DESCI

Developing and Evaluating Skills for Creativity and Innovation

DESCI Alternating Training – How to

TOOLKIT FOR TEACHERS AND TUTORS IMPLEMENTING ALTERNATING TRAINING PROCESSES BASED ON LIVING LAB ENVIRONMENT

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Introduction

The "Developing and Evaluating Skills for Creativity and Innovation" (DESCI) project, funded under the Programme Erasmus +, Key Action K2 (Strategic Partnerships), by the National Agency INDIRE, promotes alternating training based on the Living Lab approach, adopting participatory design methodologies, connecting School, Enterprise, Research and Territory.

The present document "DESCI How to – guidelines for teachers and tutors implementing Living Lab approaches based on Living Lab approach" (Teacher Toolkit) provides the basic elements and tools for planning alternating training at school, using the living lab approach implemented by DESCI.

The Teacher Toolkit pursues a modular approach: it shows sets of activities and methodologies that teachers and tutors can adapt to the specific school environment. Thank to the modular approach, The Teacher Toolkit takes into account the different needs and local contexts specificities expressed by teachers and stakeholders during DESCI testing phases and Open Campuses and suggested by DESCI Advisory Boards[1].

Moreover, the teachers can found samples of DESCI alternating training. The present Toolkit indeed, provides "Implementation Scenarios", which are specific trainings that have been realized by the School Partners[2] of DESCI Projects in relation to specific curricula/delivery/skills, using the DESCI approach described into the present documents.

The guideline is divided into 4 CHAPTERS / SECTIONS, corresponding to the macro-phases of the DESCI alternating training:
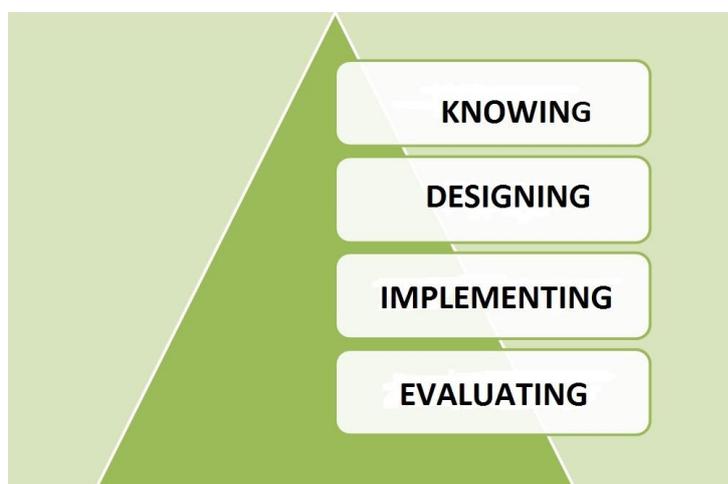
Fig. 1 – DESCI phases

KNOWING: in this section it is outlined the methodological approach- the Living Lab, operational indication on how to implement a LL at school, and indications on how / what to learn from context and previous experiences (Starting from good practices)

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[1] Advisory Boards have been in charge for providing comments during the development of the DESCI Toolkit. The Advisory Boards were composed by Experts of Education, external to the DESCI Consortium,
[2] The DESCI Toolkits have been tested in 3 School Pratners: 1st Experimental Middle School of Athens (Greece); Centro de Formacion Somorrostro (Spain); Istituto Tecnico tecnologico Frascati (Italy).

DESIGNING: in this section the alternating training paths are designed and planned, introducing the theme of skills and describing the training project. A major focus is dedicated to the LIVING LAB methodology.

IMPLEMENTING: this section describes the main steps of the working process to be adopted and aspects to watch out in the context of training. Samples of different DESCI implementation scenarios, developed by the school partners[3] of DESCI project, can be found in this section.

EVALUATING: the fourth section identifies the success factors of alternating training, by supporting the assessment and verification of the results obtained. It is linked to DESCI Evaluation Tool-kit as separate document.

The appendix contains

- o   Teacher Checklist for Internal Control;
- o   List of Methodologies;
- o   Video experiences about the implementation of the DESCI methodology;
- o   Glossary of terms;
- o   Bibliography.

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[3] The DESCI Toolkits have been tested in 3 School Pratners: 1st Experimental Middle School of Athens (Greece); Centro de Formacion Somorrostro (Spain); Istituto Tecnico tecnologico Frascati (Italy).

