

EUROPEAN POLICYBRIEF - 3

Transforming learning environments for children and youth to spread entrepreneurial skills for social innovation



Entrepreneurial skills
for young social innovators
in an open digital world

“DOIT – Entrepreneurial skills for young social innovators in an open digital world”, a Horizon 2020 Innovation Action, has trialled, evaluated and disseminated a new approach for early entrepreneurship education in Europe. The DOIT learning programme has been developed for primary and secondary school pupils (6-16 years old). The programme fosters entrepreneurial and innovative competences that are applied in makerspaces for tackling social and environmental issues. This Policy Brief summarises key insights and recommendations for educational policy makers, educational organisations, makerspaces, teachers and other facilitators of learning processes and outcomes of young innovators.

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Introduction

The DOIT project, a Horizon 2020 Innovation Action, recognises that fostering entrepreneurial mind-sets, attitudes and skills of young people for innovative ventures should begin early on in creative and collaborative settings. The project designed and trialled a practice-based approach for developing digital, social and entrepreneurial competences of young people (6–16 years old) in makerspaces.

DOIT mobilised makerspaces (within schools and extracurricular) to empower primary and secondary school pupils, together with teachers and other facilitators, to develop innovative solutions for social and environmental issues. Such issues, perceived in the local context, engaged young people in maker activities to acquire and apply creative and entrepreneurial competences.

The recommendations of this Policy Brief are derived from the evidence gathered, analysed and validated over the course of the DOIT project.

DOIT pilot actions

DOIT pilot actions are a series of workshops and other activities with children in which they learn, usually in small teams, through hands-on activities in makerspaces. The actions have been implemented in 11 regional pilots in ten European countries (Austria, Belgium, Croatia, Denmark, Finland, Germany, the Netherlands, Serbia, Slovenia, Spain). They followed the DOIT learning programme for young people (6–16 years old), from the identification of local social and environmental issues to the public presentation of innovative solutions.

Actions took place in public maker spaces or schools, youth centres and other locations temporarily equipped with a makerspace. A variety of digital tools and physical materials was used for designing and prototyping innovative solutions. More than 1.000 young people participated in the activities, primary and secondary school pupils from urban and rural areas, different social backgrounds, including also handicapped students.

Evaluation

The evaluation of the DOIT pilots concerned if the application of the DOIT approach and learning programme actually generates positive effects regarding attitudes and skills relevant for entrepreneurial and innovation activity. This has been investigated using qualitative and quantitative social science methods. These included observation reports on learning dynamics and outcomes (e.g. innovative prototypes), interviews with participants (students, facilitators/teachers), pre- and post-pilot creativity tests and questionnaires on entrepreneurial attitudes and intentions.

The analysed results confirmed that the proposed maker education yields positive results regarding attitudes and skills relevant for entrepreneurial and innovation activity. The results showed an increase in creativity and entrepreneurial attitudes such as self-efficacy. In the interviews good results regarding 'soft skills' like communication and collaboration in teamwork were highlighted next to the creative maker skills fostered by the DOIT actions. Teachers were impressed by the high motivation of the students. They assumed that such actions are highly compatible with and promote students' interests and learning.

Discussion with experts in related fields of research and practice helped to validate the project insights and informed the development of the final set of policy recommendations. Expert meetings took place, for example, at the FAB15 global conference of the FabLab Network (July 2019), the DOIT expert roundtable in Berlin (September 2019), the Supporting Key Competences Development Conference in Brussels (November 2019).

Review of policies and research literature

It is also worth noting that the design of the DOIT pilot actions, interpretation of results, and final recommendations have been informed by a review of European policies on innovation in educational practices to promote digital and entrepreneurial skills as well as the research literature in related fields (i.e. entrepreneurship education, social innovation, maker tools and practices, learning in makerspaces). Important references are included below in the section Research Parameters.

Consolidated recommendations

The DOIT recommendations given in the first two Policy Briefs have been consolidated taking account of the additional project results and insights. The recommendations in Policy Brief 1 built on the identified state-of-the-art in entrepreneurial education, while Policy Brief 2 on the results of the interim evaluation of the DOIT pilots. The policy implications and recommendations presented in the next section are a synthesis of the previous briefs and final results and insights of the project.

Entrepreneurial learning in cross-curricular maker education

Europe needs more young people with entrepreneurial competences who are able to turn creative ideas into innovations that make our society more liveable and sustainable. Fostering such competences needs to begin early on in creative and collaborative learning environments.

The DOIT project designed and trialled a practice-based approach for developing digital, social and entrepreneurial competences of young people in makerspaces. The results show that primary and secondary school pupils (6–16 years old) can be empowered through maker education to create innovative solutions for social and environmental issues.

The project-based activities allow cross-curricular learning with a focus on local issues that promotes creativity, self-efficacy, teamwork and other social skills, alongside maker skills such as design and prototyping using various tools. Promising results have been achieved in pilots that involved over 1.000 young people, from urban and rural areas, different social backgrounds, including also handicapped students.

We suggest making a DOIT learning experience possible for every young European learner between 6 and 16 years old through embedding of maker education activities in formal curricula. These activities should be inclusive and accessible to all children, regardless of gender, background, ability, or other differences.

Recommendation Offer a practice-based entrepreneurial learning experience to every young learner in Europe.



