Education in Robotics and Education with Robotics: the INBOTS Project

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1st INBOTS Conference, Pisa, Oct 17, 2018

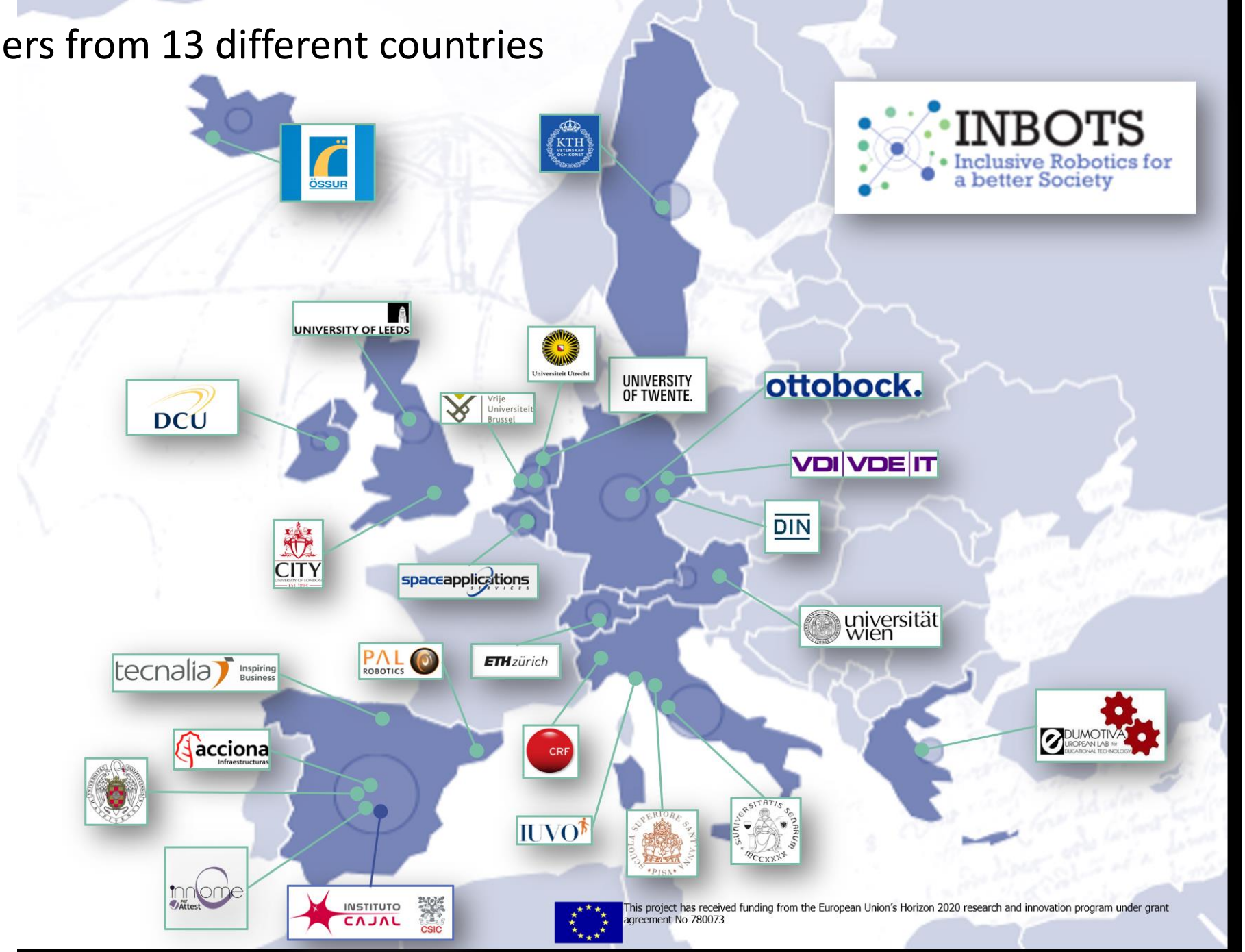
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 780073

INBOTS Areas of Expertise

- Entrepreneurship and non-technical support to SMEs.
- Debate on legal, ethics & socio-economic aspects.
- Accessible and multidisciplinary education programs.
- Standardization and benchmarking.
- Regulation and risk management framework
- Societal and socio-economic uptake

http://inbots.eu

25 partners from 13 different countries



Educational robotics: current situation

- education systems are not yet able to efficiently integrate robotics into curriculum paths
- new technologies are simply used to reinforce the old ways of teaching
- educational robotics kits are
  - expensive and proprietary, or cheap and unreliable
  - not easy to modify
  - Invisible mechanisms: robots work as the extension of the self, almost unseen to the user

Learners: consumers or makers?