Desci Conceptual Map

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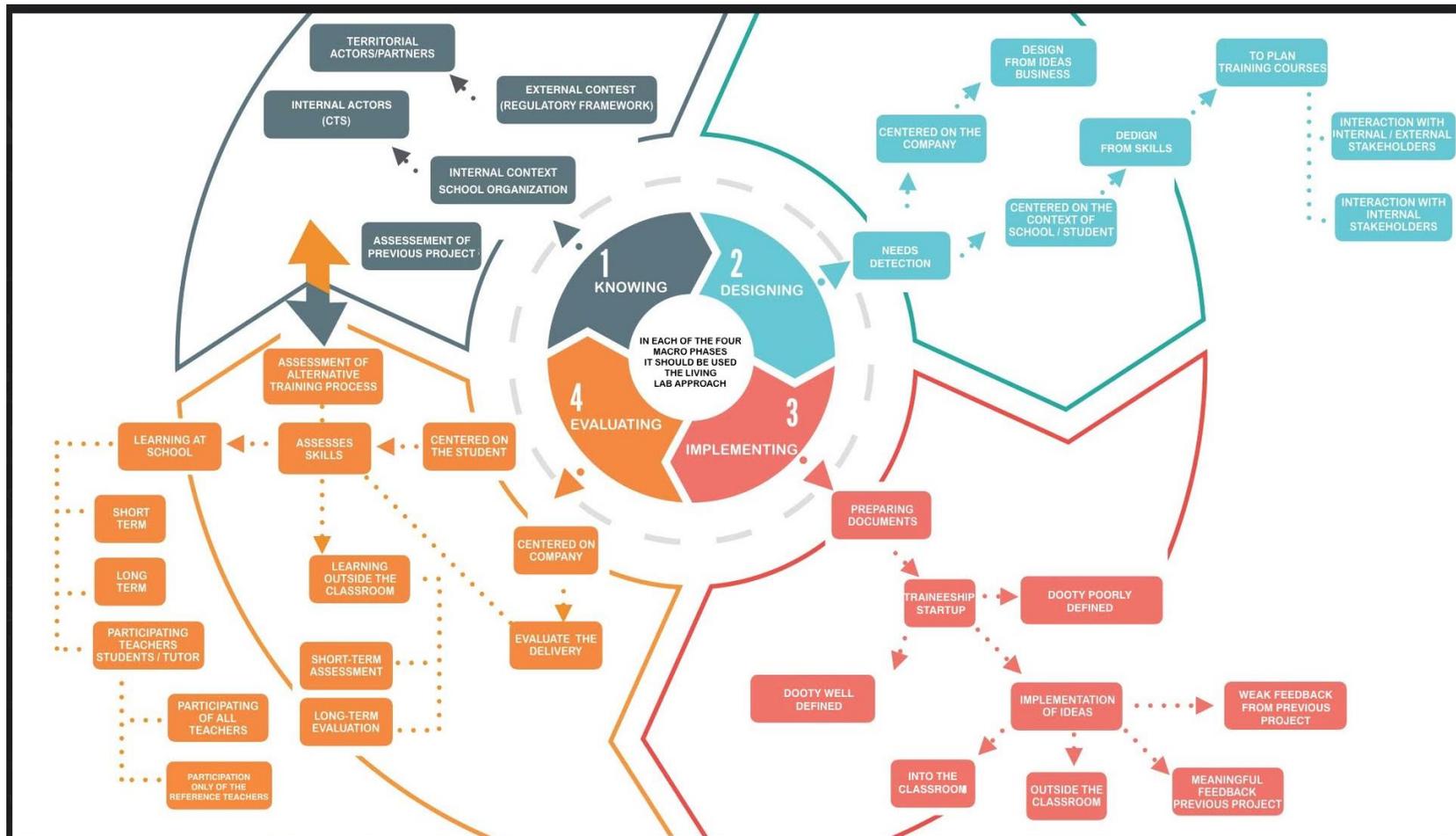
Fig. 2 – DESCI Conceptual Map

1. KNOWING

1.1 What does Alternating Training mean

1.1.1   Alternating Training Systems in Europe

With "alternating training" (AT) we refer to the alternation between theoretical education and practical **training.**

European Countries adopt several alternating training systems (ATS). Traditionally the alternating training is mandatory in VET schools but, in the last years, in some countries, like Italy, alternating training is required for all schools as practical **training** in workplaces. We refer Alternating Training to all typologies of practical training included in the different ATS[4]

1.1.2   "Knowing your system"

Individuate the aims and essential elements of the ATS in your country. In the questionnaire "AT System questionnaire" in appendix, you can find key questions about your AT system that we suggest to focalize if you would like to design a DESCI alternating training in your school.

1.1.3   Employability, creativity, innovation and social inclusion

The school is part of a socio-economic system. The school should provide the students with the competences suitable for the labor market, but also, at the same time, for their personal development and for the social innovation. The aim of the DESCI alternating training is to develop the creativity of the students for increasing their employability, on the one hand, and for expressing themselves, for acting consciously in the system and for driving the innovation and social inclusion in their communities, on the other hand. To this aim we adopt a living lab approach.

1.2 The methodological approach: the Living Lab

DESCI alternating training is based on the Living Lab approach. In this section you can find basic elements of the Living Lab approach integrated by the DESCI project into the DESCI alternated training methodology.

