Entrepreneurial skills
for young social innovators
in an open digital world

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SOCIAL INNOVATIONS WITHIN MAKERSPACE SETTINGS FOR EARLY ENTREPRENEURIAL EDUCATION
- The H2020 DOIT project

„DOIT – Entrepreneurial skills for young social innovators in an open digital world"
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Social innovations within makerspace settings for early entrepreneurial education - The DOIT project

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Abstract

The H2020 project DOIT and its 13 partners contribute to youth employment and to the creation of new jobs in the social economy by nurturing in young pupils' entrepreneurial mind-sets, knowhow and skills. The project empowers primary and secondary school pupils (6-16 years) alongside educators to apply open innovation methods, digital maker tools and collaboration skills to tackle societal problems. In this paper, the authors introduce to the background and approach of the project and the design of its learning activities called "DOIT actions".

1. Introduction

Social innovation and early entrepreneurship education for tackling social issues as well as generating sustainable businesses are seen as critical for achieving growth within Europe and, with a different frame of value references, other regions of the world. However, scientifically proven concepts are still lacking and practical applications are rare. The current European interest on a policy level provides a window of opportunity to innovate and implement novel strategies for a new European approach towards early, social innovation and entrepreneurship education. Such innovations include open didactical learning methods, such as project work within a workshop with self-set learning goals, the use of applied digital production technologies and the provision of social business collaboration and networking opportunities.

The H2020 Innovation Action DOIT aims to develop learning materials and activities that promote the core idea of an early entrepreneurship education for children and youth who are 6 to 16 years old. The DOIT concept as presented in this paper is based on the current discussion around skills and competencies within entrepreneurial education and their application to solving today's most pressing societal problems (e.g. the UN's Millennium Goals (UN, 2016a) and Sustainable Development Goals (UN, 2016b), the EU Sustainable Development Strategy adopted in 2001, see Eurostat, 2015). Acknowledging the importance of situating education in meaningful ways (Kulikowich & Young, 2001), this paper also presents a way to embed entrepreneurial education and social innovation within makerspace education (Schön, Ebner & Kumar, 2014; Unterfrauner & Voigt, 2017).

2. Current European early entrepreneurial education

2.1 Early entrepreneurial education as a key driver for Europe's wealth

Entrepreneurship education has been defined by the European Commission's Thematic Working Group on Entrepreneurship Education (2014) as developing the skills and mind-set that allow people to turn creative ideas into entrepreneurial action. Both social enterprises and commercial companies need new ideas for meeting the challenges of the future and providing options for a young, skilled workforce being potential intra- or entrepreneurs. Intrapreneurs are "those who take hands-on responsibility for creating innovation of any kind, within a business" (Pinchot, 1984). Given today's current socio-economic climate of high unemployment among young people and rising social inequality, strengthening the entrepreneurial skills of citizens from early in their education is crucial for creating wealth and future employment (OECD, 2012). Entrepreneurship education is therefore recognised as a key driver for growth and job creation in the Europe 2020 strategy (European Commission, 2016). However, it is acknowledged that potential young entrepreneurs face significant barriers, because they lack entrepreneurial skills, education about applied digital production technologies and social business networking abilities (Flash Eurobarometer 354, 2012, p. 117). The lack of adequate entrepreneurship education is related to a lack of role models, since teachers do not see themselves as entrepreneurs, and an overly theory-driven approach to entrepreneurship, which neglects the primacy of action and emotional development needed for experiencing entrepreneurship in situ. Generally, people are not aware of what entrepreneurship involves, highlighted in a survey in which only 28 per cent of EU respondents said that their school education raised their interest in becoming an entrepreneur (Flash Eurobarometer 354, 2012, p. 117). The current EU Commission's Eurydice report suggests that it is above all the inclusion of entrepreneurial activities in everyday school life that can be strengthened (Eurydice, 2017, p. 9).

2.2 Two strands of EEE: Not young millionaires, but social innovators

One strand of early entrepreneurship literature, originating from the USA, focuses on the accumulation of financial wealth. This area of early entrepreneurship education can be illustrated by the following list of some of the titles of such books: "The Lemonade Stand Millionaire: A Parents' Guide to Encouraging the Entrepreneurial Spirit in Your Kids" (Haynes, 2013) or "How to Let Your Parents Raise a Millionaire: A Kid-To-Kid View on How to Make Money, Make a Difference and Have Fun Doing Both!" (James & Coffey, 2012).