- 1.1 Promote the structural embedding of maker education activities in curricula with a focus on social and entrepreneurial mindsets, skills and collaboration in teamwork.
- 1.2 Fund cross-curricular learning activities that allow for experimentation, trial and error and learning by making.
- 1.3 Establish learning environments that promote active citizenship in order to foster creativity, self-efficacy and self-conception.
- 1.4 Invest in activities that are easy accessible and explicitly commit to inclusivity and equity.

Makerspaces as learning ecosystems

Entrepreneurial education in makerspaces requires a rich learning ecosystem, comprising the individual learners and facilitators, schools and other educational organisations, educational and social policy makers, and local stakeholders such as businesses, cultural institutions, youth organisations, among others.

Schools need support in the form of space, time and resources to develop innovation capacity and to become a school where teachers are enabled to facilitate an open, entrepreneurial learning environment. Makerspaces can provide an engaging environment for learning that makes a vital contribution to the community.

In the makerspace-based educational activities proposed by DOIT student projects meet real needs in the community outside school and draw upon local expertise. The DOIT experience shows that learning by tackling real world issues increases the engagement of learners and teachers and generates more meaningful learning processes and outcomes.

Policy makers and agencies should promote establishing more makerspaces in schools as well as collaboration with other makerspaces and local communities to enable students become young social innovators.

Recommendation

Support the establishment of innovative learning ecosystems around schools, aimed at creative social innovation.

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- 2.1 Support schools to develop innovation capacity and to cooperate with local makerspaces, entrepreneurs and communities by increasing knowledge and skills in open schooling.
- 2.2 Raise awareness of makerspaces as infrastructure and environments for practice-based development of digital, social and entrepreneurial skills of young people.
- 2.3 Expand the number of makerspaces in schools and cooperation on educational programmes with makerspaces.

Teachers as facilitators of meaningful learning processes and outcomes

A different mindset and skillset are required to facilitate maker education and entrepreneurial learning. In the educational activities proposed by D0IT the role of the facilitators is to design learning experiences and to create the conditions for knowledge and skills development, rather than traditional transfer of knowledge.

Teachers need to be able to create a permissive learning environment that stimulates open-ended exploration, leaving room for failures as learning opportunities. In maker education experimentation is fostered and things to touch, to tinker and to build with are being used in the learning process. Maker activities should be part of the regular teaching, as an integration with (rather than an addition to) the existing curricula.

Teachers unfamiliar with maker education will need training on how to facilitate learning by making and the creative use of new (digital) technologies. Training of teams of teachers will promote and support cross-curricular projects and learning activities. Transferable and scalable training formats should be shared between training organisations and schools.

Maker education also benefits a lot from partnerships with external partners by bringing in expertise, knowledge and tools. Existing community makerspaces could provide a basis for collaboration on training courses and local projects involving teachers and students.

Recommendation

Support teacher/facilitator training on a team-level in maker education, entrepreneurial competences and social innovation.

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- 3.1 Recognise the changing role of the teacher and facilitate cooperation with makerspaces.
- 3.2 Fund the development of teacher training formats, peer learning, and social innovation projects with local communities.

RESEARCH PARAMETERS

The core aim of DOIT is to help young people develop innovation and entrepreneurial mindsets, attitudes, skills, and hands-on practices. To this end DOIT researchers and practitioners

- **Reviewed the research literature** in related fields such as entrepreneurship education, social innovation, maker tools and practices, learning in makerspaces as a basis for the research design and interpretation of the results (selected reference literature is included below).
- **Designed a learning approach and programme** that uses makerspaces for early stage innovation and entrepreneurial education of primary and secondary school students (6 to 16 years old).
- **Implemented pilots** that trialled the learning approach and programme:
 - Pilots in ten European countries – Austria, Belgium, Croatia, Denmark, Finland, Germany, the Netherlands, Serbia, Slovenia, Spain.
 - Participation of over 1.000 young people (6–16 years old), from urban and rural areas, different social backgrounds, including also handicapped students.
 - Different settings including public maker spaces or schools, youth centres and other locations temporarily equipped with a makerspace.
 - Use of a variety of digital tools and physical materials for designing and prototyping innovative solutions.
- **Empirical and evaluative framework:** The consortium agreed on the framework and carried out the research work: The main research question was if the application of the DOIT approach and learning programme actually generates positive effects regarding attitudes and skills relevant for entrepreneurial and innovation activity:
 - Quantitative methods: pre- and post-pilot creativity tests and questionnaires on entrepreneurial attitudes and intentions; statistical analysis of the data.
 - Qualitative methods: observation reports by pilot facilitators, interviews with participants (facilitators/teachers, young learners); content analysis of reports and interview protocols.
 - Workshops with external experts in related fields of research and practice to validate research insights and derived recommendations.
- **Review of European policies** on innovation in educational practices to promote digital and entrepreneurial skills in order to take account of these policies and ensure the relevance of the related DOIT recommendations.

Reference research reports (selected)

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- Council of the European Union (2018). Council Recommendation of 22 May 2018 on key competences for lifelong learning. Official Journal of the European Union, C 189/01 (pp. 1-13), 4.6.2018.
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AUTHORS AND LICENSE

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PROJECT IDENTITY

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Geser G., Hollauf E.M., Hornung-Prähauser V., Schön S. & Vloet F. (2019). Makerspaces as Social Innovation and Entrepreneurship Education Environments: The DOIT Learning Program. In: Discourse and Communication for Sustainable Education, 2019, 2, pp. 60-71.

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