DESIGNING OUR TOMORROW

Conclusions after testing the pilot

Nov. – Dec. 2018; Mediaș, Romania

implemented in Romania by | through the programme | and supported by

Designing Our Tomorrow | UNIVERSITY OF CAMBRIDGE | ASOCIAȚIA techsoup | PREDA AU VIITOR | ROMANIAN - AMERICAN FOUNDATION

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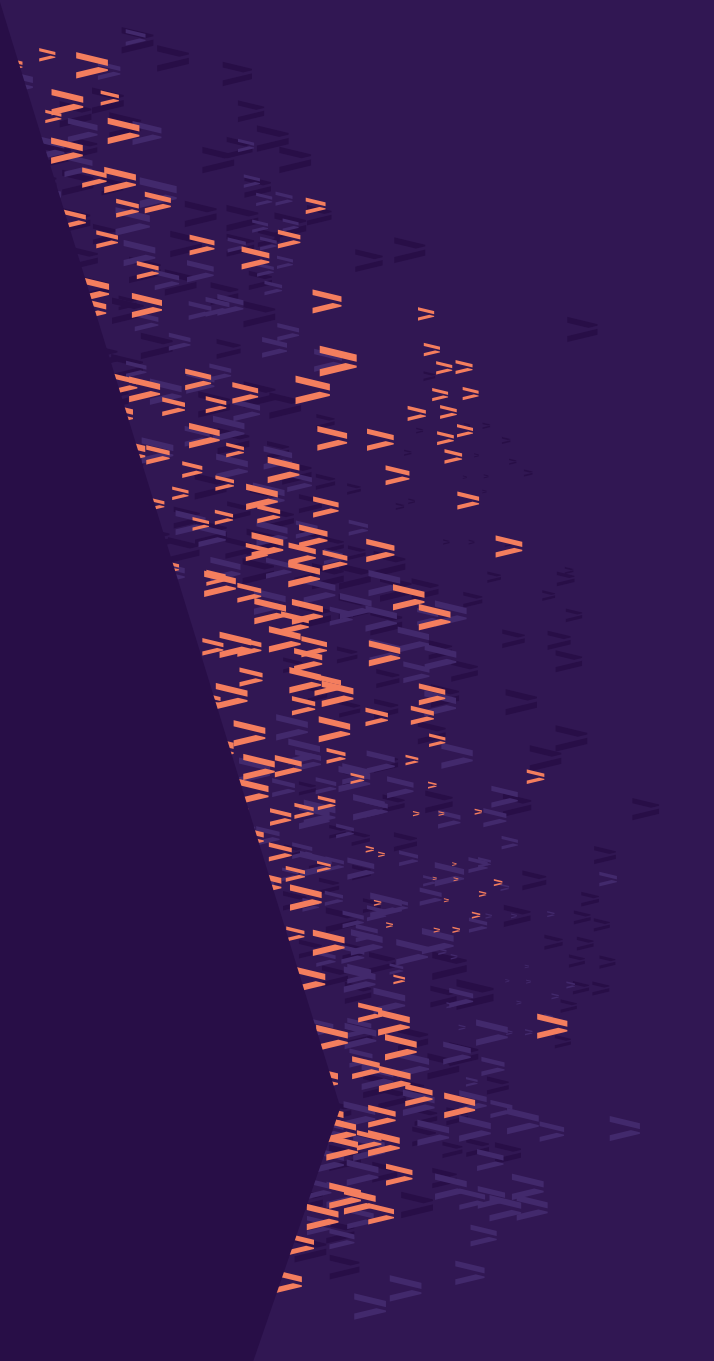
About the programmes

DOT, Predau Viitor



What is DOT?

DOT (Designing Our Tomorrow) started in 2009 as an Engineering and Physical Sciences Research Council funded project which aimed to bring authentic engineering design practices as part of the UK National Curriculum.

Since then, DOT has developed its own problem-based learning approach to the teaching of STEM, with a particular focus on creativity.

It is a joint project of Faculty of Education and Department of Engineering at the University of Cambridge.