Another strand, and this could be also seen as the European alternative to the above mentioned approach, is not emphasizing financial success, but focusing on entrepreneurial attitudes as starting points for young people to get involved in changing the future living and working conditions for the better. Here, the social aims and ambitions of entrepreneurial skills are inherently linked to the definition of an entrepreneur's goals. The working definition which has been developed by the European Commission Thematic Working Group on Entrepreneurship Education (2014, p. 8) is also emphasizing such an understanding: "[...]. This is a key competence for all learners, supporting personal development, active citizenship, social inclusion and employability. It is relevant across the lifelong learning process, in all disciplines of learning and to all forms of education and training (formal, non-formal and informal) which contribute to an entrepreneurial spirit or behaviour, with or without a commercial objective." Entrepreneurial education is therefore the measure to enable future civilians to shape society, societal processes and developments. Social entrepreneurial education is not only related to economic activities, but also to other areas of social and cultural life. It is about finding new solutions to societal challenges, such as providing development chances for disadvantaged and marginalized groups of youth. Such social innovations are regarded as the ultimate and first key driver for equitable and sustainable societies (Nidumolu et al., 2009).

Lackéus (2015) provides an overview of the wide variety of "early entrepreneurship education" and differences in the meaning and learning goals and approaches in the diverse European countries. He suggests the term "entrepreneurial education" for approaches that do not directly address children's competencies as the world's next youngest CEO, but for a broader approach focusing on children's skills and interests that give them the opportunity to shape the (future) world.

2.3 Skills and opportunities European entrepreneurship education should bring about

There are several ideas and models that describe which personal effects early entrepreneurial education can have. These typically include competencies, attitudes, ambitions and skills. Most of the overviews are addressing adults (i.e. students in higher education), for example the EntreComp framework (Bacigalupo et al., 2016) or the overview of "critical competencies for social impact leader" provided by Kraemer (2016). A current study by Eurydice (2017) gives an overview of goals entrepreneurship education in European addresses at secondary school level (see the following Table 1).

Table 1: Addressed goals of entrepreneurship education at European secondary school level by Eurydice. Source: Excerpt of figure 3.8, titled "Learning outcomes for entrepreneurship education in general upper secondary education and school-based IVET, 2014/2015"

Entrepreneurial attitudes	Entrepreneurial skills	Entrepreneurial knowledge
Self-confidence sense of initiative	Creativity Planning financial literacy managing resources managing uncertainty/risk teamwork	assessment of opportunities role of entrepreneurs entrepreneurial career options

3. Maker education and social innovation

The DOIT framework draws on two approaches, which, if systematically combined, will convey early entrepreneurial education is only rarely practiced before. DOIT suggests bringing together principles of the maker movement and specific methods aiming at social innovations.

3.1 Maker spaces, tinkering and educational technologies

To help filling the gaps that are present in this field of early entrepreneurial education, DOIT introduces makerspaces as its core place of action and education. Makerspaces offer collaborative spaces for innovative forms of production and digital do-it-yourself work. They come in all shapes and sizes and can be found in many places throughout Europe. Linked to these makerspaces, the maker movement fosters the creation and development of new things using new tools. According to Chris Anderson, CEO of 3D Robotics, "any time you give the means of production to everybody, it changes the world."[1] This view on the role of open access to digital fabrication within the Maker Movement explains why it can be regarded as a catalyst for (social) innovation and entrepreneurship. Several reports describe how makerspaces or teachers can support children in their personal development and learning journey with digital fabrication (Young Makers 2012, Makerspace / Maker Media 2013, New York Hall of Science 2013, Honey and Kanter 2013; Schön, Ebner & Narr, 2016). Martinez and Stager's (2013) "Invent to Learn" encourages educators to implement the practice of "making" and "tinkering" in schools. As put forward by Resnick and Rosenbaum (2013) "The tinkering approach is characterized by a playful, experimental, iterative style of engagement, in which makers are continually reassessing their goals, exploring new paths, and imagining new possibilities. Tinkering is undervalued (and even discouraged) in many educational settings today, but it is well aligned with the goals and spirit of the progressive-constructionist tradition—and, in our view, it is exactly what is needed to help young people prepare for life in today's society". The quote shows how existing preferences in the educational system, e.g. emphasizing content delivery and quantitative assessment, run counter to a pluralism of learning paths, including the bottom-up experiences of creating tangible objects.

