

DIS-CODE - Disconnected, discouraged, disenabled? Let's code!

Report on the training for trainers

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01	17.11.2017	First draft release
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EXECUTIVE SUMMARY

The DIS-CODE project aims to empower 12 to 18-year-olds students providing them with digital skills, mathematical competences, coding and transversal skills such as abstract and analytical thinking, logic and problem solving.

The DIS-CODE project suggests an innovative method to teach digital skills, mathematics and basics of coding to students at drop-out risk by developing ad-hoc training based on innovative teaching methods such as the flipped classroom, where the traditional educational method is flipped: class lectures are replaced by students self-learning, and home works are replaced by group work and exercises in class.

Such innovative teaching methods are suitable for both involving more families into students' education and tackling with learning difficulties through a more personalized and tailored approach. Through these methods, students can focus on learning by doing, with the teacher guiding the way, being the lecture no longer the driver of concept mastery.

Within this project, a crucial role is played by teachers and teacher trainers that have the responsibility to carry out innovative educational activities within their, and their schools', math and ICT courses. In order to train these multiplier actors, the Consortium, under the lead of EUN Partnership, organised a train the trainers workshop.

The DIS-CODE train the trainers workshop took place from 11-15 October 2017 in the Future Classroom Lab at European Schoolnet in Brussels. The Future Classroom Lab is a fully equipped, reconfigurable, teaching and learning space developed by European Schoolnet, its 30 supporting Ministries of Education and leading educational technology providers. More information can be found here: http://fcl.eun.org/.

The aim of this document is to summarize the contents of the training for trainers workshop, listing the tools used, but also the pedagogical methodologies and approaches that were presented during this five-day activity.

In addition to the above, this report provides an overview on the feedback received by the participants and, on the basis of those, suggests ways for further improving the proposed programme.



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AT THE CORE OF THE TRAINING

The course aimed at providing teachers with new ways to help their students to develop digital literacy and mathematical skills, especially by working on coding and digital creativity projects that would develop transversal skills such as problem-solving, logical reasoning and creativity, and would also increase student motivation in learning mathematics while applying these principles to reality.

The course also focused on innovative teaching practices such as Flipped Classroom, Game Based Learning (edutainment) and Project Based Learning. Through these pedagogical approaches, teachers learnt different ways to introduce programming in cross-curricular work with visual programming languages, games creation and app development tools, robots.

The ultimate goal of the course was to help teachers to explore different ways of motivating and encouraging students, and to develop an effective lesson plan for students that will focus on developing digital literacy and mathematic skills.

TRAINING CONTENTS & METHODOLOGY

The DIS-CODE workshop took place from 11-15 October 2017 in the Future Classroom Lab at European Schoolnet in Brussels. The Future Classroom Lab is a fully equipped, reconfigurable, teaching and learning space developed by European Schoolnet, its 30 supporting Ministries of Education and leading educational technology providers. Future Classroom Lab helps to visualise how conventional classrooms and other learning spaces can be reorganised to support changing styles of teaching and learning. More information can be found here: http://fcl.eun.org/.

CONTENTS & MODULES

During these days, 10 educators from Italy, Belgium, Portugal, Czech Republic and Cyprus, attended the training composed by 6 different modules on how to develop digital literacy and mathematical skills through coding, programming and computational thinking:

Games and gamification in the classroom (Minecraft)

This module was based on the digital games-based learning approach (edutainment), a learning methodology where children acquire digital literacy informally by playing games. To this end, it is important that multimedia design for training and education should combine the most powerful features of interactive multimedia design with the most effective principles of technologically-mediated learning.

<u>Minecraft: education edition</u> is an open-world game that promotes creativity, collaboration, and problem-solving in an immersive 3d digital environment. The education edition is an educational version of Minecraft specifically designed for classroom.



Visual programming languages (Scratch)

Visual programming languages lets users create programs by manipulating program elements graphically rather than by specifying them textually. They allow programming with visual expressions, spatial arrangements of text and graphic symbols, used either as elements of syntax or secondary notation.