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[4] See "Alternating Training" in Glossary. For an overview on AT systems in Europe you can see "Comparative analysis of European upper secondary schools and alternating training systems" (O1, DESCI project)

1.2.1   Key aspects

The European Network of Living Labs (ENoLL) defines a Living Lab as "an open innovation environment in real-life settings in which user-driven innovation is fully integrated within the co-creation process for new services, products and societal infrastructures"[5]

Following the ENoLL definition, key dimensions of the Living Lab, for DESCI educational purposes, are:

* **open innovation** – Living Lab approach takes into account all possible sources of innovation, by encouraging the involvement of all stakeholders (schools, research system, enterprises, associations, citizens) in transparent, collaborative and often not codified processes. In the process of open Innovation, Information and Communication Technologies (ICT) may take a leading role, although Living Lab can pursue as well social and cultural innovation.
* **real-life settings** – Deliveries (services/products) are tested in real life setting, making the prototypes available for a sufficiently long time and in the same conditions in which they would be used on a larger scale;
* **end-user involvement** ("active involvement of the end users", "user-driven innovation", "co-creation")- end users are encouraged to cooperate with researchers, developers and designers to contribute to the innovation process as a whole;

Outcomes can be services, products or projects belonging to any area, such as ICT, science, culture, society, etc.

In each phase of process of Living Lab development, the activities should be informed by the *Five Living Lab Key Principles*:

* *value* – living lab process provides value for customers & users;
* *influence* – rights, needs, wishes of users influence the living lab process;
* *sustainability* – living lab process creates sustainable environment respect to social, ecological, economics effects;
* *openness* – several stakeholders are invited to participate in the living lab process in collaborative environment;
* *realism* – living lab process is carried out in a realistic, natural, real-life setting.

The Living Lab is the approach used to design and realize the alternating training, through the sharing of ideas and collaboration between the other stakeholders: students, institutions, research centers, businesses, associations and citizens. The goal is to promote the active involvement of the end users in order to detect the needs of the territory, designing and evaluating interventions that may also have a medium- and long-term impact.

DESCI Living Lab is specifically addressed to school activities and alternate training. It also includes among own characteristics: **participatory approach** and **active learning** and **social inclusion** (see section 2.2.3 "Teaching/Learning Methodologies", addendum "Internal DESCI Check list" and Glossary).

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[5] See bibliography [8].European Network of Living Labs ENoLL, at www.openlivinglabs.eu › aboutus; [9] Ana Garcìa Robles, Tulia Hirvikosky, Dimitri Shuurman, Lorna Stokes, Editors 2015, Introducing ENoll and Living Lab Community

1.2.2   The school as a Living Lab

The basic idea of DESCI project is that the school becomes Living Lab for the territory/local community, that means that the school becomes "incubator" of innovation and creativity, a co-working space where the students develop deliveries (products or services) of social utility, under the mentorship of companies, associations and research bodies. The school opens its doors to the territory/communities and becomes a hub for innovation connected at the European level.
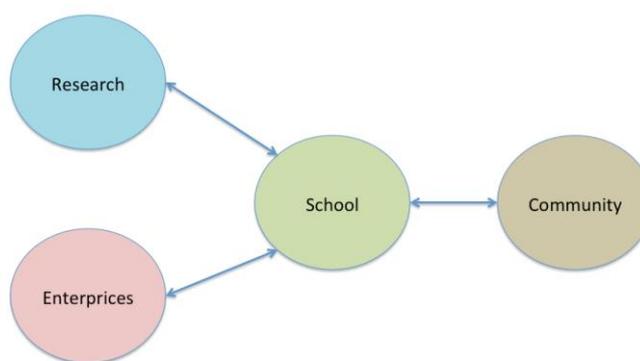
Fig. 3- DESCI stakeholders

1.3 Main stakeholders of Alternating Training

In DESCI alternating training, stakeholder are all the people or entities that may be interested in the activity of the living lab, i.e. by contributing in designing, implementing evaluating and/or developing or acquiring knowledge related to the product/service developed by the students during the alternating training.

We list some examples of stakeholders[6]: enterprises, research organization, interested local communities and associations (of patients, of citizens, of consumers, environmental, ...), other institutions (other schools, municipalities, policy institution, health units, ...), cultural institutions, institutions to address human rights, equity, gender (trade unions, disabled people associations, migrants associations, associations for protecting women, of childhood, for the rights of detainees, GLBT associations ...), departments of the schools, different group classes (internal stakeholders), individuals from all these entities and potential users of products and services.

A careful analysis of living lab points out that among the stakeholders, it is useful to identify the stakeholders that play the following roles:

* **innovator** – they provide expertise/research needed to the development of innovation (service/ system / product); i.e. researchers or enterprises.

* **producer** – they develop the innovation (service/ system / process); i.e. the students in the students living lab, the teachers in the teachers living lab, etc.

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[6] Based on literature and REPOPA results. Repopa wp4 final report 2016 http://www.repopa.eu/

*   **end user**– they use the innovation (service/ system / product).

In section 1.4 "How to implement a Living Lab in the School" you will find further explanation of these role in the school.

1.4 Exploring and networking the local productive system, territorial / local context and communities

For implementing living lab approach it is vital the analysis and connection with the local community. In this section we will give information on the following issues.

How to detect the needs of the area? How to find companies and organizations? How to find companies and organizations that have "problems to be solved" and which are willing to host DESCI alternating trainings? How to start a relationship with these companies and institutions?

