry of Education, Culture and Science. These regulations are always based on a law and/or a decree. Based on the outlined principles formulated in the 'Primary Education Act', the government under the Ministry of Education, Culture and Science establishes financial and legal frameworks through which the actors in the system are allowed to apply them autonomously. Within the primary education system, these frameworks are laid down in a sector-specific agreement, also known as '**administrative agreements**'. In the legal form of Legal Entity Task, **a school** has a **formally independent position.** The established frameworks therein have a leading character and must ensure sufficient policy freedom, which means that **schools can also act upon their own vision**. This reality confirms the decentralized character of educational system and the autonomy of the schools' role across the country. The way on which the Ministry of Education, Culture and Science carries out its tasks is thus governed by an appropriate distance from the schools, but in general the Ministry endeavours to have the education system function as a whole as **optimally** and **autonomously** as possible.

The central government has set core objectives for the six legally required school subjects in primary education – Dutch, English, arithmetic/mathematics, orientation to yourself and the world, artistic orientation and physical education. The core objectives describe in general terms what a school up to the last grade must offer to the pupils. Under the Education Supervision Act, there is another responsible department, the '**Education Inspectorate'**, commissioned by the Ministry of Education, Culture and Science, which acts as an **independent supervisory body**. Its main objective is to verify whether educational institutions comply with which is laid down in the Primary Education Act. The Inspectorate monitors the level of the school, the school board, and the functioning of the entire education system, while it checks whether schools and school boards comply with legal requirements and meet the basic quality of education. Based on this, the Inspectorate evaluates the final assessment as good, satisfactory, or unsatisfactory. This judgment can have a **major impact on the reputation and actions of a school leader**.

With regard to the **meso-level**, as revealed by the existing literature, **Provinces** offer support measures in the field of primary education. Under this framework and in the same scale, the **Municipalities** take care of the school buildings and implement municipal education policy. Due to the decentralized nature of the education system in the Netherlands, the responsibilities for the actual implementation of the regulations are set lower in the education system. Another actor that operates at meso-level is the "**School boards**" whose role is

between the Ministry of Education, Culture and Science and the individual primary schools. This is because individual schools have no formal status within the Dutch system. The school board is the formal point of contact from the national government. Following the school boards, there is the **school leader**, who is considered as the most determining factor for the realization of changes in the classroom. This is because **school leaders have ultimate responsibility for the policy choices that are made about the direction and organization of education** on an individual basis in primary school. A school leader has thus the key position to determine which direction will be shaped in the policy of their primary school and what is subsequently assigned to the teachers. A last stakeholder at this middle level regards the "Education Material Companies". In particular, a primary school must adhere to the statutory core objectives but decides for itself how it offers the subjects and which teaching material should be taught and delivered for each subject. This freedom is a fundamental right (art. 23 paragraph 2 of the Constitution). As a result, the interpretation of subjects and taught materials can sometimes differ greatly from school to school. Differently from the Greek case where the school curriculum is defined from the Ministry of Education and its related Institutes, Dutch schools can buy their own educational materials as there is **no standardized curriculum** in the Netherlands. Educational materials are designed within the schools themselves[23] or can be bought from companies who specialize in creating educational materials. This happens through a **free-market** approach.

Finally, at micro-level, there are "Teacher teams", thanks to which teachers work within teams in primary education to streamline the teaching processes. They make decisions about how they want to implement the teaching materials and offer **constructive feedback** to the school leader, as by themselves and via their position it seems that they play a marginal role within the steering network surrounding the school. Within the category of micro-level, students are also included there in, but it should be underlined that every student is a different personality and has different needs to cover and meet. In the end, the goal is to offer appropriate education to every student. An additional indirect stakeholder regards the group of parents, who are the suppliers of a school and have the legal responsibility for the upbringing of their child(ren).

Apart from the macro-, meso- and micro-level, the Dutch educational system also includes agents that give advice to specific dimensions related to various educational layers. For example, the **PO Council**, founded in 2008, is a grouping of various governing bodies in primary education. The PO Council arose from the wish of the education field to have one strong sector organization that could operate within the education system. According to the Annual Report issued in 2016, **the PO Council represents approximately 81% of all school boards in Primary Education**. Furthermore, another agent is **SLO**, which is an **expertise center for curriculum development** that **gives advice** to the Ministry of Education, Culture and Science. They also publish reports with guidelines that can be used by curriculum designers, school boards and/or teachers. This center uses its knowledge and experience for a well-thought-out (or carefully considered) curriculum and contributes to the quality of education.

At this point, some general objectives and new learning approaches are highlighted by the literature process which to some extent show if there is an open space for DT and ME to be more institutionalized in the educational system of the whole country and become part of each school's approach. The Ministry of Education, Culture and Science has been working on a new educational agenda, but its release has been

[23] **Quick note**: Most schools choose well-known language and math methods, such as 'Safe Learning to Read' (nl. Veilig Leren Lezen) or 'World in Numbers' (nl. Wereld in Getallen). In addition to a language and math method, some schools also have a method for 'orientation to yourself and the world' (geography, biology and history) and 'art orientation'. Other schools choose to develop their own lessons for this.

slowed down due to COVID impediments. It has been 15 years since the nationally established educational goals have been revised. Since then**, these goals have been revised in specific parts, but not in conjunction or integrally**. In the report 'Towards a Learning Economy' (2013), the Scientific Council of Government Policy argued for a review of the content of education. And in 2019, the Education Inspectorate advocated the necessity to give more focus on the curriculum and the need for clear choices about the common goals. Various trade unions are also asking for a **renewal of core objectives** and final objectives. Under this common discussion, in February 2021 some frameworks were initiated for the future educational agenda.

An important new dimension of the defined educational goals regards **two new learning areas**: citizenship and digital Literacy. Schools already have an obligation to pay attention to citizenship. The new law on citizenship education (November 2020) considers this an assignment for the entire school. Regarding the new learning field of digital skills, the Ministry of Education, Culture and Science has put special emphasis on all schools to become **more digitalized.** This progressive digitalization process offers opportunities for improving education itself and at the same time requires from the educational actors to work on the digital literacy of students. In this context, a digitalization agenda has been created to give direction to the digitization process in education. Moreover, in the current educational debate in the Netherlands, much attention is also paid to the "education of the future". The discussion focuses, among other, on the question of which knowledge and skills are important to prepare students for a rapidly changing society. Many of these skills are summarized as "21st century or cross-curricular skills". There seems to be a broad agreement about the importance of these growing skills. In order to properly prepare students for the 21st century society, it is considered important to give such skills a place in education. According to a SLO's study back in 2014 about the degree of integration of 21st-century skills in basic education (primary education and lower secondary education), the 21st century skills that were distinguished are ICT (basic) skills, media literacy, information skills, computational thinking, creative thinking and acting, problem-solving thinking and acting, critical thinking, self-regulation, social and cultural skills, communication, and collaboration. Since then, the research showed that **21st-century skills are still poorly addressed** and structurally addressed in education. There is a relatively limited attention for these skills in national curriculum frameworks, and in regular methods they are not implemented systematically. In particular, creative, and problem-solving thinking, acting and digital literacy were not yet fully developed. Furthermore, in 2018 the PO-raad created a **DT toolkit** addressed to the primary education. The underlying rationale for this toolkit was to **support the development of the aforementioned 21st century skills to students**, but again some gaps were observed as there was **lack of focus on teaching students more in depth the principles of DT**, but there was only an emphasis on using DT as a means to just create new lesson plans.

Finally, in the new proposal, seven subcategories of connecting skills are distinguished: (1) analytical thinking, (2) critical thinking, (3) creative thinking, (4) communicating, (5) self-direction, (6) practical action, and (7) social action. These skills should be practiced in the specific context of a subject, learning area or learning situation. Nevertheless, no specific focus has been given for the more enhanced integration of DT and ME methods as separate learning objectives.

2. Existing trends and key policy stakeholders for the integration of DT and ME in primary schools

As already explained in the previous section regarding the core objectives and the learning areas on which there has been special emphasis for the students' skills development in educational area, it is true that there has been an interest in promoting both DT and ME pedagogies across the Netherlands, but not so much in integrating them as separate lessons or learning objectives. However, many initiatives were grown to foster these methods within the educational curriculum. In secondary education, some schools started implementing a new subject called: Research & Design in which many elements are borrowed from the DT and ME approaches. Additionally, various websites such as Makered.nl and Makereducation.nl aim to provide ME theory and resources to schoolteachers. When it comes to DT method, regarding the way it is conceived by school actors and teachers, teachers sometimes mistake it with a process which is research-oriented or as project-based learning. However, the difference between DT and project-based learning is that in DT method students **find their own problem statement** that they want to solve within a broader topic, while in project-based learning the students already get a problem statement. In some cases, several teachers think that students are not able to find their own problem statement. The difference between research-based learning and DT is that research-based learning ends with a conclusion to the research whereas DT takes it further and facilitate students imagine and develop an artifact, based on their research outcomes. With regard to how the educational staff conceives in general the ME approach, it is often confused with craft or technical class. The particularity of this method is that it is more aimed at 21st century technology and democratization of these technologies.

Moving to the key policy stakeholders who play a critical role in integrating DT or ME in the school system, it seems that these actors derive both from the formal and the non-formal educational sector. More specifically, at policy level, various governing bodies at meso-level promote these methods as innovative practices. The attempt to incorporate more intensely and effectively DT and ME in the educational system does not regard only the students' learning process. The benefits of such approaches are also spread through the training of teaching staff. Some actors also from private sector can offer specialised training to teachers about innovative pedagogies. These pedagogies include project-based learning, research-based learning and even DT and ME as separate approaches. Finally, the dynamic role of non-formal actors is important, as across the country the DT and ME are promoted also by the civil society's action. Specifically, there are several companies or centers that provide workshops or project-weeks to elementary schools, such as specialized companies, museums, makerspaces, and libraries, which often collaborate with schools.