<u>Scratch</u> is a free educational visual programming language that was developed by the Lifelong Kindergarten Group at the Massachusetts Institute of Technology (MIT). Scratch is designed to be fun, educational, and easy to learn. It has the tools for creating interactive stories, games, art, simulations, and more, using block-based programming. Users program in Scratch by dragging blocks from the block palette and attaching them to other blocks like a jigsaw puzzle. Structures of multiple blocks are called scripts. This method of programming (building code with blocks) is referred to as "drag-and-drop programming". Scratch is suitable for students aged 8 to 17.

Mobile application development (Applnventor)

Developing for mobile is of increasing importance in the tech world and with most students nowadays having some form of access to mobile phones or tablets, app development can be nicely used to turn students into producers of technology rather than simple consumers of technology who stare passively on to their Smartphones all day.

For demonstrating the effectiveness of this activity to the teachers, the tool selected was <u>Applnventor</u>. Applnventor was originally created by Google and is now run by a team at MIT. It's a very appealing tool to develop mobile apps for Android devices with a very similar setup and design to the other visual programming tools. While Applnventor only allows you to develop apps for Android devices, it is not necessary for students to have an Android device in the classroom to work with it as an emulator can be installed on any PC.

Robotics and games (Lego Mindstorms)

Robots are not only very effective and appealing tools to learn about programming but also about how code translates into real-life action. They can also teach students about engineering concepts, computer hardware, and can be used to develop a whole range of cross-curricular competences. And finally, robots are a great way to engage children in computing generally because they naturally attract their curiosity and allow for a very hands-on and kinaesthetic way of learning.

<u>The Lego Mindstorms</u> series of kits contain software and hardware to create customizable, programmable robots. They include an intelligent brick computer that controls the system, a set of modular sensors and motors, and Lego parts from the Technic line to create the mechanical systems. The hardware and software roots of the Mindstorms Robotics Invention System kit go back to the programmable brick created at the MIT Media Lab. This brick was programmed in Brick Logo. Mindstorms is named after the book Mindstorms: Children, Computers, and Powerful Ideas by Seymour Papert.



The DIS-CODE method

The 'DIS-CODE method' expression refers to the whole set of instructions, guidelines, lessons plans and materials, designed and gathered by the DIS-CODE partners. Participants had the chance to explore the different modules together with the partners responsible for the drafting and the creation of those and were introduced to the learning management system made available by the project and the tools for teachers.

• Innovative ways of teaching Math (Math 2.0)

The module aimed to help teachers develop students' Mathematical competence as defined by the EU's Key Competences framework: the ability to develop and apply mathematical thinking in order to solve a range of problems in everyday situations, with the emphasis being placed on process, activity and knowledge. A key challenge in teaching Maths is not only its fundamental principles, process and applications, but also fostering a sense of curiosity and confidence in transferring the knowledge and skills to new situations. In other words helping pupils to understand the relevance of this competence outside of the Maths classroom.

The session was given by Irina Vasilescu, an experienced Maths teacher and teacher trainer, who is also directly involved in the running of the massive open online course <u>Moving to Maths 2.0</u>.

TOOLS & ACTIVITIES

Teachers were presented different programming tools to find a more engaging and effective way of teaching Maths (Scratch, Lego Mindstorms, App Inventor) and to learn about different tools and resources that helped them to get concrete ideas and resources to develop computational thinking and Maths skills (Google course on Computational Thinking, Geogebra or PHET). Besides, teachers also got a general overview of the most innovative pedagogical approaches such as Flipped Classroom (Flipped learning in a Math class), CLIL Methodology (An example of MI and CLIL used in teaching Math) Game Based Learning (Minecraft Education, Real-world treasure hunts with QR codes, Minecraft and Geometry examples) and Project Based Learning (The features of "real" PBL, Cross curricular PBL plan that includes Math or How could you escape the Bermuda Triangle) in order to introduce programming in cross-curricular work and to develop an effective lesson plan for students that focused on developing digital literacy and mathematic skills.