Making as a constructionist activity is a theoretically and historically founded principle for successful learning, coined as "learning by making (doing)" (Papert & Harel, 1991). It helps young and old experiment with innovation, develop an open mind, be creative, compute, and problem-solve, while considering the impact of their creations on society, ecology, and the environment. Construction as part of making can lead to various products and other concrete results, both tangible (machines, tools, 3D-printed parts, etc.) and digital (stop motion, apps, games, etc.). Compared with typical learning results for students (e.g. ranked test results and marks), this can provide a valuable sense of achievement that can be especially important, but is not restricted to, school underachievers. The greatest sense of achievement may come when making helps to solve problems in the real world and/or when teachers and parents are surprised by students' ideas, solutions and constructions. However, failure is also an inherent aspect of learning by doing and constructionism. Failure is an important stimulus for learning (Lenz, 2015), best summarised by John Dewey: "Failure is instructive. The person who really thinks learns quite as much from his failures as from his successes."

Maker education is a learning and teaching approach where a concrete or virtual product developed, constructed and/or done by oneself or in collaboration with others using not always, but eventually also, digital tools provided in a makerspace (Schön, Ebner & Kumar, 2014). Contrary to many STEM activities, maker education is an

open educational approach, including arts or social sciences (e.g. ethics, legal rights, participation), which fosters and allows creativity and the development of own solutions.

A makerspace learning setting will typically (though not exclusively) focus on digital fabrication, where children are allowed to choose tools as well as other resources. Adults are tutors; children will co-design with peers as well as enjoy intergenerational and interdisciplinary work. Methodically, the makerspace learning setting and its approach is an open educational approach based on open workshops, integrating peer tutoring and peer learning, where participating adults are involved as tutors and not teachers (see Figure 1).
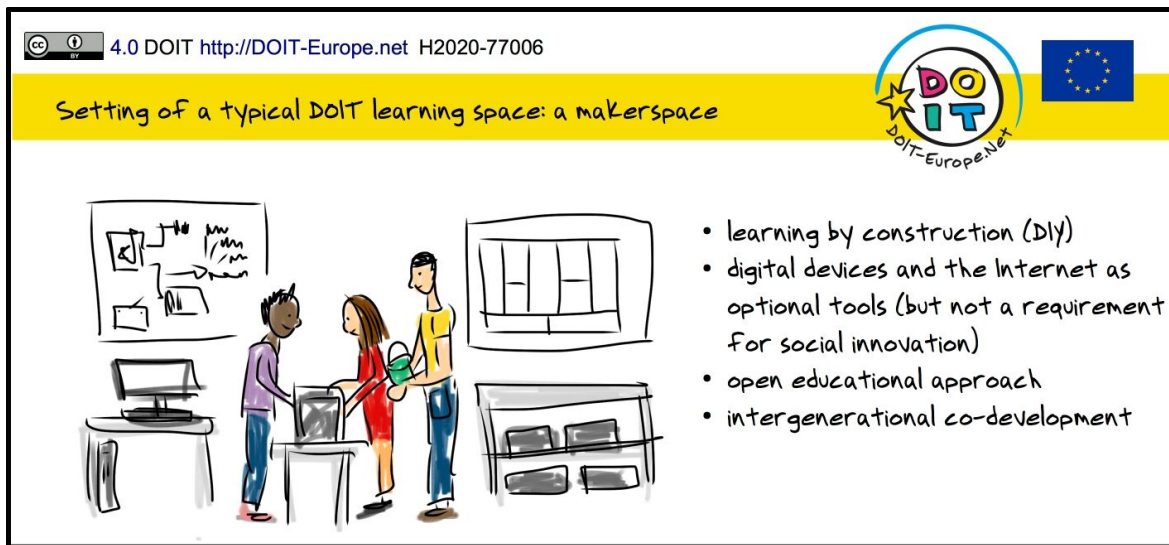

Figure 1: Principles of a typical DOIT learning space: a makerspace

3.2 Early entrepreneurial education focusing on social innovation and doing good

Innovations that meet social need and solve societal problems are called social innovations. Social innovations are regarded as new ideas (products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations. They are innovations that are not only good for society but also enhance society's capacity to act (Hubert et al., 2010).