The problem-based, creativity focused learning approach to the teaching of STEM

The DOT box

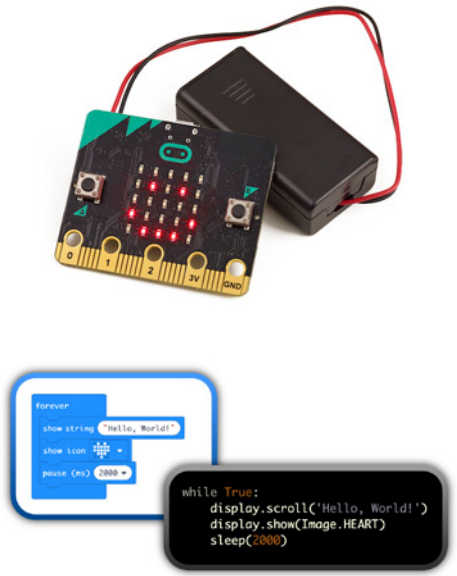
To support and empower the teacher, DOT comes in a box: a complete scheme of work, with lesson plans, teaching resources (including student activities and worksheets, as well as a PowerPoint presentation) and a supporting guide on the DOT principles and pedagogy.

DOT sets authentic challenges: real-world problems that students need to understand and solve over +14 weeks, following an iterative process of designing, using a variety of authentic design thinking tools

The “Making Sense” challenge

It starts with the BBC micro:bit — a miniboard with light, temperature and humidity sensors. Although there is an emphasis on coding within this challenge, it is open-ended and requires students to use technical knowledge (such as coding), procedural knowledge (iterative design processes of explore-create-evaluate) and also conceptual knowledge, that is, for students to find their own problem and solve it creatively.

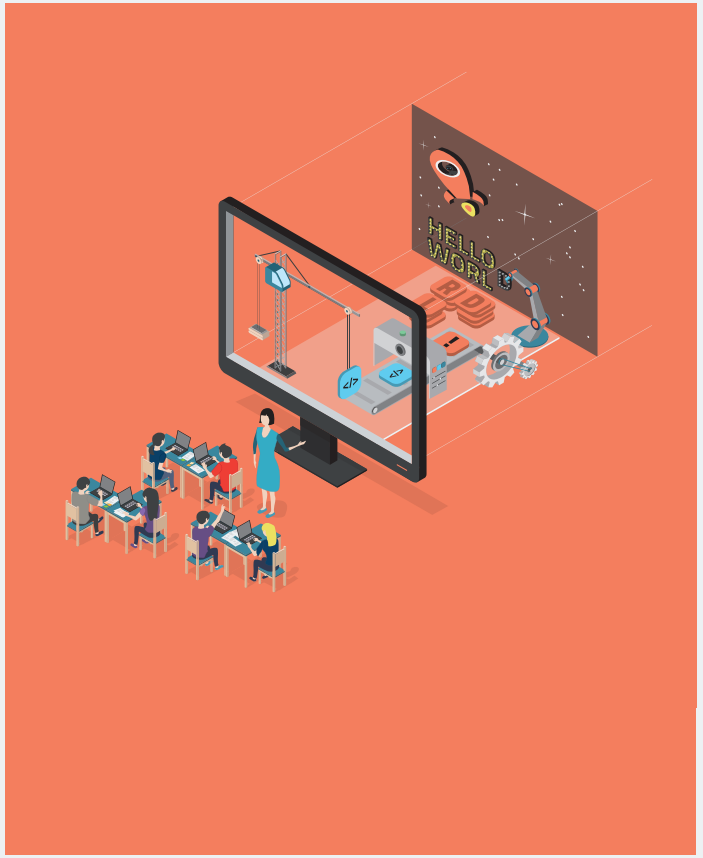
The “Making Sense” challenge asks students to use creative strategies to identify and solve problems. Design solutions must use a sensor and the BBC micro:bit.



What is Predau Viitor

Predau Viitor started in 2016 as a programme positioned to support computer science teachers to upgrade their teaching and include more problem-based and project-based learning in their work. The end goal is to expand the competences of Romanian students beyond theoretical coding.

Problem-based learning is a key pedagogical strategy in supporting Romanian teachers to achieve this with their learners.