Detections can be carried out by the teachers through the "Living Lab DESK". See sections 2.1.1 "Functions for Managing Living Lab in the School" and 2.1.2 "Scheduling the activities of Mangement & Teachers Living Lab"

Further detections can be carried out by teachers and the students as part of the alternating training, in "mapping activity", through specific surveys and web inquiry and participation procedures such as futuring tours. See

- Detection by demographic databases (Istat, Chambers of Commerce ...) and the major search sites and tools on the Internet and in social media (for example access to the companies'/institutions' groups and discussions on Facebook and/or LinkedIn pages).

- Detection by the Town Hall archives and other local authorities.

- Detection by the direct contacts of the school thank to the networks in which the school is already present (for example the students' parents or other networks).

1.5 How to implement a Living Lab in the School

In the process of activating and implementing the living lab in the school, we can distinguish three different living labs:

- **Policy Lab for Alternating Training (PLAT)**: coordination of the network of organizations (schools, research centers, enterprises) that share knowledges and experiences, that support the implementation of DESCI alternating training. First participants have been the DESCI Partners, that constituted the **Consortium Living Lab (CLL).**

- **Teachers' Living Lab (TLL)**: the living lab which is activated in each school, through which the teachers will plan, realize and evaluate the implementation scenarios for their school.

- **Students' Living Lab (SLL)** into the alternating training the students can activate a living lab for developing innovative industrial delivery, under the tutoring of the teachers, enterprises and researchers.
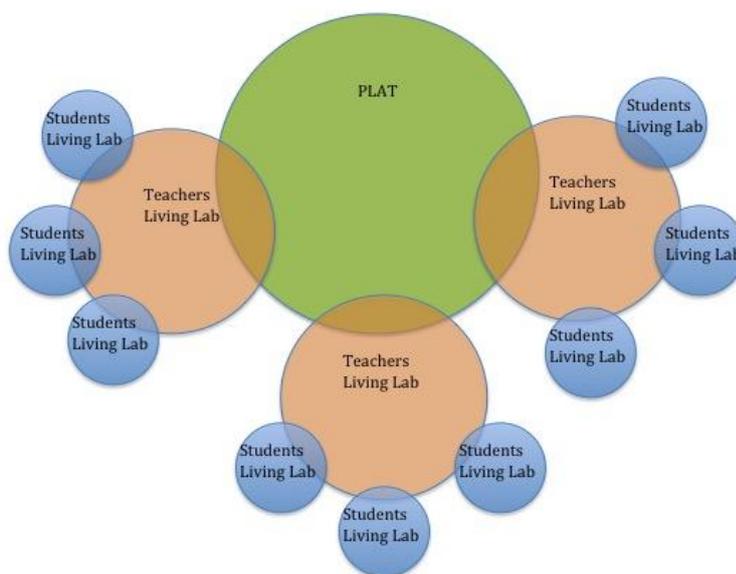
Fig. 4 – DESCI Living Labs

In the table the main features of the three living labs.

Roles	PLAT LL	Teachers' LL	Students' LL
Producer	DESCI Consortium Members	Teachers	Students
Co-producers	Enterprise, researchers	Enterprise, researchers	Enterprise, researchers
Delivery	Toolkit: DESCI Guidelines	Scenarios / AT training Planning	Output that student realize during the Alternating Training (website, app, domotic plant)
Users	Teachers	Students	Citizens/Community
Innovators	Consortium Members	Researchers	Researchers, enterprise, students, teachers
Tutors		DESCI consortium, Pedagogical advisors	Internal tutor (teacher), External tutor (in enterprise or research center)

We notice that, in the three different living labs, the same actors appear with different roles: the users of one living lab are the producer of the others. In the living lab approach the users are involved in the phase of analysis, design and evaluation. It produces an interconnection among the three living labs.

The teachers are involved in all three living lab with different roles: users, producers, tutors. The students are users of the output of the living labs of the teachers, so they may be involved in different steps of planning the scenarios.

1.6 Starting from good practices

1.6.1 Practices in my school

The guideline wants to provide tools to integrate the practices already existing in the schools, not for replacing them, according with their previous experience with living labs (see section 2.2.3 and section 2.2.4):

- If the school has never used living lab approach, we suggest of seeking the practices already existing in the school, analysing in which process function, phase and elements are close to that of a Living lab (**open innovation, real-life settings, end-user involvement, participatory approach**, **active learning and social inclusion)** for individuating the practices more suitable to be further developed for becoming a living lab.

- If the school has already experimented good practices quite similar to the living lab, we suggest to individuate those practices, using the check list in appendix, and to start from them by further developing and enriching them with DESCI living lab elements.

- If the school has already implemented a DESCI living lab we suggest to start the planning with the analysis of the evaluation results related to the living lab and alternating training of the previous years, for individuating strengthens and weakness. As indicated in the DESCI conceptual map, DESCI is a circular process, the evaluation phase is also a reflection phase in which all the stakeholders involved in the AT process (above all the TLL) must identify strengthen and weakness of the AT realized. This outputs will be used to plan and design the next/future AT projects.