Moreover, they were also offered a wide range of resources to help them to find a more engaging and effective way of teaching Maths (<u>Math and Cooking</u>, <u>Eratosthenes' experiment</u>, <u>Desmos Math puzzles</u> or Maths connected with <u>sports</u>, <u>news</u>, <u>fashion</u> and <u>music</u>).

Apart from these content-related workshops, the educators attended a workshop on Innovative Practices for teaching and learning Math and Digital technologies in the Math classroom. Likewise, they learnt about the Learning Designer tool to create their learning scenarios, and they also learnt about different teaching and learning styles and pedagogies and methodologies for international collaboration.

The teachers had also the chance to participate in the *Co-creation jam @Future Classroom Lab*, a mini hackathon where they worked in groups to design and build a digital output prototype using the tools explored during the training. They participated in an international teach meet with other teachers from



all over the world, where they had the opportunity not only to present the prototypes they had created but also to learn about innovative tools and practices to teach Maths through coding to an international audience of teachers.

During two dedicated sessions, the participants had the time to reflect about what they have learnt during the training course. One session was organised in the middle of the training (also useful for trainers to gain feedback and adapt the rest of the course accordingly, in case of need) and another one at the end of the course, where they discussed, together with the trainers, what they are going to implement in their classroom/schools and how.

Last but not least, teachers were also given the opportunity to do a guided tour of the Future Classroom Lab with the trainers, where they explored the Future Classroom Lab in an interactive way and where they also had a hands-on session with educational technology.

Due to all the above, we can say that this training course not only provided teachers with a great opportunity to learn about innovative tools and pedagogical approaches to teach Maths, but it also offered them a place to exchange with like-minded peers and provide mentoring and guidance to each other.

PARTICIPANTS

The selection process for the trainers and teachers attending the workshops was based on the participants' background and expertise. Therefore, the training course was addressed to Math or STEM teachers who wanted to find engaging ways to link Maths to coding concepts and/or apply programming in their subjects, or to Computer science teachers who were looking for getting new ideas, tools for teaching their subject and therefore to gain a more comprehensive expertise of digital literacy and mathematical skills through coding, programming and computational thinking.

10 teachers from Italy, Belgium, Portugal, Czech Republic and Cyprus involved in the teaching of Maths or computer science attended the training course:

Name	Country	Subject
Bruno Picasso	Italy	Maths
Carla Vercellone	Italy	Maths
Marco Nicolini	Belgium	Maths
Catherine Muller	Belgium	Maths
Paula Teixeira	Portugal	Maths
Ana Lúcia Pinto	Portugal	Maths
Petra Červenková	Czech Republic	Maths
Jiří Haut	Czech Republic	ICT
Eleni Constantinou	Cyprus	Maths
Andri Marathefti	Cyprus	Maths



PROGRAMME

The DIS-CODE train the trainers workshop lasted 5 days, from 11-15 October 2017. Participants explored how teachers can help students develop digital literacy and mathematical skills through coding, programming and computational thinking. Furthermore, they learnt about innovative teaching practices such as Flipped Classroom, Game Based Learning (edutainment) and Project Based Learning in order to introduce programming in cross-curricular work with visual programming languages, games creation, robots and app development tools.

The training took place at European Schoolnet premises and more specifically at the Future Classroom Lab in Brussels. At European Schoolnet, from 9-13 October 2017, another course, on *Programming for the 21st century classrooms*, which aimed at teaching participants to introduce programming in crosscurricular educational activities. The educators taking part to the DIS-CODE training had therefore the chance to exchange with a greater number of teachers and trainers coming from across Europe.

Here below a short description of the main activities proposed to the educators on each day of training.

DAY 1: WEDNESDAY 11TH OCTOBER

During the first day of the workshop, teachers were introduced to the project and its main objectives, to make sure it was clear what was expected from each one. After an ice-breaking and introductory activity, teachers discussed the project objectives and expected outcomes.