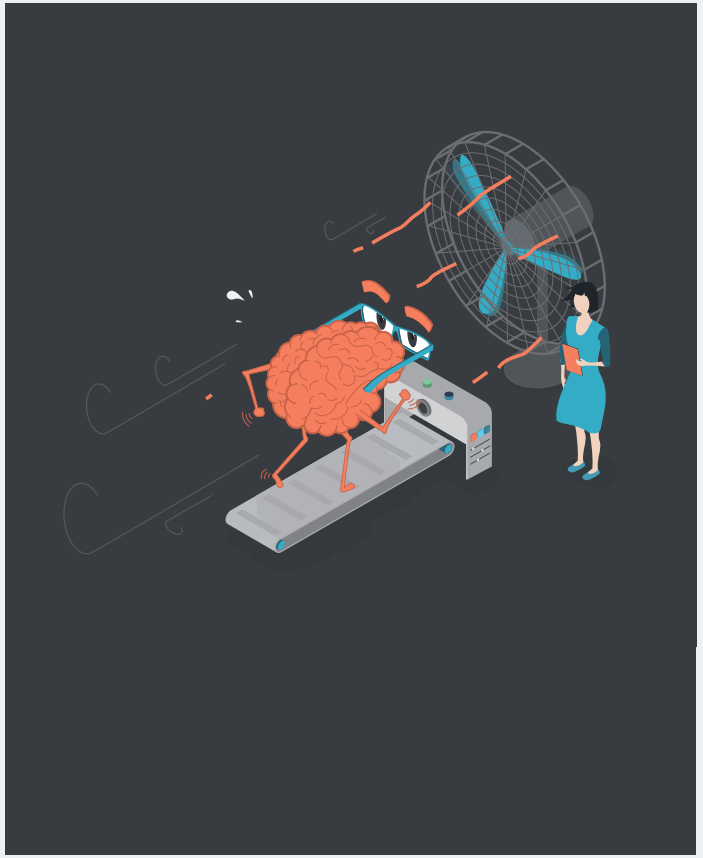


Problem-based learning for the future generation of Romanian product developers and innovators the learner as competent, confident, creative and responsible user and creator of technology, that has both the coding knowledge, but also the ability to identify and solve problems with technology

What is Predau Viitor

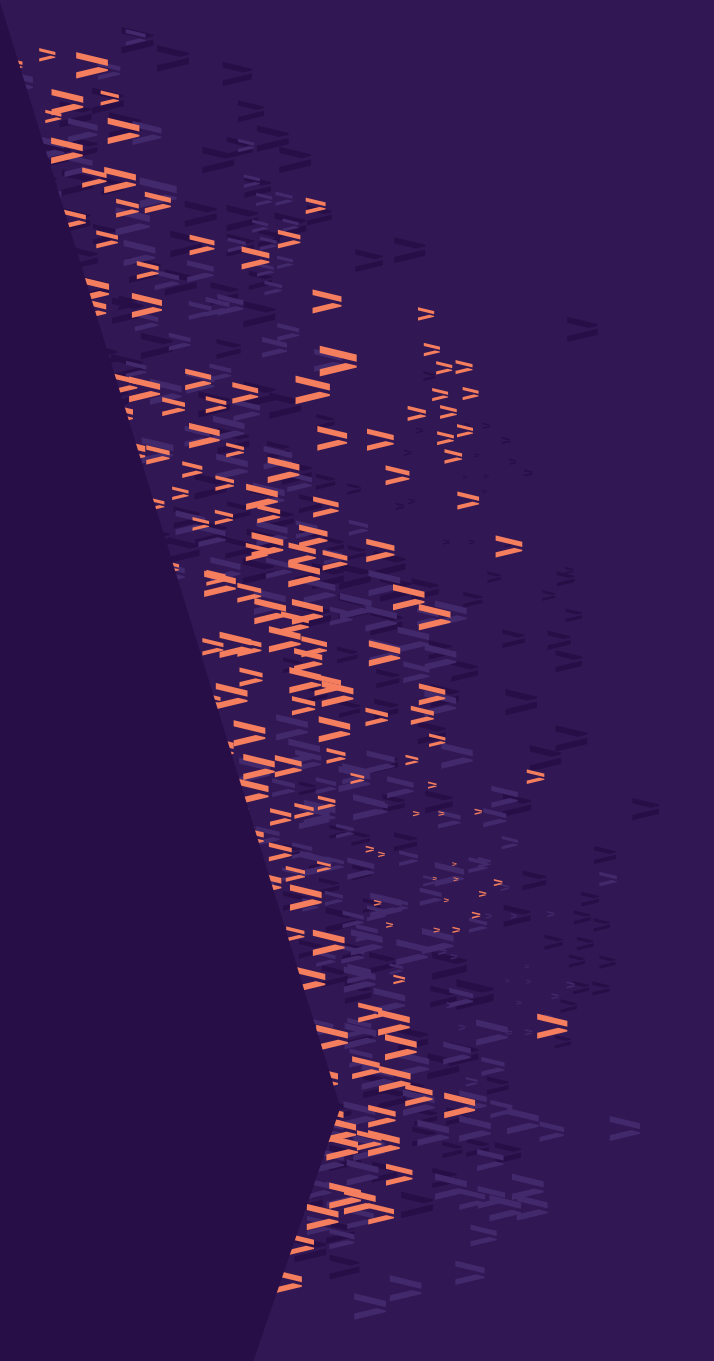
It also aims to support the development of Romanian learners as competent, confident, creative and responsible users and creators of computer science. Engage learners in the practical application of the concepts and principles of computer science. And lay the foundation for success in their career option which involve the application of computer science.