A hallmark of social innovations is the need to get them accepted by the impacted social groups, which need to participate to overcome a specific social challenge (Hochgerner, 2012). Mulgan highlights newly arising cooperation and forms of collaboration, which create "compelling new social relationships between previously separate individuals and groups" (Mulgan, 2006, p. 5, cited in Anderson et al., 2014, p. 22).

Closely related to social innovation is the concept of digital social innovation (DSI). Such digital social innovation is defined as "a type of collaborative innovation in which innovators, users and communities co-create knowledge and solutions for a wide range of social needs exploiting the network effect of the Internet" (Digital Social Innovation, 2014, EU project homepage). DOIT focuses on digital social innovation (Bria, 2015), because it will perfectly match maker education with traditional educators and motivate children for entrepreneurial activity, even at a young age: digital social innovation directly addresses children's social environment and challenges they understand and encounter.

Social entrepreneurship supports social progress: "Social entrepreneurship is as vital to the progress of societies as entrepreneurship is to the progress of economies" (Martin & Osberg, 2007, see also Bornstein & Davis, 2010). Social innovators are not – as social entrepreneur – businessmen. In order to achieve their goals, social innovators use community building, piloting, trying to find supporters, and lobbying at the government.

3.3 Experiences with social innovation in makerspaces and children

DOIT aims to foster social innovation attitudes, skills and experiences by using the digital tools and methods of makerspaces. Social Innovation experienced within makerspaces will foster more than an interest in entrepreneurship; such experiences can motivate and provide the basis for it. According to Dali (2015), early entrepreneurship education conveyed by the principles and spatial learning setting of makerspaces will help to improve attitude, knowledge and skills around digital literacy, sustainability, democracy and human rights, equality, health and welfare, as well as creativity.

Despite the evidence that makerspaces are a helpful, engaging setting to initiate and foster innovation and entrepreneurship, there is little supporting material available for either children or facilitators that explicitly develops aspects of entrepreneurship education within this new setting.

4. The DOIT project

DOIT's 13 partners contribute to youth employment and to creating new jobs in the social economy by nurturing in young pupils seeds for active social innovation: entrepreneurial mind-sets, knowhow and skills. The project is funded by the European Commission's Horizon 2020 program. It started October 2017 and will run for 36 months (see http://doit-europe.net, 10/2017-09/2020, funding number H2020 -770063). The project consortium comprises experienced actors across the social innovation value chain with links to related European initiatives fostering young entrepreneurship education.

As introduced in chapter 2, DOIT provides a new approach for entrepreneurship education building upon social innovation in makerspace settings: DOIT's learning approach focuses on a combination of social innovation education in makerspaces for young entrepreneurs and development of entrepreneurship education knowhow for facilitators, teachers and other educators building upon co-design approach (see Figure 2). DOIT took social innovation as the focus of all activities, as it is easier to find authentic challenges and as this is core to the understanding of what entrepreneurship education should be about in Europe – to develop values. Additionally, DOIT sees the maker movement and educational technologies as a fitting hands-on approach as learning setting and space for the development of solutions for social challenges. DOIT plans to develop its specific approaches and activities with co-design of partners and stakeholders, including children. Last but not least, DOIT tries to avoid isolated actions and therefore will try to reach schools and stakeholders at a broad reach as well.
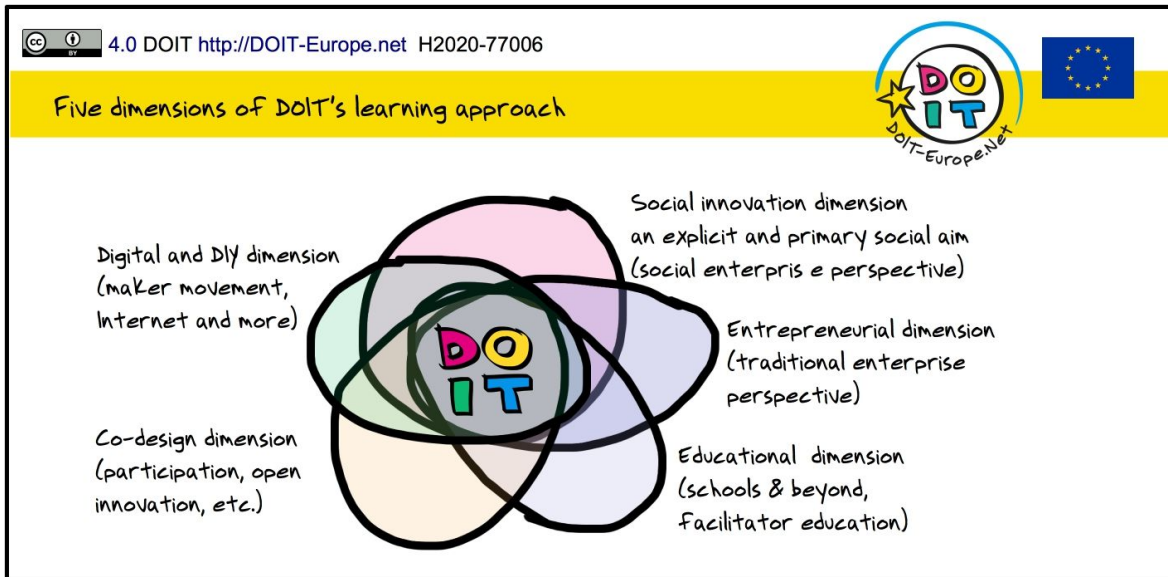
Figure 2: Five dimensions of DOIT's learning approach