In the afternoon, the participants had two workshops, one introductory and one more in depth, on introducing and exploring Minecraft Education (Minecraft Education), where they also learnt about the benefits of games and game based learning in the classroom.

DAY 2: THURSDAY 12TH OCTOBER

On Thursday 12th in the morning, teachers learnt about visual programming languages, and explored Scratch (Scratch) and about developing mobile applications, with App Inventor (App Inventor). In the afternoon, teachers were introduced to robotics in the classroom and had the chance to learn about Lego Mindstorms (Lego Mindstorm). They worked in groups and participated in an internal competition where every team had to build, program and command their own robot. These activities led them not only understand how students can develop logical thinking but also how they can gain a deeper knowledge about the use of visual programming tools and app development in the classroom, thus developing their creativity and computational thinking.

DAY 3: FRIDAY 13TH OCTOBER

On Friday 13th in the morning, teachers participated in an international mini-hackathon that took place in the Future Classroom Lab. Divided in teams, they had the chance to work collaboratively in order to design and build a digital output prototype using the tools they had explored so far.

This experience gave them the possibility to better understand the concept of gamification in the classroom and the real value of team work and collaboration. Teachers could thus try first hand an inclusive and participatory activity that can be easily proposed to their students as well.



In the afternoon, each of the DIS-CODE partners explained a specific part of the DIS-CODE methodology, the learning management system made available by the project and the tools for teachers.

DAY 4: SATURDAY 14TH OCTOBER

On Saturday 14th, Teachers learnt about innovative practices and Digital technologies for teaching and learning Maths (e.g. <u>Google course on Computational Thinking</u>, <u>Geogebra</u> or <u>PHET</u>), and they started to develop their own learning scenario with the online tool Learning Designer.

Moreover, they were also offered a wide range of resources to help them to find a more engaging and effective way of teaching Maths (<u>Math and Cooking</u>, <u>Eratosthenes' experiment</u>, <u>Desmos Math puzzles</u> or Maths connected with sports, news, fashion and music).



Figure 1. Participants learn about the Flipped Classroom methodology of teaching with Irina Vasilescu, Romania

Teachers participated in an <u>international "TeachMeet"</u> with other teachers from all over the world. During this online conference, the DIS-CODE teachers had the opportunity not only to present the prototypes they had created during the workshop to an international audience - such as the project: using Scratch to create a game to connect together programming, Maths and music- but also to learn about innovative tools and practices to teach Maths through coding that teachers from Germany, Macedonia, Ukraine, Belgium, Romania, Moldova, Italy and Bosnia and Herzegovina shared during the TeachMeet.

DAY 5: SUNDAY 15TH OCTOBER

On Sunday, teachers finalized their learning scenarios and they were introduced different methodologies for international collaboration, apart from future competitions their schools and students could participate in. Moreover, teachers did a group reflection about all the new things they had learnt during the workshop, and also about the things they would implement in their classroom/schools. In the end of the training, every participant received a certificate.



The fact that teachers had the chance to exchange and interact with such an international audience provided them with a great opportunity to visualize and understand the innovative practices that are being carried out in other countries when it comes to teach Maths through coding and computing. Moreover, it allowed them to enter an international context where they also discussed the possibility to collaborate together to run international projects involving schools from different countries.



Figure 2. Group picture of participants in the end of the training

SOCIAL & NETWORKING ACTIVITIES

As part of the networking activities, teachers were given the opportunity to participate in social activities, city walks around the city or to do visit the House of Europe, the Parc Royal, the Gran Place, etc. Besides, the dinners organized together with the partners and the possibility to meet and interact with other teachers from all over Europe allowed them to feel part of an international community that helped them to find synergies and set the basis for future collaborations.

COMMUNICATION

During the workshop, different social media channels were used to promote and disseminate the event, such as Twitter, using the hashtag #DISCODE_eu.