1.6.2   Practices outside my school

Before starting the planning of your DESCI alternating training, we suggest to explore the experiences of other schools, research centers and university, word of work. You can find other schools joining to DESCI eTwinng group.

2. DESIGNING

2.1 The Management & the Teachers Living Lab

Managing Living Lab alternating training can be a challenge for the school, because it implies to involve external stakeholders and to implement participatory strategies.

STEP 1 The first step is that the school identifies the Management "functions" for handling the living lab alternating training, i.e. identify the procedures for elaborating living lab scenarios, approving them, appointing tutors, evaluating students skills, etc. See subsection 2.1.1

If the school already has management procedures for dealing with the alternating training, the management procedures already existing can be adapted for managing living lab alternating training. If the school has no alternating training management procedures, the school should identify a suitable management structure, depending on National law, regulations and the school procedures and environment, for handling with the living lab alternating training.

STEP 2 Then the school should identify the management team, i.e. people who will be in charge for the identified functions. The management team can be composed by teachers, but also by administrative or other school roles, depending on National law, regulations and the school organization. The school can involve external experts, from research and business world, using a living lab approach.

STEP 3 Management team should plan tasks and activities to follow for implementing living lab alternating training

What is the Teachers living Lab? In managing the activities, especially in designing activities, the management team can adopt the living lab approach (i.e. involving external stakeholders in designing or in evaluating the activities). In this case we refer as "Teachers Living Lab". In general, we refer as "Teachers Living Lab" to the environment where activities of alternating training managing are carried out using living lab approach. We speak about "teachers" living lab, because we are assuming that the activities of managing, and in particular the activities of designing the alternating training, are carried out mainly be the teachers. See section 1.4.

2.1.1 Functions for Managing Living Lab in the School

Here below you can find some functions with which the school should equip itself for implementing living lab alternating training.

Function 1 (F1) **School Living Lab Regulation**. The school should detect existing laws and regulations and identify the procedures through which operate, linking the present teachers guidelines to the school regulation and the School Education Plans.

Function 2 (F2) **Living Lab Desk.** To Link school and local community, the school should identify who and how will interact with the external stakeholders, identifying peoples in charge and procedures for finding, interacting and module relationships and agreements with Enterprises, Research, Associations, local authorities/decision makers, but also potential targets, potential users of alternating training deliveries.

Function 3 (F3) **Selection and approval of proposals for living lab alternating trainings**. The school has to plan who and how should select and approve living lab alternating training, identifying peoples in charge and procedures for selecting and approving proposal for alternating training that

come from enterprises, research centers, association, citizens but also by teachers, parents, students.

Function 4 (F4) **Co-design alternating training**. The school should identify who and how to design the alternating training, identifying people in charge and procedures for designing alternating training scenarios with the local community (companies, research institutions, associations etc ...) and students (personalized trainings). In designing the activities teachers can adopt the living lab approach. (Teachers Living Lab)

Function 5 (F5) **Living Lab Tutoring** The school appoints internal tutors, one per group of student involved and the coordinator tutor who has the task of coordinating the work of tutors. The school can also appoint the external tutor identified by the counter function (F2).

2.1.2 Management Team

The above management functions can be allocated to the members of the school or partially delegated to external components with which the school set up agreements/conventions for Alternating Training, constituting the management team.

The Management team identifies and brings together the most appropriate procedures for inserting DESCI alternating training into the school regulations and environment.

> ### *Samples of Management in the DESCI Living Lab - Case Studies*

The above fuctions can be carried out by bodies already present in the educational systems and therefore these bodies can become or can include the Management functions:

- Istituto Tecnico Tecnologico di Frascati (Italy).: The management functions are carried out by the Scientific-Technical Committee (CTS), composed by internal and external members: school director, administrative director, 4 teachers and 1 representative of external institution FormaScienza.
- Centro de Formacion Somorrostro (Spain): The Scientific-Technical Committee already existing in the school plus 2 representatives of the Company involved in the Scenario.
- 1st Experimental Middle School of Athens (Greece): there is no alternation institute, the project is included in the economics teaching and the teachers are managing the living lab alternating system.

2.1.3 Scheduling the activities of Mana gement & Teachers Living Lab

The activities to be performed by the Management team are divided into two phases:

- **Activation phase**, the first time that a school implement a living lab approach
- **Regime phase**, if the school has already implemented a living lab approach

Here below we report the activities that have been implemented by the school partners of DESCI. For each relevant task / activity we report a function number, for helping the management team to identify who should to deliver the task/activity.

Tasks in Activation Phase

The following tasks should be scheduled by the Management team for activating DESCI training.