The DOIT approach does not attempt to change or replace existing entrepreneurship education methods such as entrepreneurial games or young enterprise companies (school-based trial companies managed by students). Different learning offers allow choice and can complement each other.

The following figure (Figure 3) illustrates how DOIT aims to support the entrepreneurial and social innovation journey of children.
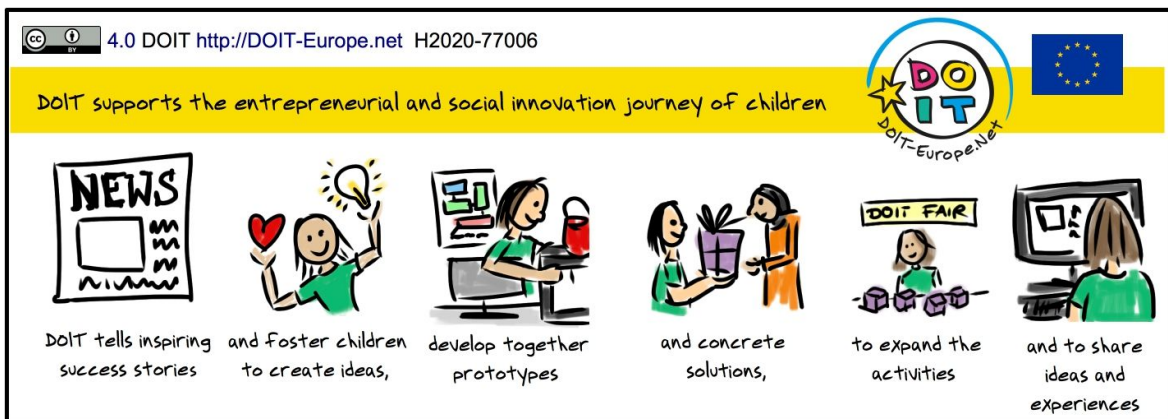

Figure 3: DOIT supports the entrepreneurial and social innovation journey of children: supporting early entrepreneurship from ideas to sharing experiences

The following illustration gives an overview of DOIT's objectives, key processes and results (Figure 4). The overall objectives of DOIT – Entrepreneurial Skills for Young Social Innovators in an Open Digital World are:

- Providing an environment based on the DOIT approach that empowers young people (6–16 years old), educators, makerspaces and social businesses to promote digital social entrepreneurship and innovation,

- Fostering entrepreneurial mindsets, attitudes and skills of children and young people through digital fabrication and maker movement knowhow with the DOIT toolboxes and platform,
- Bridging current gaps between makerspaces, schools, teacher training, entrepreneurship education and networks of social entrepreneurs through stakeholder mobilization and cooperation in the DOIT roll-out activities,
- Contribution, in the medium to long term, to the creation of digital social innovation culture, higher youth employment, new markets and new jobs in the long term.

DOIT will therefore create, validate and spread a new approach to generating entrepreneurial and digital innovation knowhow and skills, especially targeted to create new employment and businesses in the social economy. The DOIT approach aims to empower primary- and secondary-school pupils (6–16 years old), together with educators and other facilitators, to apply open innovation methodsand digital maker and collaboration tools to tackle societal problems. DOIT toolboxes and a collaboration platform will allow them to develop entrepreneurial knowhow and experience being a digital social innovator, in both child-friendly local makerspaces and the DOIT web-based collaboration environment.