Towards the end of the training, a <u>Facebook group</u> was created with the purpose of providing participants with a common place to share ideas or materials for their classes. A collection of tweets and pictures taken during the training course can be seen in the following <u>Twitter moments</u>.



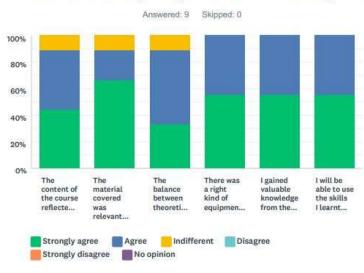
FEEDBACK / CONCLUSIONS

After the training, the participants received an online feedback form to provide their evaluation on how the training went, from their point of view, what they learnt and what can be improved. The feedback <u>form</u> was structured in a way that enables participants to rate each workshop, networking activities and general organisation.

Participants were also encouraged to leave suggestions and share what was useful to learn about during this training.

The overall impression received from the participants about the content and the delivery of the training is strongly positive, as it is shown by the graph below. All participants declared that they have gained valuable knowledge from the training and that they will be able to use what learnt in their teaching practices (5 strongly agreed and 4 agreed with these two statements).

Q1 Select to what extend you agree with the following statements.



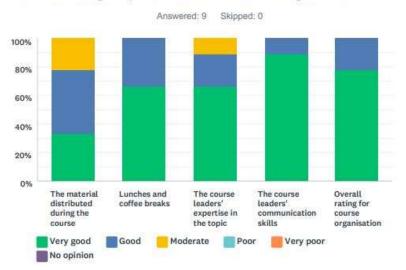
	STRONGLY AGREE	AGREE	INDIFFERENT	DISAGREE	STRONGLY DISAGREE	NO OPINION	TOTAL
The content of the course reflected what was communicated.	44.44% 4	44.44% 4	11.11% 1	0.00%	0.00%	0.00%	9
The material covered was relevant for me.	66.67% 6	22.22%	11.11% 1	0.00%	0.00%	0.00%	9
The balance between theoretical information and practical/hands-on learning was adequate.	33.33% 3	55.56% 5	11.11% 1	0.00%	0.00%	0.00%	9
There was a right kind of equipment available to do the tasks.	55.56% 5	44.44% 4	0.00%	0.00%	0.00%	0.00%	9
I gained valuable knowledge from the course.	55.56% 5	44.44% 4	0.00%	0.00%	0.00%	0.00%	9
I will be able to use the skills I learnt in my teaching practice.	55.56% 5	44.44% 4	0.00%	0.00%	0.00%	0.00%	9

The organisational aspects of the training as well as the competence of the trainers was also rated very high. The overall course organisation was rated "very good" by 7 participants and "good" by the remaining 2 respondents. Among the different elements, the course leaders' expertise in the topic



taught and their communication skills were also rated particularly high, with a 100% of positive feedback.

Q6 Rate the following aspects of the course organisation and delivery



	VERY GOOD	GOOD	MODERATE	POOR	VERY POOR	NO OPINION	TOTAL
The material distributed during the	33.33%	44.44%	22.22%	0.00%	0.00%	0.00%	
course	3	4	2	0	0	0	9
Lunches and coffee breaks	66.67%	33.33%	0.00%	0.00%	0.00%	0.00%	
	6	3	0	0	0	0	9
The course leaders' expertise in the topic	66.67%	22.22%	11.11%	0.00%	0.00%	0.00%	
- X - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	6	2	1	0	0	0	9
The course leaders' communication skills	88.89%	11.11%	0.00%	0.00%	0.00%	0.00%	
	8	1	0	0	0	0	9
Overall rating for course organisation	77.78%	22.22%	0.00%	0.00%	0.00%	0.00%	
	7	2	0	0	0	0	9

When asked which sessions and elements of the course they found most interesting, participants responded respectively: the activities with Scratch, App Inventor and Lego Mindstorm, as well the sessions devoted to reflection, design of learning scenarios, and to the exploration and debate of the DIS-CODE methodology. The tools and practices presented during the Math 2.0 session were also very appreciated.