To sum up, in the Netherlands the educational system has a decentralised character and there is not a standardized curriculum. This permits schools to act autonomously about the development of the curriculum and the design of educational materials, following some basic frameworks established by the Ministry of Education. Regarding DT and ME, these pedagogies have attracted the attention and interest of multiple stakeholders, but again it depends on each school's policy to integrate and foster them more effectively within its policy. In any case, existing initiatives related to such methods come both from formal and non-formal education actors, although DT and ME are not yet established as formal practices by the national government and are not included in official guidelines or in the context of new learning areas.

Relevant national recommendations for the integration and institutionalisation of DT and ME

It is evident that the Dutch case indicates its own specificities regarding the issue of integrating DT and ME in schools, considering the particular structure of its educational system. As such, policy recommendations should be tailored to the overall decentralised system of the country so that they can be adapted by any school, as there is not a standard curriculum because it is defined and streamlined by the school board and teaching staff. Nevertheless, a combination of factors at macro-, meso-, and micro-level can be put forward with the aim to achieve the institutionalization of our examined and promising methods. A concise summary of high-level recommendations, considering the gathered insights from focus groups and interviews, is offered below:

Policy recommendation 1: Leverage digital materials and complementary learning resources

The fist essential change on which both pilot teachers and interviewed policy makers shed light for the integration and institutionalization of DT and ME in Dutch schools is the significant role of innovative resources, customized to student's contemporary needs. More specifically, a Dutch teacher mentioned that an interesting idea is for each school to create a set of useful printed/ digital guides (e.g., in a form of a useful and specialised handbook) that will give clearer explanations for DT and ME, the maker kits, the steps of DT methodology as well as the philosophy around such methods as an additional educational package for teachers. Another participating Dutch educator supported that there should be more focus on visual techniques for facilitating the integration of DT and ME inside classroom, such as the system of a pictogram.[24] This idea can accelerate any educational activity with a more playful and interactive way, thus surpassing traditional methods of knowledge transfer (such as focus only on sorting work or fill-in work after each lesson). Furthermore, the usefulness of deploying audiovisual material was mentioned also by policy makers, who claimed that teachers could leverage digital tools for developing additional PowerPoint presentations related to DT and ME before starting or during the delivering of each lesson. Generally speaking, the idea of introducing more innovative resources for many different activities is an asset both for teachers and for students to adopt new patterns in the learning process and improve the cognitive methods with as many multiple options as possible. The uptake of the aforementioned measures can really benefit each school and consequently contributes to the quicker and successful integration of DT and ME in each school's curriculum. Simultaneously, they help the progress of digitalization process to which the Ministry of Education, Culture and Science has paid special attention during the last year and can enable schools and teaching process to adapt to the challenges caused by the restrictions of Covid-19 pandemic, thus being more in readiness to apply digitally DT and ME activities, where needed in the future.

Regarding the issue of equipment and other essential resources, teachers from focus groups supported that for implementing DT and ME during school hours, they usually need some basic staff to offer to students for designing an idea. In this way, teachers can adapt simple and flexible materials to their lessons and many of them have started to incorporate the methods with a basic equipment. At the same time, another educator supported that the use of "Maak-o-theek" learning materials in their school seems to be a good suggestion for continuing the incorporation of DT and ME. Triggered by this statement, it seems very important for each

[24] A pictogram is a chart that uses pictures to represent data. Pictograms are set out in the same way as bar charts, but instead of bars they use columns of pictures to show the numbers involved. You can find more info here: https://www.theschoolrun.com/pictograph

school to have such tools and to help teachers and students start with simple things and basic steps for creating a prototype and designing practically an idea. Nevertheless, the problem often appears when they should focus on a more demanding activity, because not all primary schools have been properly equipped with larger materials. In this case, it seems more challenging for teachers to adapt very easily because not all schools have a so specialized equipment and they occasionally contact electricity companies to equip them with some materials or they even look for a cooperation with high schools that have laser cutter machines, 3D printers and other related expensive equipment for being able to proceed with a more complex making. For this reason, a teacher suggested that schools which experience a respective 'shortage' could establish a cooperation or a common agreement with other schools (which may be equipped with more materials) or they can cooperate with private companies and other educational centers which specialize in creating high-quality educational materials and maker kits so as to offer productive feedback and complementary, material support to the teaching staff.

Policy recommendation 2: **Integrate DT and ME in the new educational agenda and learning areas**

The second element that should be taken into consideration for achieving the integration of DT and ME more feasibly in all Dutch schools is the **enrichment of each school's curriculum**. According to some interviewees, the topics that are taught in the current curricula of Dutch schools should be further enriched for facilitating the effective integration of such methods in the learning process. This is also confirmed by a teacher's viewpoint: "***I think these topics are too far removed from primary education…. at primary school it should be a little closer to the students so as to come up with solutions that can be realized***".

Another dimension for achieving the enrichment of curriculum is to focus more on design-based learning and 21st century knowledge, according to some teachers' opinion. This is truly necessary because, according to some teachers' point of view, in some schools there is too much emphasis on the core subjects (such as math and language) and less attention to other subjects like geography or citizenship education, in the context of which DT and ME can be equally included. At the same time, DT and ME are often seen as extra-curricular subjects and are not part of the curriculum in strict terms, so the policy educational stakeholders should realize that the current subjects can be easily combined with DT and ME, as they are adaptive methods, thus without requiring more valuable time for their integration. This will increase the understanding of core subjects' goals and broaden the children' horizon in any type of knowledge they are taught. Policymakers from their side stated that innovative approaches such as DBL have started to become prominent in some schools as a didactic approach, but in other school curricula there is no mention or so much attention in this learning method. Regarding ME, some of its elements may be taught through the engineering (or more technical-focused) education, but the focus on design learning (close to DT method) still remains very narrow. As clearly mentioned by an interviewee: "***I don't expect ME or DBL to be integrated in the policies, but I do think that schools will get the space to implement their didactic approach if they desire to invest in this***". What is generally observed by the previous viewpoints is that as there is not a comprehensive national curriculum, schools are free to choose on how they want to implement each innovative method. Several schools have already started, as part of their own policy, to look for innovation pathways. In this respect, the process of disseminating, integrating, and sustaining DT and ME is evidently a school strategy's initiative and not a governmental one.

On the other hand, teachers and policy interviewees recognized that in Netherlands there is to some extent a minimum level of integration and indicative examples were given for this fact, coming from schools such as Dalton or OGO, which have a student-driven pedagogy and promote a project-based learning, as early adapters for introducing the principles of DT and ME in related programs. This happens because the philosophy behind DT and ME are closer to these schools' identity and way of operation. Another important information is that currently there are new plans from SLO (Expertise center for curriculum development) and curriculum.NU through which a concept called "bouwstenen" has been elaborated, although it has not started yet to be implemented. This new concept is similar to the competencies promoted by DT and ME – for example in curiculum.nu there are some elements of DBL (Design-based learning) but not explicitly – and this could be a fertile ground for developing new learning plans dedicated to these methods in relation to this concept. However, during the Covid-19 pandemic, not all schools were facilitated to adopt competence-based programs, but the Ministry of Education has published in the meantime some suggested intervention strategies (some such some new frameworks as mentioned in the literature process of the previous section), however without having the authority to intervene on how they can be applied in each school. Also, focusing on the development of meta-cognitive skills gains more ground in the policy agenda. In parallel, there is a broad agreement about the importance of 21st century skills but generally it was supported that these skills are still poorly addressed area of education.

As it has been observed by the participants' viewpoints, the integration of DT and ME can be achieved in each school by enriching the curriculum through various learning areas, such as combing them with the teaching of soft competences (creative thinking and acting, problem-solving) or with focus on project-based learning approach. Overall, the methods can be prioritized in the overall national learning objectives or can be incorporated as separate new practices in the frameworks that were initiated this year under the formation of a new educational agenda.

Finally, some teachers shed light on another critical factor for advancing their curriculum. Specifically, they suggested a new assessment process for students' soft and digital skills in their curriculum. It was supported that some schools continue to be attached to the typical assessment and grades' system which cannot permit for more students' freedom and development. As a teacher mentioned: "***There is so much emphasis on the grades children get in reading and maths to the exclusion of all else. If the CITO grade would not be the main thing that is looked at when a child is going to secondary school, that would make for a lot less pressure on teachers***". In addition to this, many parents also focus too much on grades, without permitting their children to be connected with the subjects under a more alternative and experiential attitude. In order to facilitating the openness of new pathways for the integration of DT and ME and moving from a more traditional assessment system to a more alternative type of evaluating students' competencies, a part of policy makers suggested to **think about adding a 'diploma for skills' to the school system**. The justification on this special recommendation is that in elementary schools children are usually given feedback on grades or elements such as their listening attitude and performance on core subjects, but not about their digital, communication or problem-solving skills. If students both in primary and secondary schools were given credits for their skills, these were more valued and could be evaluated through a DT and ME implementation system via specific steps or activities that can permit even a system of self-assessment and reflection of students.