The DOIT children's social innovation and entrepreneurship program is piloted and evaluated across 10 European countries (AT, BE, DE, DK, ES, FI, HR, NL, RS and SI). DOIT will provide materials (as open educational resources) and opportunities and aim to build a network of organizations to foster entrepreneurial thinking at an early age, social innovation, intergenerational, and multidisciplinary work. Moreover, the project will run roll-out activities to disseminate the DOIT approach and mobilize stakeholder engagement for adopting and scaling its application in the participating countries and across Europe.
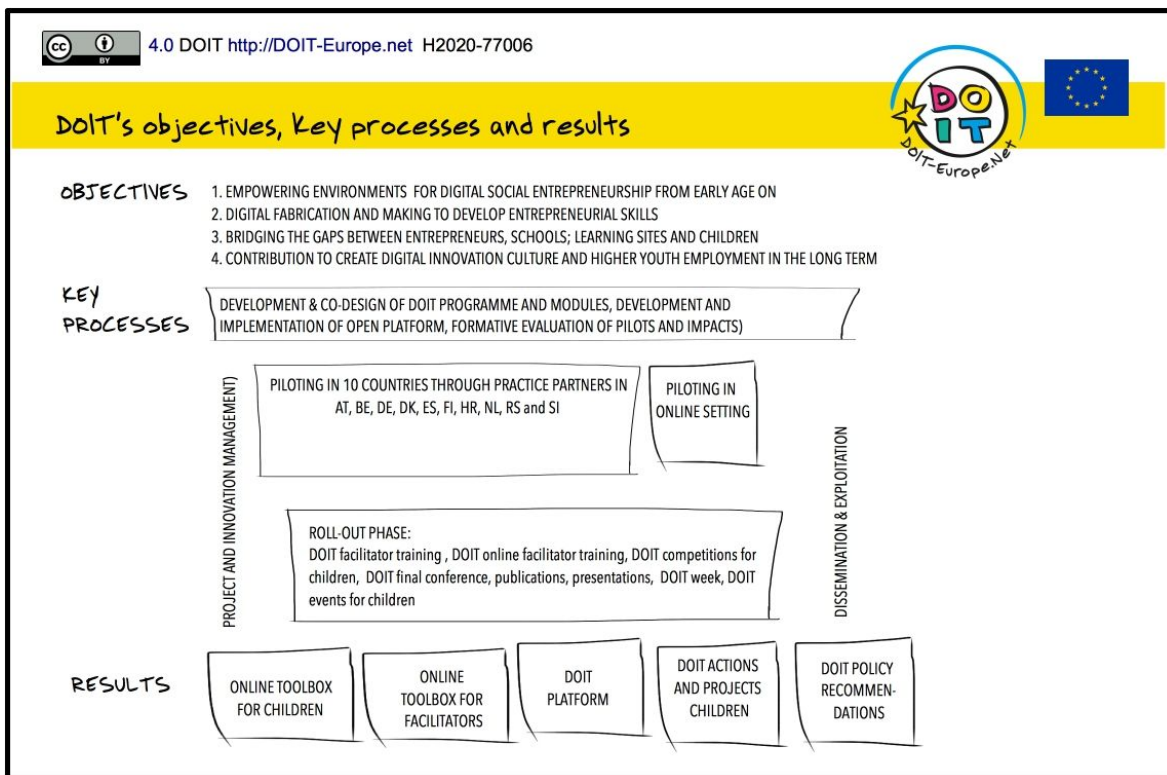

Figure 4: DOIT overview.

Among the different innovative elements of DOIT, openness is a principle that could be seen as DOIT's key asset:

- Open workshop environment (makerspace) - DOIT actions and events are always in an open workshop environment with technologies such as computers, 3D printers, vinyl cutters as well as traditional tools and materials. Open workshop environment means that users are allowed to work with a variety of tools and materials and not limited to a (very) small set.
- Open educational practices - DOIT builds upon learning settings that are designed to let children decide about learning goals and ways to learn. Additionally, learning typically occurs by doing.
- Open innovation and co-creative initiatives - DOIT fosters open innovation to tackle societal challenges through its settings and design approach.
- Open access - DOIT publications will be published with open access, preferentially in "gold" open access journals.
- Open educational resources (OER) - all DOIT materials are provided under an open license (CC BY 4.0). This enables future adaptations, variations, translations and usage of the materials and supports their long-term and widespread use (sustainability).