- ready-made pre-fabricated robots
- teaching/learning materials define what is best for learners facing them just as consumers
- Learners have simply to follow step-by-step recipes to assembly and/or program a predefined robot.
- poor learning results, superficial and trivial knowledge acquisition instead of deep learning and skills development

Towards a paradigm shift…

“Kids make their own robots”

Robotics + 3D Printing + DIY electronics + maker movement philosophy

Towards a paradigm shift…

Enriching edurobotics with the constructionism culture…

- Papert’s constructionism

  “learning can happen most effectively when people are active in making tangible objects in the real world”

  constructionism is connected with experiential learning and builds on Jean Piaget's epistemological theory of constructivism
- digital fabrication labs
- Do-it-Yourself (DIY) philosophy
- Students as makers!

From a “Jobs” Culture to a Literacy Culture

- “*robotics should address only talented youth or science- and technology-oriented students*”
- fluency with robotics is no longer just a vocational skill, but knowledge and skills valuable for every citizen.
- “professional” platforms **are not appropriate for schools** because they introduce a plethora of technical details that are foreign to the main learning goal and end up unnecessarily frustrating students even before they can accomplish the simplest of projects.
- The materials that children use (robotics kits, electronics kits, etc.) should be **specifically designed for children.**
- The same goes for programming languages, not C++, use Scratch!

From a Hacker Culture to a Learning Culture

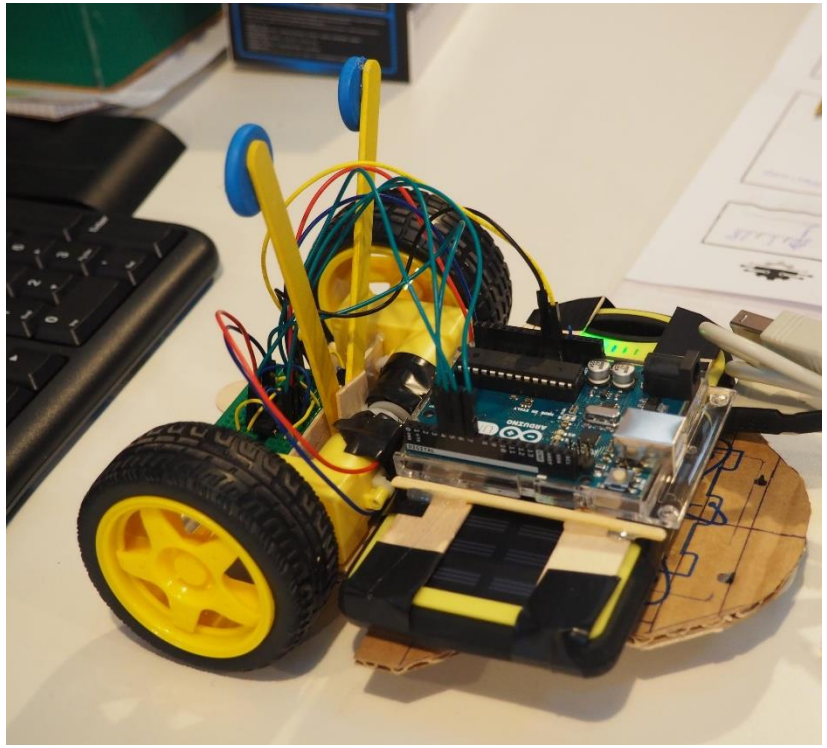
autodidacticism, individualism, and competition

impose a very specific mindset—generated in a very atypical environment—onto schools.

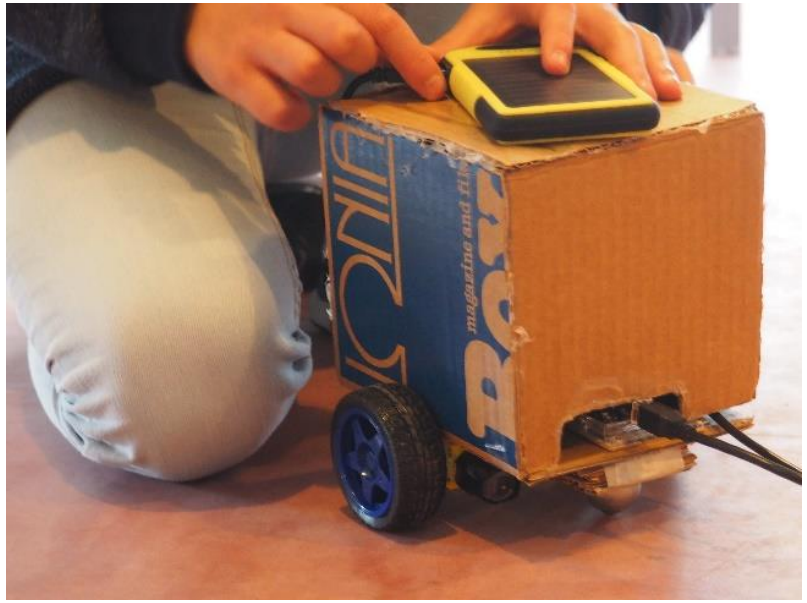
Teacher as coach
Team work
Collaboration

support learners in building their own identity, not to take on an externally imposed culture