Policy recommendation 3: Achieve teachers' behavioral change through capacity building and guidance from external parties

The decentralised structure of the Dutch system renders the role of teacher a significant factor in promoting and embedding DT and ME in their school. Achieving a positive change of teaching staff's mindset and regaining motivation from their side is among the most important enablers to achieving and sustaining these methods in each school. Issues related to fear of taking the initiatives must be overcome. Teachers from focus groups stated that even if some teachers are willing to take the initiative, lack of skills in how to handle and guide students can hamper any fruitful attempt to systematically incorporate them. Investing in more training of teaching staff and equipping them with the necessary skills is more than critical today for every school. Although, this investment depends on each's school vision, as some schools have already initiated such approaches, but other schools lag behind and need more training or extra time to devote in order for the teachers to be better acquainted with the operation, understanding and philosophy behind such methods, before applying it into the subjects. For the bigger familiarization of teachers with DT and ME and their devotion to integrate them in their lessons, a policy interviewee supported that a useful tool for each educator is to create worksheets. In simple words, an idea is for teachers to develop a lesson overview for them and/ or their colleagues and write their plans or how such methods can be easily embedded in a lesson and of course what is expected for them and their students. This can result in a **peer support network among teachers** supported by teacher teams included in each school or through mentoring or consultation by principals. Since the national policy does not determine how teachers should enrich their lessons and is up to each school's policy to choose the way of a lesson's implementation, a top-down approach would not be so efficient and thus the schools and their directors should promote themselves such methods, with the valuable help of teachers. In addition, the embeddedness of DT and ME can be fostered through an extra pathway and this comes from the educational sciences where it could be further examined how DBL or more specifically DT and ME or a combination of both can be used in practice within the classroom and the learning process. Practically, this can be achieved through teacher's academic education in order for them to implement such methods, already developed from their university studies, directly into schools in which they teach. Some teachers mentioned in the academic primary education studies, there is to some extent a focus on DBL (a kind of learning very close to DT) but it is seen more as an approach for teachers to just create better education, not so much as a tool to guide students. During the past, teachers were using a very scientific method to create better education, but during the very last years, many of them have acknowledged that innovative methods like DT for example are more appropriate due to iterative and practical aspects they entail. That is why it is substantial **to promote this mentality in teachers' education**, because they will be more equipped to implement them almost automatically and intuitively in their classroom. An indicative testimony from a teacher on this point: "***At the pabo, the teacher training college, I did not learn anything about technique.. it is in the form of such an interesting project (i.e., the DESIGN FUTURES project) that helps us a lot***".

Dutch teachers that participated in pilot activities and focus groups supported that for them and many other teachers across country it is more than substantial to continue the integration of DT and ME. Indeed, some of them are already experienced and engaged in these pedagogies and they have included them to some extent in the kind of education they promote and implement in the classroom since their beginning. Moreover, it was suggested that for effectively sustaining DT and ME as integral part of their teaching process and of their curriculum, it is better not to always use pre-formulated techniques, because what is first needed for them is to **know how they can apply these pedagogies on their own**. This argument is summarized in one teacher's argument: "*We need to look at how it can be built into our current system. So not to do it next to it, but to make it part of the curriculum".* The importance of boosting teachers to implement DT and ME steps

by themselves, in other words to implement them in their own way through by gaining continuously practical experience, is a key element for their systematic embeddedness in their schools because it is not sufficient for them to learn only from a presentation, a manual or a booklet.

For effectively upscaling teachers' professional development and familiarization with DT and ME, some policymakers mentioned that a prerequisite is to change teachers' mentality to avoid connecting such methods only with technology or the creation of simple artifact. Teachers have to approach them in a different way for being able to transmit the knowledge around them to students with a more creative way. As characteristically mentioned by a teacher: "***The main challenge is other teachers' mindset as some believe that anything has to do with technique is not for them***". Cultivating a good attitude and a willingness to try out new things in the teaching and learning process, either as an older or as a new educator, is considered really important, as they can motivate both themselves and their students and apply more smoothly a "learn by doing" approach into and outside classroom. The lack of motivation by some teachers is attributed to the fact that some teachers do not have the necessary skills for communicating the meaning and teaching the principles of DT and ME, although the technique in implementing activities related to such methods is not necessarily complicated.

According to a knowledge broker's opinion, generally speaking it is true that teachers are allowed to integrate such pedagogies, and this means that they are autonomous. The problem is that teachers at most schools (with the exception of Dalton or OGO type schools) are not so stimulated on any structural level. Although to some extent teachers are usually facilitated to promote innovative pedagogies like DT and ME through educational grants or subsidizers that are focused on knowledge's impact and improvement, what is really needed for them and the schools is "***to be creative in where they are looking for solutions***". This suggestion on teachers' or school's dynamic role a is verified by a third interviewee who mentioned that it really depends on the school in which a teacher is involved – from schools that fully dive in and invest a lot of time in such a method, to those that apply it only in a science class, or even those that are not interested at all to promote them as part of their curriculum.

A final aspect that was claimed by the interviewed teachers was that capacity building for teachers in support of integrating DT and ME can be accelerated through the collaboration and liaison with experts in the fields. In principle, the participation of external parties with such an expertise can help shape school agendas through consulting and feedback, as well as provide guidance to the school personnel. This recommendation should build on the existence of stakeholder groups such as the PO Council and SLO, which possess already rich insights and previous experience in the instruction of DT and ME pedagogies and can therefore navigate teachers to that direction.

Policy recommendation 4: Pair DT and ME with various educational fields

The final crucial recommendation on which Dutch teachers and policymakers brought up regards the strengthening of current learning methods by combining the examined methods with the existing learning areas on each school focuses. As there were Dutch teachers from different schools, it was not possible to gather exactly the same opinions, as each school follows its own plan in the development of curriculum. To begin with, some educators mentioned that adding innovative elements in a current learning method can be strengthened through more collaboration and exchange of opinions among students on a new examined topic/pedagogy. Regarding this aspect, a teacher suggested that each educator could leave some time (within school hours) for further discussion and reflection at the end of each lesson. In this way, students will be

empowered to make use of their critical thinking and communication skills, evaluating more critically and consciously any lesson they are taught. Elements of DT and ME like, the reflection or the collaborative spirit that they promote, can be easily assimilated by primary education's students in various learning areas and fields (from Physics to environmental education and civic lessons), thus impacting positively on the curriculum's enrichment. This is something that should be further looked upon by school boards and principals when deciding on the selection of teaching methods.

Moreover, a similar suggestion for the upgrade of current learning methods put emphasis on the thematic areas on which schools focus. As indicatively described by a teacher: "*We already work thematically, we will continue thematically and twice a year we do a design assignment in it…what you just need is to get your colleagues being more excited…* ***the only problem would be if DT or ME could not be properly incorporated into a theme… if there is such an option to integrate them next to the selected themes, they would actually become part of the curriculum***". A part of participating teachers added in this comment that in principle it seems to be quite easy to combine DT and ME with selected themes, as in their setting, especially for science and technology subjects, the method of DT and ME can be covered with different types of projects and ways of working. Teachers in general have to be careful to cover all the topics and to be aligned with each objective, either pertained to the language or to more technical parts of some subjects. In some schools, such as the school OGO these methods have already been included in one or another way with the learning objectives. Since DT and ME are often considered as extra subjects, mixing them with core activities can be a subtle but effective way to integrate them. This can help overcome the barrier of lack of time, while DT and ME will stop being regarded as luxurious activity.

Apart from combing these methods within existing learning goals, a teacher mentioned additionally that DT and ME can be considered for the annual planning of the school year 2021/2022 and be further looked upon as core objectives, given that both methods can be aligned to a new theme that the school is planning to promote (such as the area of citizenship or digital literacy), where students can become through DT and ME more active citizens and exercise collectively some essential 21st century skills.

Furthermore, it was supported that some schools which continue to use some standardized methods have started to experiment with new projects every year, to enrich and improve the learning process. The idea of being engaged in a project and adopting steps and elements from DT and ME pedagogies as new methods in separated or exiting lessons seemed to gain the interest of other teachers from focus groups, who stated that this initiative could be easily adopted by each school for the direct incorporation of DT and ME in their curriculum. For instance, they can be incorporated into digital skills or environmental projects.

Moving on the suggestions of interviewees from policy making area about the alignment of DT and ME with the current learning objectives, the first viewpoint pointed out a significant difference on how this alignment can be applied. It is one thing to focus on DT and ME as separate goals per se and another thing if a teacher or a school looks for including them more indirectly inside various learning objectives such as citizenship, identity, integration. The same interviewee supported also that the most achievable suggestion is to draw attention to what is also called **'cooperatieve werkvormen'** (cooperative forms of work/methods), because schools are more open to this rather than integrating these methods exclusively and officially as separate didactic methods. Another interviewee supported that the students' learning goals set at a national level are so broad that everything can be included in them. So, a clear suggestion is for the macro-level stakeholders to consider clearly which laws they should legislate for urging the schools to involve these methods in a form of a specific plan that clarifies concrete goals around DT and ME in consistency with the already chosen

learning areas. In this way, schools can be facilitated about how they have to accomplish one or another goal related to these methods. Another good suggestion is to look for learning objectives that can reassure certain schools that the DT or ME method and the related objectives fit to the national learning priorities. Thus, looking at DBL or more specifically in DT and ME as approaches, it is recommended that it would be better to leave schools to re-examine for which national objectives or learning objectives they want to use each innovative method. For example, by using design or DT as a method for self-directedness (which is a personality trait of self-determination to regulate and adapt behavior to the demands of a situation) would fit well with the national objectives and especially with the skill that is related to the self-direction (also referred in the country policy profile), as it can help students test their boundaries and shapes their personality. A final viewpoint focused on ME that is considered easy to implement in the nature and technology domains, but it would also fit to the other domains as it is considered a flexible method. In this way, there are several options to enrich the curriculum and integrate our examined pedagogies within it, helping both teachers and young learners think creatively about any new idea and educational field.