Predau Viitor is a program created by Asociația Techsoup, with support from the Romanian-American Foundation.



Pilot implementation

Structure, progression, feedback



DOT in Romania: the first pilot

Piloted DOT “Making Sense” with an intervention group of 15 students (7 girls and 8 boys).

They were enrolled in a 30 students, 10th grade class (16-17 years old) at the Colegiul Național Școala Națională de Gaz Mediaș.

The process was facilited by Cornelia Maier, informatics teacher — in an extra-curricular setting, over a week in November-December 2018.

An evidence-based intervention and approach to problem-based learning in Computer Science

DOT in Romania: the first pilot

Research to understand and measure the pilot via a mixed methods study which included:

- **focus group interviews** undertaken within same-sex groups of the entire 30 students' class before any DOT teaching (15 girls and 15 boys);
- 32-item **creativity survey** applied before DOT to 109 students (60 girls and 49 boys ranging from 16 to 19 years of age — significant majority of them 16 to 17 years old) from all IT related classes to explore students' creative self-concept, and after DOT with the 10th grade classes (30 students making up intervention and control group);
- **Torrance Tests of Creative Thinking** — TTCT (figural and verbal), applied before and after the pilot to the entire 30 students' class;
- **individual interviews** with all 15 students who undertook the DOT challenge (i.e. after DOT);

After the DOT intervention

- After DOT creativity survey, the intervention group students scored significantly more highly in their creativity than the control group students.
- The post-figural scores on the TTCT were greater for the intervention group than those for the control group. Elaboration, abstractness of title and resistance to premature closure scored significantly more for the intervention group post DOT.
- Whereas girls are typically more creative in the school before their experiences of DOT, the DOT intervention enables boys to be on a par with the girls.

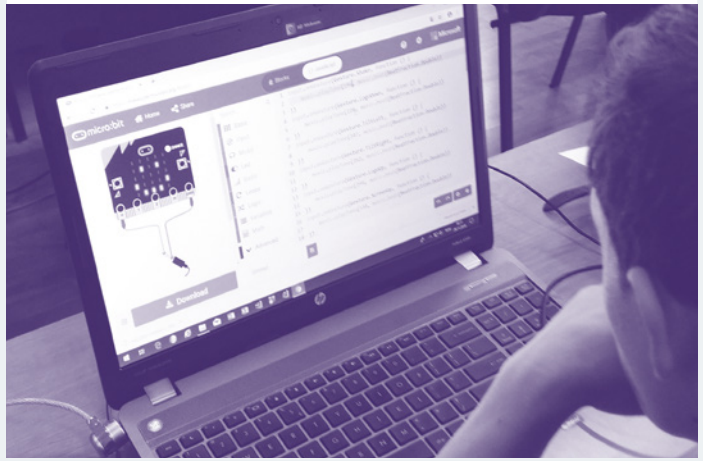
The intervention group's total creative post-DOT score on the TTCT was greater than the control group's.

After the DOT intervention

I mean I wasn't pressured but we... I had in my mind an idea that I need to get the best idea and that... I think it didn't stress me, it made me work harder and think more about what I want to do, it was very stimulating for me."

Yeah I really think it motivate me and continue to express my feelings, my ideas and try to resonate with the others so we can come up with something, and it was really nice knowing that someone really listens to you and understands you, and even laugh, make joke. But it is okay, it is really okay. It is really good."

The way we learned. We were freer and it was interesting for me... for the first time we came to school with pleasure, without being forced."