- Analysis of the DESCI materials: guidelines, scenarios (F4)
- Setting of the requirements for the adoption of DESCI model and of LLM functions, in particular:
    - Living Lab Desk (F2)
    - Internal tutors and tutor coordinator (F5)
- Appointment of external advisors, if any
- Presentation and discussion of DESCI guidelines and scenarios
- Definition of supporting technologies and logistics needs
- Budgeting for activities and time schedule
- Contacting and preliminary meetings with entities (companies, research institutions, associations). (F2)
- Co-design of the scenarios (identifying products / phases / prerequisites required by the entity) (F2, F4)
- Connection with School Education Plans, selecting the learning objectives and/or the skills of the scenarios, taking into account the soft and technical skills. (F5, F4, F1)
- Discussion of the scenarios under DESCI project, compared with other European Schools (F4, F1)
- Elaboration and approval of the "customized DESCI tools for school" as:
    - form for personalized project for the student on the basis of DESCI model and school scenario (F4, F5)
    - form for agreements entities-school(F2)
    - assessment tools (test, observation forms) based on the DESCI model and on the school system (F4, F5)
- Discussion of "customized DESCI tools for school" as part of the DESCI project, compared with other European schools (F4)
- Discussion of evaluation tools of the DESCI project (F4)
- Meeting with organizations and schools for the establishment of a DESCI network (F2)
- Legal agreements (F2)

Tasks in Regime

The activities/tasks to be scheduled by the Management in regime are the following:

- Analysis of school scenarios already existing and to be developed in DESCI framework, based on the assessment of past experiences and on other European schools (available for example on DESCI platform) (F5)
- Contact entities (enterprise, research institutions, associations), preliminary meetings. (F2)
- Elaboration of new scenarios in particular:
    - Co-design scenarios with entities (enterprise, research institutions, associations) (F2, F4)
    - Connection of scenarios with School Education Plans, selecting the "learning objectives", taking into account the transversal and technical skills. (F5, F4, F1)
    - Finalizing the design with participation of the students. (F4)
- Elaboration and approval of the "tools" in particular:
    - form for personalized project for the student on the basis of DESCI model (F4, F5)
    - form for agreements entities-school(F2)
    - assessment tools (test, observation forms) based on the DESCI model (F4, F5)

- Designing and approval the procedures for facilitating the choice of scenarios by students (and/or the selection of the students by enterprise) and for the personalization of the trainings for students (F5). In particular:
  - Co-developing personalized trainings for students involving the students (F5)
  - Co-designing personalized trainings for students involving entities (identification of products / phases / prerequisites required by the entity / guidance activities) (F4, F1)
- Defining the procedures and timeframe for:
  - Approval of personalized project for the students (F3)
  - Signing agreement with entities (F2)
- To equip itself for the realization of student trainings: timing, materials and definition and coordination of the personnel for tutoring and monitoring
- Setting the procedure for evaluation, in particular:
  - Student assessment
  - Scenarios assessment
  - Process assessment

Above tasks should be distributed according to the functions identified in the Management.

2.2 Designing Implementation Scenarios

The educational responsibility of the training is of the scholastic institution that designs the scenarios[7], helps the student to design the personalized training, assesses and certifies the skills acquired.

The school plans the implementation scenarios based on the present guidelines. The scenario identifies core elements of the process that students will follow during the alternating training:

- Skills
- Teaching /Learning Methodologies.
- Learning Activities,

The teachers can design the scenarios and the personalized training for students involving companies and research institutions, using a living lab approach through the Teachers Living Lab (TLL).

Following the living lab approach, the scenario should remain "open" in some part, providing modules in which:

- students are protagonists as "producers", designing innovative product or co-elaborating solution for industrial problem.
- The local community is actively involved in analyzing needs and / or evaluation delivery

If the educational system allows it, students, as users of the scenario, should be actively involved in designing scenarios and personalized trainings
If the educational system does not allow the students to design product/services, teachers can plan trainings that adopt Living Lab approach in other phases, i.e. in knowing phase, involving students

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[7] IAddendum "Glossary" you can find definition of "scenario"

in the choice of the training area of interest, or in evaluation phase, involving students and local community trough the assessment of the delivery (product/service) or of the process.

Below, in the Chapter 4 Implementing we describe how, by adopting the methodology of living lab, plug in the design modules that make students active in formulating together with the enterprise/researchers/users/stakeholders the idea of training, the general scenarios and personalized projects, and in which phases can involve the local community in the training with the students

2.2.1 Template for the Scenario Design

GENERAL DESCRIPTION

Title of Scenario						
Type of school and school system						
Class		**Age of the students**		**Total Duration**	*How many years, period*	**Number of hours**	
Short Description	*Short description of the idea and the activities*					
Outputs	*If any, please specify the main outputs (services/products) that is going to be produced by the students through the living lab approach*					
Stakeholders involved	*List the stakeholders that are (or may be) involved. Identify, if possible, the function related to the living lab approach: producers, innovators, users. You can find suggestion in the section 1.2.*					
Environment	*Internal Coherence with the school environment: how the scenario responds to the needs of the students and how it is related to the curriculum* *External coherence with the school environment: how the scenario responds to the needs of the community*					
Learning Outcomes	*Learning outcomes in terms of knowledges, skills and competences and/ore other expected outcomes. You can find suggestions in the section 2.2.1*					
Key words						

DETAILED DESCRIPTION IMPLEMENTATION SCENARIO

For designing the Alternating Training Plan, you can describe the activities each phase of scenario.