Chapter 5: Romania

Country policy profile

1. Overview of the Educational System

The Romanian educational system is structured **in a centralized way** and the main responsibilities for educational strategy, policy making, and delivery of knowledge are stipulated and conducted primarily by the Minister of Education. The Minister receives input from specialized bodies, while the elected authorities have a little contribution towards educational policies. The Minister is governing from the central level and is the agent who monitors the implementation of policies though the County School Inspectorates. Overall, schools and teachers lack influence in practice over important dimensions of teaching and learning process, even if in principle they have autonomy over one-third of the curriculum that pertains to some optional/elective subjects which are rarely used[25].

The most important progress in terms of reform in Romania was made in 2005 when the country adopted the Quality Law and in 2011 the Educational Law which both have introduced significant changes towards increased quality, fairness, decentralization, and involvement of all stakeholders. However, the Laws underwent many adjustments and some of the measures were reversed. The president of Romania, a former teacher, initiated in 2016 a new program titled as "**Educated Romania**"[26] to involve local stakeholders in solving social issues and a new law of education is currently under consideration. The new law is favourable to the introduction of innovative teaching and learning methods (such as the DT and ME methods). One of the key aspects is the updated curriculum after 20 years. In more detail, important progress has been made after over 20 years of stagnation. The new curriculum has a **competency-based approach** to learning and in 2015 eight main competencies aligned with the EU Reference Framework have been set: 1. communication in the mother tongue, 2. communication in foreign languages, 3. mathematical competence and basic competencies in science and technology, 4. digital competence, 5. learning to learn, 6. social and civic competencies, 7. sense of initiative and entrepreneurship and 8. cultural awareness and expression.[27]

The new educational priorities emphasize the direction that the Ministry is taking for the promotion of a competency-based approach which also included the process of **project-based learning** and focused on **changing teachers' role from traditional teaching approach towards a more facilitating approach**, aligned with DT and ME. However, even if the new curriculum has been adopted in classroom, teachers still continue to face difficulties and although the roll-out of the new curriculum's implementation was rapid, some gaps are observed. For example, **there is lack of teacher training and appropriate utilisation of the new concepts**.

---

[25] OECD. (2017). OECD Reviews of Evaluation and Assessment in Education. Romania 2017. Retrieved from: https://www.oecd-ilibrary.org/education/romania-2017_9789264274051-en

[26] "Educated Romania" is the national project initiated by the President of Romania to support the reconnection of Romanian society with certain values as well as the development of a culture of success based on performance, work, talent, honesty and integrity. You can find more info here: https://www.presidency.ro/en/commitments/educated-romania

[27] OJEU. (2006). Recommendation of the European Parliament and of the Council of 18 December 2006 on Key Competencies for Lifelong Learning. Official Journal of the European Union, Brussels, http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32006H0962 .

Romanian teachers are used to teaching and learning by being heavily focused on memorization and content knowledge and as a result the transformation of their teaching methods towards inclusion, more student engagement and attention to complex competencies require further professional development. In 2017, the largest teacher training program started, called 'CRED', which focused on developing competency-based teaching for over 55,000 teachers. The program was scheduled to run between 2017 to 2021.

2. Existing trends and key policy stakeholders for the integration of DT and ME in primary schools

According to the existing literature, it is observed that **DT and ME are partially incorporated in teacher's practices,** mostly **as part of extracurricular activities** in partnership and design by the civil society. Some of the practices incorporate more the service-learning aspects such are the projects from New Horizons (https://www.noi-orizonturi.ro/en/) or active citizenship-related programmes, such as the 'Proiectul Cetateanul' (https://cetateanul.intercultural.ro/) or projects with an entrepreneurial approach such as Junior Achievement initiative (https://www.jaromania.org/), recognized by the Ministry of Education. Other initiatives include more design and ME elements such as 'De-a Arhitectura' (http://www.de-a-arhitectura.ro/language/en/) or even STEM issues together with ME such as 'MakerKid' (https://makerkid.ro/ and 'Stiintescu' (https://stiintescu.ro/). If ME initiatives are presented as such, initiatives which use DT focus more on the outcomes of the process rather than the method itself. However, besides DESIGN FUTURES project that offered a combination of DT and ME in one curriculum, there is **no initiative which combines both methods** and can contribute to address under both methods' principles contemporary challenges, like the SDGs goals.

Regarding the level of integration of these two methods in the school curriculum, DT and ME are implemented at all levels of education, from primary to secondary level, and based on how the activities are designed they could fit well to the new curricular priorities. There are few pathways which teachers have been using in order to incorporate innovative methods into schools' activities, as follows:

1. Partial incorporation - enhancing the practical aspects of existing subjects. Civic Education is part of Primary students' curriculum (3rd and 4th grades) and has allocated one hour per week during the entire school year. It is focused on civic and moral literacy, developing positive attitudes towards themselves and others and fostering civic and moral behavior in a democratic society. In low secondary classes (5th to 8th Grade) Romania has included Social Education as part of the student's curriculum. The thematic areas of critical thinking and children's rights are covered in 5th Grade, the intercultural education in 6th Grade, the democratic citizenship education in 7th Grade and finally the economic and financial Education in the 8th grade. At high school level, students have a subject focused on entrepreneurial education in 10th grade and includes Ethics in business, Risk and success in business, management of personal resources and starting a business tools and practices.
2. Outside the curriculum, during Săptămâna Altfel / A different type of week: for a week in each semester, schools engage in activities which are "different" than the regular classes. Often, this is the time when teachers coordinate projects, visits outside the school or other activities which are not normally done during the school year. This is an opportunity for teachers to test new methods and to be acquainted with DT and ME.

3. Stand-alone subject: When it comes to the School Decision Curriculum, there are various more innovative classes, however **there is none focused on DT and ME** as separate subjects approved by the Ministry.

With regard to the difficulty or feasibility of integrating DT and ME in line with the education levels, according to the literature it is revealed that the methods are easier to be integrated at primary level since teachers spend more time with students and could link DT and ME with existing subjects, such as communication, science, math, arts and so on. At secondary level, integration of these pedagogies seems to be more difficult, but a **multidisciplinary approach would make it more feasible and is encouraged by the Ministry**, however in practice it is rarely done.

The issue of incorporating and embedding DT and ME in Romanian school curriculum is connected also with some structural challenges that are observed in the educational system. As described by OECD, "*Romania's education system has made major advances since 1989. Learning outcomes have improved and it has established modern institutions with technical expertise. However, educational attainment and performance continues to be strongly influenced by a student's background, and learning levels remain low for many*".[28].

Finally, the major progress for the curriculum's enrichment happened after Romania became a member of the EU, since many teachers participated in exchange projects such as Erasmus+ and in parallel the reform of the curriculum took place which was aligned with the EU priorities which influenced many country's policies. For example, the European Union's (EU) jobs and growth strategy for 2010-20, the EU 2020, was at the core of the Romania's Educational Reform and the Educational Law which was adopted in 2011 focused on addressing challenges such as "*reducing early school leaving, improving the quality of tertiary education and VET, developing lifelong learning and investing in educational institutions' infrastructure*".[29] Even if there has been progress to some extent, there are still structural problems which need to be addressed, from teachers' training and capacity building to insufficient funding and assessment and evaluation procedures of the learning and teaching area.

Overall, Romania has a centralized system which follows the same line in all schools regarding the development and implementation of the defined curriculum. During the last years, there was some essential adjustments in the curriculum and some new educational laws have been initiated which facilitate more the adoption of a competency-based approach and the introduction of innovative methods in the learning area. Although DT and ME are occasionally implemented in one or another way in all educational levels with the support of civil society actors, they are not established as formal practices because their systematic incorporation meets structural problems that have not been resolved yet in an effective way, such as the lack of teachers' training in innovative pedagogies or inadequate funding and evaluation measures.

[28] Kitchen, H., et al. (2017). Romania 2017 - OECD Reviews of Evaluation and Assessment in Education. p. 39. OECD Publishing, Paris. Retrieved from: https://www.oecd-ilibrary.org/docserver/9789264274051-en.pdf?expires=1631886594&id=id&accname=guest&checksum=B40AFE3B2B855045CF2B63F63EAB22C9
[29] OECD. (2017). OECD Reviews of Evaluation and Assessment in Education. Romania 2017. Retrieved from: https://www.oecd-ilibrary.org/education/romania-2017_9789264274051-en

Relevant national recommendations for the integration and institutionalisation of DT and ME

Despite the significant information of desk research process regarding the progress of educational system in Romania to incorporate innovative methods or some structural challenges that impede their integration in schools as formal practices, a series of insightful findings came also from the two focus groups that were carried out as also the interviews with policy experts. The Romanian case shows quite a few similarities with the other countries (mainly with the Greek case) when it comes to which policy recommendations for the integration and institutionalisation of DT and ME should be taken into account. However, since the country's educational system is structured in a unique way and the educational laws and respective measures differ from country to country, specific recommendations have to be adapted by the macro-level mechanism and the schools. A variety of essential policy suggestions is presented below:

Policy recommendation 1: **Transform teachers' mentality and competences**

The first suggestion that was distinguished both by teachers and the policy makers regarding the **training needs of teachers**, for acquiring more professional experience with DT and ME. The participating teachers have already been aware of some existing shortages in terms of teachers' training and more expertise in innovative methods and tools. In order for this to be addressed effectively, the creation of a **guide for teachers' training**, including all necessary information and techniques for educational staff in native language, was considered extremely useful by the first group of teachers. The second teachers' focus group supported that a **combination of theoretical with practical training** is needed for achieving more easily the institutionalisation of DT and ME in the school education and mainly in primary education level. Concerning the latter, some teachers supported that a theoretical training through which teachers could go over it by themselves should be first developed and in parallel or as a second step a practical training, focusing on their capacity building towards these pedagogies, can follow in which they can exercise and put into practice their theoretical knowledge. For the practical aspects, it was stated that there should focus also on flexible modes of training, such as online or hybrid trainings, especially this time due to Covid-19 restrictions, so as to cover with the best possible way the needs of all teachers and for all staff to be able to attend it at any time, even after school hours.