One of the educators suggested that more time "devoted to Scratch and App Inventor would have been welcome since the use of these tools appears to be really suitable to the implementation of the "Dis-Code" approach.

Finally, several of the participants used the additional comments box to express their satisfaction for the delivery of the training and their gratitude for the opportunity to learn among educators from other countries and backgrounds.

An informal debriefing session, held with all the participants on the last day of activity, confirmed that teachers considered very valuable both the hands on experimentation sessions as well as the reflection and learning scenarios design sessions. More time and more opportunities to develop the competences acquired during the training would be threefore very welcome by the participant educators.



ANNEX 1 – FULL PROGRAMME OF THE COURSE

	Day 1 – Wednesday 11 Octo	bber 2017				
12:00-12:30	Arrival and welcoming lunch					
12:30-13:15	Introduction to the training course, o	Introduction to the training course, objectives, structure				
13:15-14:45	Part I - Games and Gamification in t Introducing Minecraft Education	Part I - Games and Gamification in the classroom: Introducing Minecraft Education				
14:45 – 15:15	Coffee break					
15:15-16:15	Part II - Games and Gamification in the classroom: Exploring Minecraft Education					
16:15-16:30	Wrap up					
16:30	End of the day					
16:30	Social activity					
	Day 2 – Thursday 12 Octob	er 2017				
9:00-10:50	GROUP 1: Visual programming tools (Scratch)	GROUP 2: App development (App Inventor)				
10:50-11:10	Coffee Break					
11:10-13:00	GROUP 2: Visual programming tools (Scratch)	GROUP 1: App development (App Inventor)				
13:00-14:00	Lunch break (Outside – Atelier)					
14:00-15:15	Workshop – medium FCL meeting room, exploring other tools - Robotics in the classroom: Lego Mindstorm					
15:15-16:00	Reflection on what learnt so far: Round table: needs/potentials/solutions					
16:00-16:30	Coffee Break					



16:30-17:30	Tour of the Future Classroom Lab & innovative pedagogies - Exploring the FCL in an interactive way - Hands-on with educational technology TeachMeet explanation and rehearsal
19:00	DIS-CODE Project dinner
	Day 3 – Friday 13 October 2017
9:00-13:00 (incl. coffee break)	Co-creation coding jam @ the Future Classroom Lab - Group work for designing and building a digital output prototype using the tools explored until now
13:00-13:30	Lunch break
13:30-16:30 (incl. coffee break)	DIS-CODE concept @ the EUN Meeting Room - Improving Digital Skills - lesson Plan 2 (CLOUD) - Improving Numerical Skills lesson Plan 2 (ALGEBRA) - Integration of transversal modules
16:30	End of the day
17:00	Social/cultural activity: Visiting the Parlamentarium & City walk
	Day 4 – Saturday 14 October 2017
9:00-9:15	Objectives of the last two days of training
9:15-11:15	Moving to Math 2.0 (Trainer: Irina Vasilescu) - Innovative practices for teaching and learning Math - Digital technologies in your Math classroom
11:00-11:30	Coffee Break
11:30-13:00	Part I - Develop your own learning scenario / lesson plan Group work across 5 sessions: - Objectives / outcomes - Teaching / learning styles (pedagogies - NC) - Tools & resources – Learning Designer (Irina) - Compile the learning scenario (teachers)
13:00-14:00	Lunch break



14:00-15:30	Part II - Develop your own learning scenario / lesson plan (teachers under supervision of trainers)
15:30-15:45	Coffee Break
15:45-17:00	Show & Tell – TeachMeet
17:00	End of the day
	Day 5 – Sunday 15 October 2017
9:30-11:00	Finalisation of learning scenarios Methodologies for international collaboration: - competition for students/schools in March + Hackathon on 20 October - eTwinning project Group reflection – What new things have you learnt during the workshop? What are you going to implement in your class/school and why?
11:00-11:45	Feedback & Wrap up (Warm words form project manager)
11:45	Certificates + photo
12:00	End of the course