- from “black box” and silo products to the “white box” paradigm
- learners become “makers” of transparent robotic artefacts

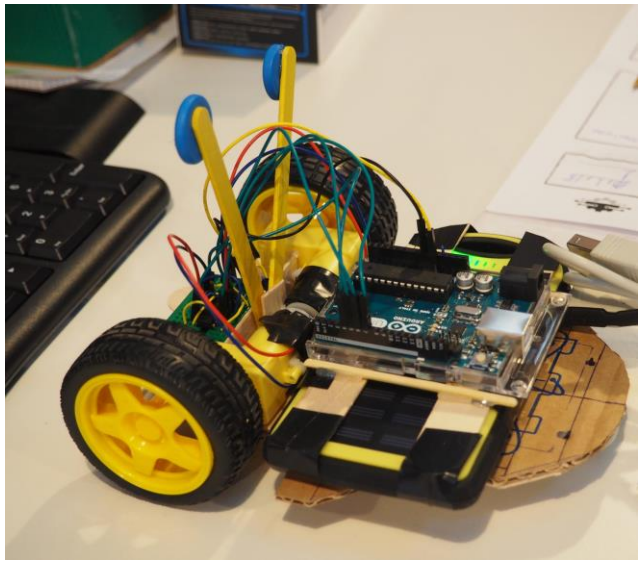


- A great variety of technologies and tools that can support a wide spectrum of educational projects.
- Free and open source technologies and tools.
- Low cost, low energy tools
- Recycled and everyday life materials
- Crafting
- Transparent robots



Visibility

- having access to and visibility into the environment,
- visible access to the tools and materials helps explore the different tools/technologies available in the lab
- access to a wide variety of tools.
- learners are encouraged to ask questions
- take things apart and put them back together again
- try out new solutions
- spark ideas for new projects



Product or Process?

- Give precedence to the learning throughout the **process**
- emphasis not on the final artefact but on the underpinning learning process towards the completion that matters the most.
- Emphasise collaboration, project management, going beyond their comfort zone
- Projects inviting for children, especially novices
- a new type of culture, one that promotes deep, plural, equitable learning.

“tinkering”

- No rush to make a predefined product/project
- “what happens if…”
- Engaging learners in iterative explorations/experimentations with the tools and materials (“a deep conversation”)

Assessment versus “instinct”

- Robotics education benefits are often considered as self-evident
- it is a common and dangerous trap to promise that students’ science scores will automatically improve as a result of a robotics class.
- Need for new assessment approaches and tools.
- Teachers and practitioners need to be aware that the metrics of success will not necessarily be test scores but very different types of assessments
- Long-term results and benefits

Learning methodology

1. Ideation & Planning

- https://youtu.be/pOqfKEocHHs
- https://youtu.be/KASmme8jH08
- https://youtu.be/ORXy8OlCy64

2. Creating & Programming

- https://youtu.be/uFbL76R_kPg

3. Sharing

- https://youtu.be/V6n360hagOQ
-
- https://youtu.be/6iqC4n1DW_Q
-
- https://youtu.be/TL3yhYfJnaA
-
- https://youtu.be/972r9HIYUV8

Indicative projects…

https://www.youtube.com/watch?v=QZHyYlv87no&list=PLgKtrHOACe-J6bvq-ka5ue4ERs142f4De

THE INBOTS METHOD OF WORK

- **Curricula** based on novel pedagogical methods including learning scenarios addressing several interdisciplinary topics.
- **Open educational resources** for learners and teachers including a variety of materials and resources where users can select the suitable ones based on their needs and interests and use within their robotics projects.
- **Promotion of learning activities** focused on interactive robotics either in schools or in non-formal education settings ensuring that curricula and resources become accessible by learners and teachers.

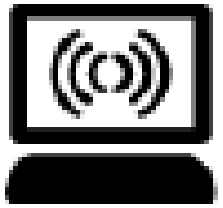
The INBOTS ambition…

help educators and students

- appreciate the potential of robotics,
- navigate the future of robotics
- provide insight into how hands-on learning experiences with robotics can develop the 21st century skills.

…and plans

- A European Summer course for teachers, student-teachers & school students in Athens
- A Master course for teachers in edurobotics



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