As already observed by the literature process, in Romania, DT and ME are not yet part of national policies per se. Although the Ministry encourages a competence-based curriculum, teachers stated that it is still difficult to see it into practice. Innovative methods are often diffused among teachers who are part of different networks such as 'Teach for Romania' where the methods are not introduced in detail. From their side, policy makers mentioned that there is a broad consensus at national level to bring these methods closer to students, but first the **teachers' mentality needs to change** for making easier and more feasible the institutionalisation of these methods. The existence of a small movement in this area is an important first step but is not sufficient for rendering them as formal practices. Structural changes towards the integration of DT and ME cannot be applied only at the structural level. It is evident that the factor of positive behavioural change from teachers' side is pivotal for achieving an integration of DT and ME with a long-term perspective.

The majority of participants from focus groups and interviews agreed that t**eachers can assume many roles for facilitating the integration of these methods**, enhancing simultaneously their professionalisation as well as their own and students' familiarisation with such pedagogies. They can be facilitators, coordinators of activities, supporters of students' initiatives, mentors for students or even participants, by learning together

with the student anew method. In this way, they can be at the same level with the students so as to customize the support, based on students' needs. Moreover, teachers need to help students understand the real meaning of these methods even through activities of current classes, explaining them that such methods do not support a competitive spirit for students but rather they consist of a win-win approach, they are based on the participants' collaborative mentality. For strengthening the multifaceted role of teachers for integrating effectively DT and ME, the second teachers' focus group, based on their experience from the project's pilot activities, endorsed the idea of **engaging more teachers who are critical or traditional in exploring such methods**, as they will be helped to be more open-minded and patient in the stage of their implementation and incorporation in the curriculum. This is a critical dimension, because DT and ME require a more reflective thinking and are based on an iterative process, something that requires a more dedicated time and not all teachers are willing to devote more time for learning and teaching something new. As a Romanian teacher mentioned: "*I dedicated around 10 hours for the part of We make (i.e., in DEISGN FUTURES..). If the teachers do not want to dedicate that much time they will not manage such methods appropriately*'. Engaging as many teachers as possible can help achieve a critical mass in support and systematic incorporation of these pedagogies, thus influencing positively several traditional or reluctant teachers to embrace DT and ME – inspired techniques in their teaching style.

Another useful practical step is that the teachers need to plan and find new ways to integrate DT and ME in the curriculum, **by forming for example a teachers' support group** by which they can exchange multiple opinions or basic queries on how to best integrate them commonly in their classes. Regarding some obstacles that impede the systematic integration of DT and ME, some policy makers mentioned that today many teachers are not yet ready to change as they are used to teach with a more traditional way as there are incidents of scepticism and introversion by teachers towards adopting something more innovative. As an interviewed policy expert stated: "*We are in the first phase where teachers think they need to be prefect and they are afraid of recognizing others and give credit, this comes from a lack of confidence. Also, teachers are afraid of failure and trying new things*". It seems that many teachers are used to educate and transmit the knowledge in a standardised way and it is hard to change because they are afraid the failure of applying a new method and they lack confidence as they are not specialised in using innovative methods into their classroom. What is more, it is suggested that **the classes need to be planned differently** and for this there should be a different approach to the selected methods and tools used in the classroom. Also, in schools there is still a mentality that those who try to do new things are excluded and only if they succeed in a new experiment they are welcomed. Thus, to some extent there is a level of scepticism at school level and in order for the teaching staff to alter their mindset, interviewees insisted that it is substantial to **experience these methods through a lot of training** so as to be able to know how to integrate these methods into their teaching. Providing appropriate training to teachers both at theoretical and practical level can help teachers be more confident and capable to implement by themselves the DT and ME pedagogies.

Policy recommendation 2: **Activate the role of school management**

Afterwards, a second interesting suggestion by participating teachers has to do with **the openness of schools in embracing and diffusing new methods**. Both Romanian focus groups suggested that despite the centralised character of the country's educational system, schools could try out, to the extent that is permitted and feasible given the current regulations, to initiative new pathways for the institutionalisation of DT and ME into school curriculum. In particular, it is suggested that teachers could propose this

incorporation by **including both methods as optional/elective subjects**. However, it was mentioned that for this solution the approval by the local representatives is needed, so it is not only up to a teacher's motivation to intervene and apply on his/her own such methods into school hours. Another teacher proposed a different suggestion, supporting that a school can become more open by including activities under personal development around the human and society area. A third pathway that can really facilitate a school to gain a relatively "autonomy" and move beyond exiting educational regulations is to **participate in the submission and implementation of EU-funded projects as partner** (e.g., Erasmus projects) with the guidance of local inspectors, where needed. This option could offer many advantages both to the schools as institutions (e.g. building fruitful partnerships and new types of cooperation with other schools or organisations around Europe) and to teachers (as teachers can have more dedicated time to explore and be taught in both methods).

Policy recommendation 3: **Promote flexibility of curriculum to gain space and time for DT and ME**

A third major theme as formulated by the findings focuses on making the educational curriculum more flexible with the aim to accommodate effectively innovative learning methods and techniques. The dimension of flexibility is strictly connected to the basic problem of absence of time. The factor of time was on the frontline of the discussion. Timing is considered as **a real challenge for most Romanian teachers so as to manage all classes** as much effectively as possible. As it was indicatively mentioned: "*Dedicating more time to the project is essential […] especially in phase of we make we needed more time to collect materials, to build something and so on*..". Time is valuable also in terms of the way through which teachers or students need to understand and handle the manual and any useful materials around DT and ME so as to have a clear image and finally achieve a good outcome via the steps of these methods.

Solving the timing problem is not that easy. For instance, a Romanian teacher mentioned that for gaining more time, DT and ME could be taught in a space that operates as a form of experiential club or in a space that is addressed to extracurricular activities. However, the problem with the lack of time is that some students might not be interested in devoting extra time at all in their schedule and it is likely to find such activities more boring if they are not included in the core classes where they give their best and most are more concentrated. On top of that obstacle, if DT and ME are integrated as extracurricular activities, some teachers may also be reluctant to do this for free. As such, the idea of incorporating these methods by simply adding extra time may require a kind of payment for teachers so as to gather more students; a teacher actually supported that also some parents appreciate more the activities they pay for. Nevertheless, such policy recipes seem difficult to be realistically implemented at national level, as there is neither so much funding to pay for teachers for extra classes, nor all parents can afford such initiative for their children.

Given that in principle it is extremely difficult to merely find more time for DT and ME, a clever alternative solution is to address of time by rendering the school curriculum more flexible. Practically speaking, DT and ME can be integrated as part of existing elective courses. As teachers are relatively more autonomous in their elective courses, each school could decide in its own how to best match DT/ME with specific elective courses. Moreover, flexibility can be promoted through the creation of interdisciplinary working groups between teachers. Already experienced teachers can transmit the principles of DT and ME to their peers who specialize on other more traditional areas, and therefore are less willing to embrace these pedagogies in elective courses of their specialization. Experienced teachers can help their colleagues to shape more flexible elective

courses in terms of structure, so as to accommodate DT and ME during the official school hours, thus overcoming the barriers of inertia, lack of time and lack of funding.

Policy recommendation 4: Enrich national curriculum and refine current learning objectives

The fourth policy recommendation for the Romanian case concentrates on the **enrichment of national curriculum and defined learning goals**. For fulfilling such an aspiration and facilitating DT and ME to be integrated in the curriculum, a teacher supported the **creation of an interdisciplinary team among teachers so as to discuss on the thematic areas and support each other**, irrespective of the subject(s) they teach and the field of their expertise. DT and ME should be included in the curriculum in such a way that can include more practical activities (e.g., like the 'We make' part from the project). As it was clearly stated: "*we need to **move from abstract learning to practical activities and experiential learning**…it could be aligned if the curriculum focused on a 'learning by doing' approach".* Another suggestion is to enrich the curriculum's content and main areas of learning by focusing more on environmental education, because students can become more responsible towards the environment by exercising multiple skills (green, digital, etc.) via a reflective way of thinking that is promoted by DT and ME. Since the Romanian educational systems is characterised by centralisation, the role of Ministry is significant in advancing the current curriculum. Some initial steps have already been done towards the integration of DT and ME such as the focus on a competence-based approach, but to move on from theory to practice, DT and ME must stop being addressed in a fragmented way, but they should be incorporated into a single educational strategy. Combining both pedagogies into a tailored framework or into a concrete learning area is a key consideration in this respect, while ad-hoc national action plans for equipping teachers must be formulated.

Regarding the alignment of DT and ME with current students' learning objectives, set at a national level, with the implementation of DT and ME in class, it was supported that the Ministry promotes critical competencies (such as critical thinking, adaptability, etc.) but there is a huge gap between what is being asked and what is actually happening in the classrooms. As a policymaker mentioned: "*The vision DT and ME have is similar to what the ministry has but it needs to start with the teachers who need to evolve and understand that it is only not about content. This change is also hard for students, especially when they interact with a traditional teacher who promotes memorization, however the change needs to start somewhere*". The second Romanian policy maker mentioned verified the previous statements, claiming that in the official guidelines there are references to integrate new methods such as the project-based learning which was integrated with interdisciplinary activities. Another important suggestion through which the methods could benefit teachers is by helping them accelerate the learning methods by moving from a linear learning model to a more dynamic one, promoting in this way a student-centred approach. Student-centred and other learning methods are present in the methodological recommendations but **are not reflected in the classroom**.