Phase	*Name of the phase (Knowing, Designing, Implementing, Evaluating)*

For each phase, more activities can be scheduled. For suggestion on the possible activities you can consult section 2.2.4

Activity	*Name of the module*
Duration	*Duration of the module*
Prerequisites	*Knowledge, skills and competences that the student must already have acquired before being able to fill out the module*
Knowledge	*Knowledge/ability that the student is expected to acquire*
Technical skills	*Technical skills that the student is expected to acquire at the end of the module, related to the curriculum.*
Soft Skills	*List the soft skills that the student is expected to acquire at the end of the module, with particular reference to creativity and innovation skills. You can find the creativity and innovation skills outlined by DESCI project in the section 2.2.1*
Prerequisites	*Knowledge, skills and competences that the student must already have acquired before being able to fill out the module*
Teaching/Learning Methodologies	*See 2.2.2*

2.2.2   Skills & Competences

The skills considered in DESCI can be grouped into four main areas, which include, different key competences identified by the EQF and identifies some additional, specific of a DESCI alternate training

TECHNICAL AND PROFESSIONAL SKILLS (identifiable from the specific alternate training project and the reference scenario). This skills will be articulated in two main categories:

- cultural area
- organizational and operational

Examples of technical skills

- ability to develop computer applications
- ability to develop websites
- ability to communicate to the public technical innovations,
- ability to devise information campaign for a local community
- ability to design and differentiate by product marketing strategies

TRANSVERSAL SOFT SKILLS[8]:

- Attitudes and values at work;
- Application of knowledge ability;
- Thinking skills and competences

Examples of transversal soft skills

- responsibilities (punctuality and presence)
- teamwork
- autonomy
- flexibility
- ability to make decisions
- ability to solve problems
- projects of presentation and communication skills
- ability to apply theoretical knowledge to real situations and problems

CITIZENSHIP SKILLS (SOCIAL AND CIVIC)9

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[8] As identified in the ESCO (European Skills compentences occupation) database
https://ec.europa.eu/esco/portal/home
[9] On the basis of : Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning (2006/962/EC) and subsequent European documents.

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- Learning to learn skills

- Sense of initiative and entrepreneurship "proactive project management (involving, for example the ability to plan, organize, manage, lead and delegate, analyze, communicate, de-brief, evaluate and record), effective representation and negotiation, and the ability to work both as an individual and collaboratively in teams."

- Social skills: "communicate constructively in different environments, to show tolerance, express and understand different viewpoints, to negotiate with the ability to create confidence, and to feel empathy. Individuals should be capable of coping with stress and frustration and expressing them in a constructive way and should also distinguish between the personal and professional spheres".

- Civic skills: "to engage effectively with others in the public domain, and to display solidarity and interest in solving problems affecting the local and wider community. This involves critical and creative reflection and constructive participation in community or neighbor hood activities as well as decision-making at all levels, from local to national and European level".

- Showing risk-taking attitudes to solve problems skills: "A problem-solving attitude supports both the learning process itself and an individual's ability to handle obstacles and change. The desire to apply prior learning and life experiences and the curiosity to look for opportunities to learn and apply learning in a variety of life contexts are essential elements of a positive attitude."

- cooperate and participate (in particular: identifying and employing the most appropriate team working tools to intervene in key organizational and professional contexts);

- act independently and responsibly;

- identify links and relations;

- acquiring and interpreting information

CREATIVITY AND INNOVATION SKILLS[10]

- Cognitive dimension: search and use knowledge and experiences according to the purposes
Capacity of relating ideas; conceive systemic and dynamic visions; Fluency of thinking; Propensity to divergent thinking, fluidity and flexibility of thought

- Operational dimension: ability to reflect on the process; to elaborate original proposals in relationship with available materials/objects/conditions; ability to play with possibilities; ability to re-direct the action or the project in relation to unforeseen events

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[10] Defined with reference to: Teaching creatively and teaching for creativity, Jeffrey and Craft, 2004; Martha Boden The Creative Mind: Myths and Mechanisms 2004.

- Interactional dimension: ability of representation and communication of original ideas/projects; readiness in catching the value of alternative views/proposals; ability to re-elaborate proposals/tools/ procedures in relationship with new partners

- Personal dimension: readiness to self-motivation; showing resistance to premature closure of projects; tolerance of uncertainty

The skills and the personalized project for the students

A part from the skills defined in DESCI framework, the teachers (or tutor (depending on the educational system) may identify other skills that they suppose the students will develop through the specific alternating training.

Sources

In selecting the skills we refer to the EQF ("8 key competences for lifelong learning" - 2006/962/CE, COUNCIL RECOMMENDATION of 22 May 2017 on the European Qualifications Framework for lifelong learning and repealing the recommendation of the European Parliament and of the Council of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning - 2017/C 189/03)11, the EC 17.1.2018 Proposal for a COUNCIL RECOMMENDATION on Key Competences for Lifelong Learning, the ESCO (European Skills competences occupation) database12, the pedagogical framework of CREAT-IT project13 and the questionnaires for the schools.

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[11] The EQF aims to establish a common reference framework as a translation device between different qualification systems and their levels. This framework comprises general, higher and vocational education and training, and should lead to better transparency, comparability and portability of citizens' qualifications (e.g. diplomas, certificates etc.).