5. The DOIT actions

DOIT's approach will be developed for so-called "DOIT actions" (see Schön et al., 2017): These are a multi-day-event or a series of regular, but shorter events for children within a makerspace setting. Every DOIT action starts with a co-design workshop where (potential) participants (children as well as facilitators) co-design the future DOIT action, for example deciding on potential partners, involving stakeholders, more refined topics (for example an event focusing on "quality and accessibility of local playgrounds") or the decision to pitch specific ideas after a first workshop. Each DOIT action relates closely to the field of social innovation and to the field of maker education. Each pilot partner engages its target group with a socially relevant and relatable topic (see UN's Millennium Goals (UN, 2016a) and Sustainable Development Goals (UN, 2016b), the EU Sustainable Development Strategy adopted in 2001, see Eurostat, 2015), and uses making as a means to discuss and research this topic, come up with alternatives, collaborate with people and to be creative in thinking about possible solutions. DOIT actions lead to several ideas and prototypes (DOIT projects) for social innovation within the addressed topics.

Adults, who are not normally or regularly included in the children's maker activities, will now become involved within the open setting. Besides teachers, educators and adult makers in the makerspace, we will also invite adults from traditional businesses, social and service economies, and volunteering schemes to support and collaborate with the children on their ideas, products and social businesses. Adults are systematically involved in DOIT as co-workers and/or tutors, so children and adults work collaboratively.

The following two stories[2] of DOIT actions help to illustrate how the pilot partners can develop their activities within this framework, and how the DOIT approach and materials will be implemented.

(a) DOIT action "Be fit" and the new piano stairways in the main station: A makerspace in a small town calls for participants for a "Be fit!" action, where children and entrepreneurs are asked to develop ideas about how the fitness of all living in the city can be supported. The group of 80 children and 30 adults decides to develop a prototype of a staircase with a piano-like function and motivates people to use the stairs and not the lifts or escalators. In a joint workshop they develop a plan for realizing the prototype. Some weeks later the mayor of the town officially opens the piano stairway in the central train station that was sponsored by the local rotary club.

(b) DOIT action "Clean our area" and the interactive rubbish bin: 50 school children living in a rural area want to develop solutions to support recycling activities in their area. After a joint workshop where they interview local residents to find possible solutions, they create different innovations with the mobile makerspace tools that are placed in their schools. Together with local craftsmen and entrepreneurs, they develop more than 80 ideas, discuss them and then start to develop and prototype. Ten project ideas are further developed into prototypes during half-day events. In a public presentation of the prototypes, three ideas are selected and business plans are developed on how the prototypes could be turned into social enterprises. One prototype is launched and receives international attention: the interactive rubbish bin that always says "thank you, my hero" when rubbish is dropped in at the swimming lake.

Each of the 10 regional pilots and one online pilot will focus on a specific target group, so that it is possible to cover special settings and special target groups. However, all pilots will try to include all target groups to a greater or lesser extent, and some children can be considered to be part of several target groups. The target groups are: younger children (6–10 years); older children (11–16 years); children within and outside of school settings; children with less privileged backgrounds; children with disabilities; girls; children in rural areas; and advanced young makers and social entrepreneurs. Especially the age range will lead to some differences in addressing and working with children.

6. Outlook: Influencing early entrepreneurship education on the European (educational) policy level

The recent Eurydice study on entrepreneurship education at school in Europe (2016) reports that in "almost half of the European education systems, teacher training institutions have the autonomy to decide whether to include entrepreneurship education in their programs, and if they decide to do so, they are free to determine how it should be delivered. Furthermore, the integration of entrepreneurship education into initial teacher training curricula is not subject to regulation in over one-third of the countries/regions". Further, "more than half of the examined countries have very few and almost no teaching guidelines for entrepreneurship education. If there is one, they are more usually used at general upper secondary level and in school-based IVET than at lower levels of education" (cf. 2016, p. 93-94; p. 14). These findings support our notion that DOIT's materials and results can have an impact on future European early entrepreneurship education.

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Acknowledgment

Endnotes

[1] Several Web pages use this quote and refer to Chris Anderson.

[2] Both ideas were already developed and prototyped by the Volkswagen Stiftung as well as others.