A final factor that was highlighted regarding the role of DT and ME in the enrichment of curriculum is the element of reflection which is essential when applying these methods as they include an iteration process. In particular, it was supported that the part of reflection could be further leveraged in the future, even in subjects like geography because students can learn better within this process. As it was indicatively stated by a geography teacher: "*When we learn about earth composition, we work with eggs. We can leverage simple things around the students and use them as teaching materials. **Students need to be taken out of their comfort zone** and be more practical and reflective under an experiential way*".

Moving to the part of focus groups focused on recommendations for scaling up and sustaining DT and ME, Romanian teachers expressed a deep interest and willingness in changing their teaching methods so as to able to incorporate better these pedagogies in the long term. As clearly mentioned, the teaching style currently used by the staff in primary education is not working, as it is very abstract. As supported by a teacher: "***We need to make it more practical so as to integrate experiences and connect them to the environment***". Also, as the time is really limited to add a new class, an alternative option for teachers is to turn the existing classes into more practical sessions, whenever feasible. Even in case that teachers would integrate them as extra-curricular approaches to gain flexibility, there still should be more focus on the necessity to adapt the curriculum at different disciplines and include these pedagogies in various classes, like the science classes.

Additional suggestions were given by teachers for an alignment and better connection of these two methods with their teaching approach. More specifically, some teachers mentioned that DT and ME can be taught also outside the science classes like in language, personal development, math, social issues that focus on poverty issues etc., because they can be interdisciplinary and flexible in any subject's activity. What is more, according to their experience with DF method which combined DT and ME, Romanian teachers stated that they were inspired via multiple phases of this method, as follows: "***in the "We imagine phase" we start all from a novel idea and is something I would love to integrate this in my teaching***", and another testimony: "*in the phase of Present, students are given new ideas, helping them become more disciplined, while in the step "we evaluate" they went through a process that reflected upon what is good and what they can improve*". Based on the previous statements, it is clear that the added value and positive impact that DT and ME generated within each teacher's experience stimulated them to a great extent and there is a strong interest to reuse and integrate officially such methods in their teaching process.

Policy recommendation 5: Mobilise parents and reach out local stakeholders to act as multipliers

When it comes to the role of support by the various stakeholders for the systematic integration of DT and ME in school process, the majority of Romanian teachers mentioned as a first critical stakeholder the **parental support**. Parents could support such methods and endorse the innovative activities, by offering as much as possible donations for materials and also by promoting new collaboration opportunities in the schools. In addition to that, the support from external agents as experts in DT and/or ME, representing a type of co-facilitator (except for the teacher) for the students, can be rendered really essential in each school, as they can explain to teachers and young learners some things about DT and ME under a different prism. As a teacher mentioned: "***I asked the mechanical to come to the school for the project and this was the favourite part for students".*** Another idea is for the school to cooperate with a tv channel and help schools establish a tv show where the teachers in collaboration with students can present different prototypes or explain in a more interactive way their experience with DT and ME. Another suggestion focused on the idea of teachers' and principals' connection with local experts. A teacher from focus group mentioned that "***I would really like to present the project to local teachers' meetings***", indicating the importance of being active as educator on discussions and knowledge exchange with each other, thus empowering the connection of one school with another in a specific region and disseminating more directly the added value and benefits of DT and ME even through the project or other future similar initiatives. With regard to recommendations pertained to changes at national level, it was endorsed that teachers must drastically be supported to gain experience in the long-term. Given that a part of Romanian teachers seems to be quite introvert and suspicious towards DT and ME, the parental support and mobilisation from local experts even from civil society are critical dimensions. Also,

a level of scepticism from the side of several parents must also be countered by opening communication channels between parents and teachers, but also among parents. A final idea, according to some teachers' opinion, is that there should be a further motivation and openness by macro-level or meso-level mechanisms to reach more stakeholders like universities or students from educational departments of primary and preschool education (IPP) and speak to them about these two methods, their philosophy and the benefits they can produce both for the school community and for the students' skills and personal development. As a teacher stated: "*I think something specific needs to be made like a movement – attracting more teachers but also other relative stakeholders…We need this to grow*".

Policy recommendation 6: **Invest in novel learning resources and complementary innovative tools**

The last essential element for achieving the institutionalisation and better integration of DT and ME in Romanian schools relates to the **issue of resources and needed equipment**. More specifically, it was supported that Romanian schools could have more specialised labs for experiential activities related to DT and ME. Another teacher proposed the idea of developing a brochure with best practices of these methods that can be used as useful storage and backup for the inexperienced and demotivated schools, operating as a roadmap in a related future initiative. Also, the resources are not considered only at material level, as it was stressed that the evaluation of the project or testimonials from participants of project on any difficulties and solutions from the pilot activities can function as a good guidance and a mapping of lessons learnt for a beginner who participates and tries to reflect on and create for the first time something related to DT and ME steps. At the same time, the two-fold issue of funding and equipment is a recurring theme that has to be addressed. Romanian teachers struggle with low funding – a structural challenge – and basic tools, such as laptops, do not suffice. Funding for the acquiring of more specialised tools, like labs for activities related to DT and ME, is extremely important. This can be alternatively supplemented by digital tools such as creative blogs or digital tools for performing a DT and ME activity. Another interviewee supported that although in some schools some teachers are interested in being more open for such methods, they **do not have the necessary tools and sufficient resources** for implementing such pedagogies. There are of course some tools at basic level (e.g., laptops for digital activities) but again to help teachers become more creative and test a new pedagogy and learning method in practice, they need to move to real examples, and they lack significant resources.

To effectively integrate DT and ME into Romanian teaching and learning process, also policy interviewees expressed their perspective on the importance of complementary learning tools for facilitating the systematic implementation of these two pedagogies (DT and ME) in school settings. A fist provided suggestion focuses on the **combination of a platform or similar tool** (e.g., a blog) **with practical activities**, which teachers could adapt it during their lessons. Generally, it was observed that the pandemic exposed many of these options especially at digital level. There are also some groups of teachers/ communities of teachers who are open-minded to new methods, but these cases are marginal. As it was stated: "*Teachers who try new methods are enthusiastic, but the keenness fades out in time. There are tools but we are still searching for the right way to bring the content to teachers*". Another decision maker mentioned that **a project based-methodological framework** is needed. Specifically, schools should focus on investing in a theory by which the concepts and what DT and ME means in education and how they help teachers and students will be clarified. This dimension is very crucial as many teachers remain conservative. On top of that, **training sessions focused on practice** are necessary as a complementary tool, supporting teachers to know how to apply the knowledge. As it was

clearly claimed: "*to facilitate this, the methodological guide where all the information is very clear will be very helpful and will save them time. It needs to be very specific and have step by step instructions really easy to implement*". In this way, teachers will be more facilitated and acquainted with these methods. With a capacity-building training and a methodological guide, teachers of primary education will learn how DT and ME are implemented, and they will be more motivated to promote it to their colleagues.

Finally, a useful element as complementary learning tool for the integration of these methods in Romanian school settings is the provision of more maker kits and other technical material for the implementation of different activities and artifacts in order for the kids to learn about educational fields with the support of appropriate tools, exercising in parallel multiple skills. In addition to this, a teacher proposed that the videos and materials developed during the project could be dubbed and disseminated in schools that have not participated yet in a relevant initiative, in order for inexperienced teachers and students receive feedback from their peers in the native language and be aware of the project's participants as also their whole experience with the DT and ME pedagogies.

Chapter 6: General recommendations: a comparative synopsis

In light of all the previous presented recommendations, the report concludes with an integrated policy matrix which includes suggestions at an aggregate level, taking into consideration national particularities – indicated also through the country policy profile – and all research participants' perspectives. The matrix allows comparability between countries, while shedding light on key policy needs for each country. This in turn will help educational policy makers and stakeholders who access the matrix to spot similar problems and common practices in other countries of the DESIGN FUTURES project, and eventually establish cross-national communication webs for exchanging good practices and lessons learned. **In total, 7 cross-national policy themes have emerged through the analysis, which have to be considered for the wider institutionalisation of DT and ME in different European educational settings.**

At the same time, in order for the recommendations to be feasible for the effective and efficient integration of DT and ME into schools, each aggregated policy recommendation in the left column is expressed in a unique way within each country. **Thus, the report adopts a realistic approach, linking policy suggestions to existing trends and opportunities pathways that have been traced in the four countries**. Policy recommendations per country build on pre-existing initiatives, networks, and practices, and dictate their quantitative upscale or qualitative upgrade. Thus, the 7 policy factors are further broken down in each national setting, serving as opportunities for the realisation of integrating DT and ME under specific national specificities and circumstances. Lastly, the policy suggestions are articulated both at theoretical and operational level and are addressed to various stakeholders, from micro- (e.g., teachers, parents), meso- (e.g., communities, institutional structures) and macro-level (e.g., government, ministries), thus covering a wide range of agents for a consensual and thus smooth integration of DT and ME.

Table 1.Policy matrix on integrating and upscaling DT and ME pedagogies

Policy themes	Opportunities, trends, and related suggestions at national level			
	Greece	**Italy**	**The Netherlands**	**Romania**
Resources, infrastructures, tools, and equipment	• Create libraries for research activities and creative thinking. • Raise more funding for the creation of new labs in STEM (with a reflective approach) to perform DT and ME activities, with emphasis on public schools that do not always receive funding and they are forced to purchase materials. • Plan handy activities beyond the typical classes (e.g., environmental education, geography, Skills Labs, Flexible Zone).	• Further proliferation of existing modern labs, which offer an alternative space than a traditional classroom. • Set-up of creative spaces that focus on DT elements, as supplement to existing labs that focus on ME method. This opportunity could be a way to drive more effectively the adoption of new methodological approaches (which naturally require dedicated spaces)	• Invest in more printed or digital guidebooks for teachers (e.g., how to organize by themselves a workshop or an activity in DT or ME or how to instructions in national language on how to apply a maker kit). • Add audiovisual material like PowerPoint presentations before starting or during the delivering of each lesson. • Provide more specialized tools (e.g., laser cut machines or 3D printers) to primary schools through cooperation with high schools or external support from ICT companies. Each school can just include simple and creative maker kits that are not necessarily so costly so as to carry out DT and ME activities.	• Develop a brochure with best practices of these methods as useful storage for the inexperienced staff or less engaged schools. • Provide materials of the project's evaluation (or even testimonials from participants on which difficulties and solutions they met in the pilot activities). • Equip schools with maker kits and other technical material for practical activities and artifacts by providing in parallel specialized labs. • Design a platform or similar tool (e.g., a blog) in parallel to practical activities or dub videos and materials developed during the DESIGN FUTURES.