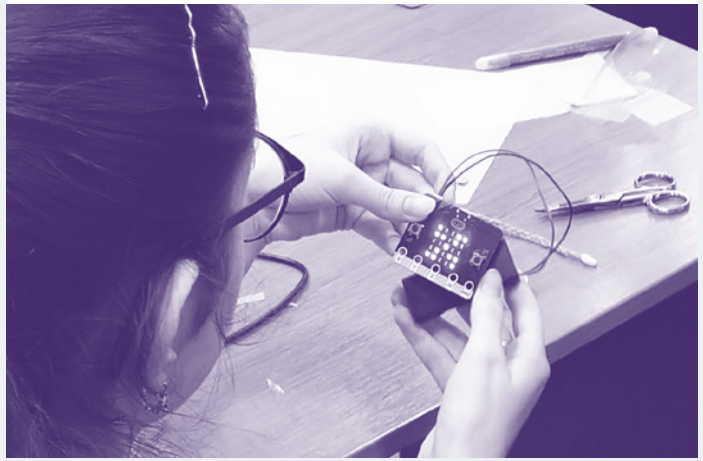


After the DOT intervention

> For me it is important because we…with the project we learned to work in groups, like this was the most important thing, and then we learnt to be creative. So I don't know why not be in the normal classroom."

> Well it is nice knowing that you are being listened and encouraged to do things on your own with your team. And to know that no matter your idea, how your idea is… it is not wrong or right, and it is very nice to know that you are being appreciated doing this stuff."

> The idea that your creativity is put very much to the test – I mean, you squeezed the creativity from us – and the idea of you viewing the students as more than students, more than a group, you viewed us individually."



Results

And next steps

Conclusions

Students are motivated by authentic design challenges and engage with the issue of identifying and solving problems with genuine insight and creativity.

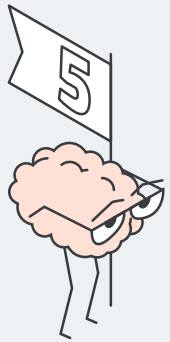
There is a tremendous opportunity to equip students with knowledge and skills to help foster creative thinking whatever roles they may take on in the future.

But caution needs to be taken in identifying the long-term impact of any intervention on learning outcomes, and careful piloting and research are key to fully understand the impact of DOT in the Romanian context.

Pilot data shows that DOT improved both the student's and the teacher's school experience in Computer Science. Students in the DOT intervention seem to be more confident and more creative, while also enjoying more their CS experience.

Next steps in the 2019-2020 school year

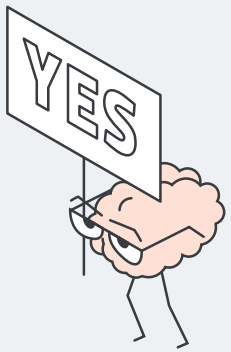
Continue with DOT in an extra-curricular setting for different high-school classes



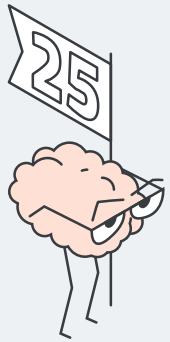
Expand DOT pilot to 5 schools – intensively train 15 teachers from these schools

Continue to measure and understand the effects on learning outcomes

Next steps over the next 3 years



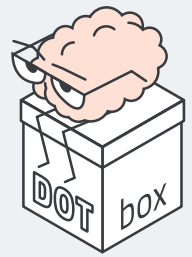
Propose and include DOT as a school decision curriculum for CS for 9th grade and also junior secondary classes



Expand DOT to 25 schools – intensively train teachers from these schools

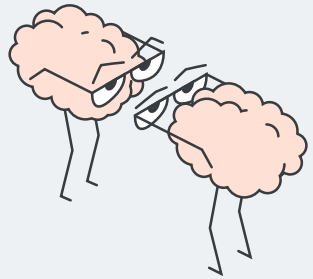
Continue to investigate the evolution of students and teachers

What does DOT mean for a school

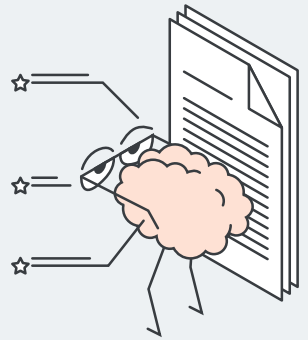


The Making Sense DOT Box + BBC micro:bit kits for a class of 30

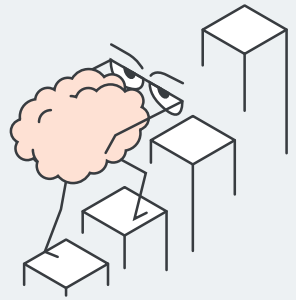
An intensive week long training by DOT and Asociația Techsoup experts — we train at least 2 teachers in each school



Class observance before and during DOT



Measuring the results and sharing them



An unique opportunity to study and teach an applied and problem-based Computer Science curricula

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