Investment in educational personnel: proper training, cultural change, more teachers, and supportive mechanisms	• Mobilise already experienced teachers in activities related to new teaching and learning approaches, especially in the Making part. • Invest in teachers' life-long learning and training through training sessions and workshops. • Focus on teachers' assessment for the integration of DT and ME in schools so as to identify gaps about their skills or their used methods.	• Motivate teachers, with the support of schools principals in their school, to improve their teaching style and not focus only to old-fashioned approaches or standardized techniques. • Create 'support groups' for teachers among them at regional level, so teachers can meet to discuss on how their training can benefit their curriculum, combining new elements with the exiting curriculum they've developed. • Train teachers on how to handle the pedagogies independently, not only technically, but emotionally. Teachers should feel more confident and less afraid of adopting a new approach.	• Invest in more training of teaching staff. For this, the objectives and regulation of each school should be carefully considered for aligning the training of teachers with their main duties. • Implement worksheets by encouraging teachers to develop a lesson overview for them and/ or their colleagues and write their plans or how such methods can be easily embedded in a lesson and what is expected from them and their students. In this suggestion, the Teacher teams (i.e., teachers working within teams to streamline the teaching processes) in each school can fulfil this idea by coordinating the teachers to organise commonly their worksheets and offer constructive feedback to each other. • Leverage support from external parties, where experts in DT or ME can meet and collaborate with teachers, planning agendas and	• Create a guide for teachers' training, including all necessary information and simple techniques for educational staff in native language. • Focus on flexible modes of training (through online or hybrid trainings), adapting better to post Covid-19 period. • Form a teachers' supportive group for exchanging multiple opinions or basic queries on how to best integrate them in their classes.

			exploring together new or already used materials that can be fit in DT and ME.	
Institutional, regulatory, and legal updates	• Transfer DT and ME from extracurricular activity to formal educational practices by gaining the support of Ministry of Education. • Create an encouraging institutional environment within schools that is promoted by school principals. This can create a positive context for teachers to undertake initiatives towards DT and ME.	• Simplify the current and complex legal framework around school activities that may hinder the initiation of innovative tools in some schools. • Apply DT and ME activities in alignment with guidelines pertained to GDPR or safety regulations. • Overcome bureaucratic barriers through transitional paths, such as flexible but appropriate rules about DT and ME implementation. • Ensure the real and digital safety of teachers and students when using videos or photos with the participants. In each curriculum there should be balance between the operation of highly innovative laboratories and the compliance to safety laws.	• Incorporate DT and ME in the new educational agenda or the new educational areas that is promoted by the central government and can be adjusted by each school in combination with its own vison for the formal institutionalisation of the pedagogies.	

Development and implementation of supportive measures at governmental level	• Seize the opportunity through the introduction of DT and ME as part of "LifeLong Learning" process in the upcoming governmental planning for restructuring the educational curriculum of primary education, and especially in Skills Workshops.	• Compensate the autonomy of schools at regional level by promoting the coordination between local initiatives in support of DT and ME. • Upscale and reinforce existing networks between national institutes that currently collaborate to promote ME and DT.	• Step-up the role of Ministry of Education in supporting the uptake of DT and ME by complementing the autonomous role of teachers. Furthermore, the methods can be prioritized in the overall national learning objectives or can be considered in the annual planning of the schools. • Deploy the role of "Education Inspectorate', commissioned by the Ministry of Education to promote the integration of DT and ME, by having them as criterion of assessing a school's quality of education.	• Under the centralised role of Ministry, DT and ME must stop being addressed in a fragmented and theoretical way, and rather be incorporated into a single educational strategy. Combining both pedagogies into one nation-wide curriculum is a key consideration in this respect, while ad-hoc national action plans for equipping teachers must be formulated.
Adaptation and alignment of school curriculum's content and goals with DT and ME	• Launch educational guidelines that foresee more time allocated to DT and ME in school curriculum. • Introduce DT and ME into traditional modules, such as STEM subjects.		• Promote DT and ME under autonomous school projects, rather than trying to adjust existing learning methods in core subjects. This idea can be facilitated under the approach of 'cooperatieve werkvormen' (cooperative forms of work/methods), where teachers collaborate, exchange feedback, and organise interdisciplinary	• Use the knowledge and good practices from individual EU-funded projects that focus on service-learning aspects and can thus help promote DT and ME. • Implement a multidisciplinary approach so as to move on from a fragmented instruction of DT and ME to a national strategy.

			(e.g., combination of digital and environmental education) actions and relevant initiatives. • Connect DT and ME, as teaching methods, into specific thematic areas on which some Dutch schools focus (from STEM to civic education and geography).	
Mobilisation and support from external stakeholders: parents, experts, and communities	• Initiate and systematise consultation between teachers and parents, so as to inform reluctant and sceptical parents about the multiple benefits of DT and ME to the soft and hard skills of their kids. This will overcome potential negative reactions from parents towards DT and ME initiatives in schools. • Boost multi-stakeholder alliances between formal and non-formal actors to exploit new opportunities offered by external experts. Synergies between private agents, parents, CSOs and	• Engage parents to share their opinions and perspectives on the systematic incorporation of these methods into school curricula. • Mobilization of local communities through multi-stakeholder dialogues at local level (e.g., co-creation workshops, etc.) to stimulate teachers.	• Attract external parties, where experts in DT or ME can meet and collaborate with teachers, planning agendas and exploring together new or already used materials. • Foster cooperation with companies that provide innovative workshops to schools, and organisations, such as specialized companies, museums, makerspaces, and libraries, which often collaborate with schools.	• Leverage external financial support from parents in the forms of donations for materials. • Mobilise external agents as experts in DT and/or ME, representing a type of co-facilitator (except for the teacher) for the students.

	schoolteachers should be sought.			
Tailored evaluation framework for DT and ME		• Set new indicators and monitoring frameworks for the proper evaluation of DT and ME and for 21st century competencies. • Include DT elements in any lab-based approach (not only element of ME), so as to combine both methods in any experiential activity.	• Each school at primary level can reflect on the idea of adding a 'diploma for skills', which includes assessment and development of students' skills via practical activities.	

Bibliography

Akker, J. van den (2003). Curriculum perspectives: an introduction (In J. Van den Akker, W. Kuiper and U. Hameyer (Eds.), Curriculum landscape and trends (pp. 1-10). Dordrecht: Kluwer Academic Publishers.

Bardour (2008). Introducing Qualitative Research: A Student's Guide. Sage. Second Edition.

Bryman, A. (2016). Social Research Methods. Fourth edition, Oxford University Press.

Cohen, D., Crabtree, B. (2006). Qualitative Research Guidelines Project. Focus groups. Retrieved from: http://www.qualres.org/HomeFocu-3647.html

EC, Eurydice. (2021). Teaching and Learning in Primary Education. Retrieved from: https://eacea.ec.europa.eu/national-policies/eurydice/content/teaching-and-learning-primary-education-20_en

Facebook page of "Designers of the Future": https://www.facebook.com/groups/sxediastes/ & https://www.innovathens.gr/speakers/%CE%B4%CE%B7%CE%BC%CE%AE%CF%84%CF%81%CE%B7%CF%82-%CE%B3%CF%81%CE%B1%CE%BC%CE%BC%CE%AD%CE%BD%CE%BF%CF%82/

IEP. (2021). Δημιουργώ και Καινοτομώ – Δημιουργική Σκέψη και Πρωτοβουλία. Retrieved from: http://iep.edu.gr/en/psifiako-apothetirio/skill-labs/913-dimiourgo-kai-kainotomo

INDIRE. (2020). Ideal methodology. Retrieved from: https://lab.indire.it/metodologia-ideal

Kitchen, H., et al. (2017). Romania 2017 - OECD Reviews of Evaluation and Assessment in Education.

OECD Publishing, Paris. Retrieved from: https://www.oecd-ilibrary.org/docserver/9789264274051-en.pdf?expires=1631886594&id=id&accname=guest&checksum=B40AFE3B2B855045CF2B63F63EAB22C9

Make Faire Rome. (2021). WHAT IS MAKER FAIRE. Retrieved from: https://makerfairerome.eu/en/what-is-maker-faire/

Moraitopoulou. (2018*). School Make Faire: τι είναι & πως να διοργανώσετε ένα στο σχολείο σας*. Retrieved from: https://edu.ellak.gr/2018/04/30/school-make-faire-ti-ine-pos-na-diorganosete-ena-sto-scholio-sas/

Niewint J. (2019). Design thinking at school. Two workshops on the IDeAL methodology at Fiera Didacta. Retrieved from: https://www.indire.it/2019/08/30/design-thinking-a-scuola-a-fiera-didacta-due-workshop-sulla-metodologia-ideal/

OECD. (2017). OECD Reviews of Evaluation and Assessment in Education. Romania 2017. Retrieved from: https://www.oecd-ilibrary.org/education/romania-2017_9789264274051-en

OJEU. (2006). Recommendation of the European Parliament and of the Council of 18 December 2006 on Key Competencies for Lifelong Learning. Official Journal of the European Union, Brussels, http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32006H0962.

OPEN LAB. (2021). Retrieved from: https://opendesign.ellak.gr/2017/12/21/open-lab/

Panhellenic School Network: https://www.sch.gr/

Robson, C. and McCartan, K. (2016). Real World Research. Fourth Edition, John Wiley & Sons Ltd.

Wright, S., O'Brien, B. C., Nimmon, L., Law, M., Mylopoulos, M. (2016). Research Design Considerations. Journal of Graduate Medical Education. DOI: http://dx.doi.org/10.4300/JGME-D-15-00566.1

ΠΕ.Κ.Ε.Σ. ΘΕΣΣΑΛΙΑΣ. (2021). *Η σχεδιαστική σκέψη στη μάθηση*. Retrieved from: http://pekesthess.sites.sch.gr/index.php/news-events/69-i-sxediastiki-skepsi-sti-mathisi & https://drive.google.com/file/d/1WBMiaVv_OhuSWrPfl1kdRaR5HWBzUtW6/view

Annexes

1. **Focus group questionnaire:**

Introduction	
Part 1. Personal experience and lessons learnt from pilot activities on DF method (25 minutes)	
Objective:	The goal of this activity is to elicit information about the driving factors of DF method that enabled the successful implementation of pilot activities in the participating schools, any obstacles that appeared and how the teachers dealt with them. In addition, another objective is to collect information and evaluate the experience of teachers with the materials provided (maker kit, maker materials) as well as to let them provide some lessons learned from their pilot activities.
Facilitator Instructions:	The facilitator will explain simply to the participating teachers the main objective of this part in the discussion (introducing them to the questions of the Part 1), and he/she will urge the participants to make some basic notes. After all the participants finished with the following 8 questions, they will be asked to mention in turn their answers orally. **Note**: All participants can pose questions before they start to write down their answers and thoughts.
Notetaker Instructions:	Please use the **data extraction form** for reporting on participants' answers. We have created different worksheets for each country enabling you to take notes in your own language at the time of the group discussion. However, we need you to translate those as Stimmuli and TUe will use the data that you will insert in the Eng-summary worksheet.

General experience:

1. From your experience, which activities, based on the DF method, were the most successful?
2. What were the factors that enabled these activities to succeed?
3. What obstacles did you encounter? How did you deal with them?
4. What did you change from the provided materials in order to be able to implement DF in your context?

Extra questions:

- Were the materials clear?
- How did you experience working with the maker kit/maker materials?
- What did you enjoy the most/least and why?

Assessment:

5. How did you experience the student assessment procedures?
6. How did the DF activities contribute to the students' growth?
7. How have the DF activities contributed to your professional development?
8. In our opinion, what are the most important lessons learnt from these pilot activities?

Part 2. Practical steps and recommendations for integrating and institutionalizing ME and DT pedagogies (40 minutes)

Objective:	The goal of this activity is to introduce teachers to the "brainstorming" part of this focus group in order to think about and reflect on which practical steps and changes are needed in schools so that ME and DT can be integrated and institutionalized in the formal school setting.
Facilitator Instructions:	We start by telling teachers that we will need their help on how DT and ME can be integrated and institutionalized in the formal school setting.
Notetaker Instructions:	Please use the **data extraction form** for reporting on participants' answers. We have created different worksheets for each country enabling you to take notes in your own language at the time of the group discussion. However, we need you to translate those as Stimmuli and TUe will use the data that you will insert in the Eng-summary worksheet.
Brainwriting and brainstorming	The participants should be asked to write down in Jamboard (please each partner use your unique Jamboard link) up to 4 **changes/suggestions** each – based on their personal experience– that are needed to integrate and institutionalize the DF method (entailing elements from both Design Thinking and Maker education pedagogies which are considered to lead to significant changes and can upscale the traditional way of teaching) in their school setting. We need to show participants the curricular spiderweb to help them think of the curricular structure that needs to be followed. ***Show them the figure below.*** This connection is useful as the curricular spiderweb has guided the creation of DF curriculum.

Figure 7. *The Curricular spiderweb by van den Akker (2003)*

Give participants some **hints** such as:

"….We would like you to think about what (alternative) changes are necessary, according to your experience, to be done for facilitating the effective integration of DF method in your school environment. By ***changes****, we mean adjustments or novelties in terms of:*

- training needed (more tailor-made trainings for teaching staff as they are not all fully familiarized with these pedagogies even though they have as an experience the pilot activities of the project).
- openness of school in the integration of innovative practices
*-**resources and materials needed***
-support needed (parents, students)
-further enrichment of curriculum that is currently implemented with innovative elements (e.g. with the help of digital tools and other necessary materials)
*-**teachers' role** (flexibility and adaptability to such innovative techniques)*
*- **timing** (if it is needed extra time to devote for integrating the DF method in the learning process or in a course of a curriculum as the change that think about may be efficient in terms of content but it may be time-consuming)*

- Anything else?"

	Give participants 10 minutes to think and post on Jamboard.
Discussion	At this point, we explain to participants that after the 4 changes that they have thought and written down in Jamboard (or in post-it if this activity takes place offline) in the previous step (brainwriting), it is time to reflect and discuss as a group on these changes and exchange views and opinions. It is not required for them to write down their ideas. The facilitator, however, needs to take notes in the data extraction form. We should coordinate the discussion by asking them to: 1) describe **briefly** why it is important for them to make these changes facilitating thus the integration and institutionalization of DF method in their school. (each participant presents their changes and justification) 2) the feasibility and difficulties for integrating and implementing these changes (e.g., are the proposed changes too complicated or not so realistic, will it be accepted by the students, will the parents support the change or will be they benefited indirectly for such a change?), etc.) (group discussion) 3) how they as teachers could contribute to the proposed change, focusing on the learning activities (e.g. to integrate these pedagogies in several subjects/classes where the idea can be implemented). (group discussion)
Part 3. Practical steps and recommendations for sustaining and scaling-up Design Thinking and Maker education (25 minutes)	
Objectives:	The goal of this activity is to capture teachers' opinion and some information about the long-term adaptations that must be done so that ME and DT are sustained in the future.
Facilitator Instructions:	Ask the participants the questions listed below. Try to learn as much as possible from the teacher's perspective. Follow up with questions as much as needed.
Notetaker Instructions:	Please use the **data extraction form** for reporting on participants' answers. We have created different worksheets for each country enabling you to take notes in your own language at the time of the group discussion. However, we need you to translate those as Stimmuli and TUe will use the data that you will insert in the Eng-summary worksheet.

1) After having implemented the DF methodology, would you consider changing your teaching methods to incorporate these pedagogies in the long term and when advancing school curricula?

Follow-up questions:

- Do you think that the legacy of this DF method could be further looked upon in relation to your existing/current methods and to the development of curriculum?
- How would you align the current students' learning objectives set at a national level, with the implementation of DT and ME in class?

2) Can you think of complementary learning tools/ materials for facilitating the systematic implementation of these two pedagogies (DT and ME) in your school setting?

Indicative example: *to implement more regularly practical activities during a subject, including maker kits for STEM subjects or creative kits for other subjects (Art class) for helping students develop 21st century skills like leadership, teamwork, to include a reflection part after a more theoretical subject (storytelling and reflection on it) etc.*

Follow-up question:

- Do you believe that the usefulness and importance of such innovative learning tools to the curriculum implementation must be further examined by the school principals or by superior policymakers on a macro-level?

3) What barriers are there today at a national level that may impede the systematic integration of DT and ME?

Follow-up question:

- From your perspective what changes at the national/policy level need to happen for you and more teachers be able to use DT and ME broadly?

Indicative example: *is it the rigidity of the system, the monolithic direction of the Ministry of Education, or is it more an issue of each school unit and a problem that is related to the management and guidance of each headteacher/policy maker?*

4) Is there anything else you would like to add about the previous questions?

CLOSING

[Thank you very much for your time and contributions to all parts of this focus group.]

2. Questionnaire for semi-structured interviews with policy makers:

Practical steps and recommendations for engaging schools with Design Thinking and Maker education pedagogies (30 minutes)	
Objectives:	The goal of this activity is to capture the opinion of policy and decision makers regarding the long-term adaptations that must be done so that ME and DT are gradually integrated in the different educational settings.
Facilitator Instructions:	Ask the participants the questions listed below. Try to learn as much as possible. Follow up with questions as much as needed.
Notetaker Instructions:	Please use the **data extraction form** for reporting on participants' answers. We have created different worksheets for each country enabling you to take notes in your own language at the time of the interview. However, we need you to translate those as Stimmuli will use the data that you will insert in the Eng-summary worksheet.

1) Is DT and ME integrated in national policies? Are these pedagogies adopted as a formal practice from schools themselves, based on an official policy line? If yes, elaborate on the progress made?

2) How would you align the current students' learning objectives set at a national level, with the implementation of DT and ME in class?

3) Can you think of complementary learning tools/ materials for facilitating the systematic implementation of these two pedagogies (DT and ME) in a school setting in your country?

Indicative example*: to implement more regularly practical activities during a subject, including maker kits for STEM subjects or creative kits for other subjects (Art class) for helping students develop 21st century skills like leadership, teamwork, to include a reflection part after a more theoretical subject (storytelling and reflection on it) etc.*

4) How much are teachers in your country facilitated by the education system and the relevant legislation to promote DT and ME in their learning methods?

5) What barriers are there today at a national level that may impede the systematic integration of DT and ME?

6) What changes at the national/policy level need to happen for being able to use DT and ME broadly?

Indicative example: *is it the rigidity of the system, the monolithic direction of the Ministry of Education, or is it more an issue of each school unit and a problem that is related to the management and guidance of each headteacher/policy maker?*