The EQF recommends that each level of qualification should, in principle, be attainable by way of a variety of educational and career paths. The EQF neither replaces nor defines national qualification systems nor qualifications. It does not describe any particular qualifications or individual competences, but describes the eight EQF levels via descriptors for the three categories "knowledge", "skills" and "competences"

In the context of EQF, knowledge is described as theoretical and/or factual; skills are described as cognitive (involving the use of logical, intuitive and creative thinking) and practical (involving manual dexterity and the use of methods, materials, tools and instruments; competence is described in terms of responsibility and autonomy.

Focusing on Competences and on the definitions of the 8 levels for their evaluation we exemplify the range from Level 1: *work or study under direct supervision in a structured context*, to Level 8: *demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research*

[12] ESCO (European Skills compentences occupation) database: https://ec.europa.eu/esco/portal/home

[13] D1.2 CREAT-IT "Implementing Creative Strategies into Science teaching" project – pedagogical framework, Lifelong Learning Programme, 2013-2015. Teaching creatively and teaching for creativity, Jeffrey and Craft, 2004; Martha Boden The Creative Mind: Myths and Mechanisms 2004.

2.2.3 Teaching/learning Methodologies

In the scenario design, TTL will choose the most suitable methodologies according to the purposes, the planned activities and the skills that they want to develop in the students.

The living lab approach in the training of the students is realized by the adoption of different teaching methods. For our purposes, we can focus mainly on two groups:

- **active learning**: students are active in the solution of problems (problem solving), in the analysis (inquiry-based) and in cooperative learning, in which students work in groups and make shared decisions, with respect to the meanings to attribute and actions to be taken.
- **participatory methodologies**, that will be adopted for involving the local community, the end users of delivery, other possible stakeholders. Inspiring practices can be: junior science cafe, futuring tour, ethics and polemics.

In designing the scenarios the teachers can inserts modules that adopt active learning methodologies and participatory session, planning a series of activities aimed at the active involvement of students and / or the involvement of the local community.

For example, the TLL can plan to use active learning methodologies for identifying the areas of personal interest of the students; through participatory methodologies, students can detect the needs of the community/users and, based on the detected needs, they can seek possible business partners and institutions. This can be done, for example, at the beginning of the alternating training, inserting a module during the process of orientation and analysis of the territory. The establishment of the relationship with business can be undertaken after this phase of explanation of the interests and territorial analysis.

In addendum you can find the list of Methodologies, with explanation, references and useful links

Samples of teaching learning methodologies

Istituto Tecnico Tecnologico "Enrico Fermi" di Frascati (Italy)
- Metaplan
- Open Space Technology
- Word Cafe
- Interviews to users (grandparents and elderlies of the local healthcare center)

Centro de Formacion Somorrostro (Spain)
- Roundtable
- Brainstorming
- Collaborative learning strategies
- Ethazi

1st Experimental Middle School of Athens (Greece); 1st Experimental School of Athens (Greece)
- Brainstorming
- Role Playing
- Collaborative Learning (e-Formus in Moodle)
- Flipped Class-Room
- Laboratory Session
- Metaplan

2.2.4   Linking Skills and Methodologies

In the table below we report the links between skills and methodologies that the DESCI School Partners found during the testing phase

Metaplan	**Attitudes and values** show responsibility attend to detail **Thinking** manage time make decisions think creatively **Social interaction** perform interviews use appropriate language interact with others **Application of knowledge** *ICT* digital communication and collaboration
Brainstorming	**Thinking** make decisions think creatively **Social interaction** address an audience use appropriate language interact with others present arguments persuasively
Role Playing	**Attitudes and values** show responsibility attend to quality meet commitments follow work schedule attend to detail attend to hygiene (Gastronomy club) **Thinking** manage time make decisions think creatively **Social interaction** address an audience use appropriate language work in teams interact with others present arguments persuasively **Application of knowledge**

	health and safety follow safety precautions in work practices (Gastronomy club) follow hygienic work practices (Gastronomy club) *ICT* digital content creation (ICT Club, Math club, Virtual enterprises) digital communication and collaboration *numeracy and mathematics* manage quantitative data (Virtual enterprises)
Collaborative Learning	**Attitudes and values** show responsibility attend to quality meet commitments follow work schedule attend to detail attend to hygiene (Gastronomy club) **Thinking** manage time make decisions think creatively **Social interaction** address an audience use appropriate language work in teams interact with others present arguments persuasively **Application of knowledge** *health and safety* follow safety precautions in work practices (Gastronomy club) follow hygienic work practices (Gastronomy club) *ICT* digital content creation (ICT Club, Math club, Virtual enterprises) digital communication and collaboration *numeracy and mathematics* manage quantitative data (Virtual enterprises)
Flipped Class-Room	**Attitudes and values** show responsibility meet commitments follow work schedule **Thinking** manage time **Application of knowledge**

	ICT digital content creation (ICT Club, Math club, Virtual enterprises) digital communication and collaboration *numeracy and mathematics* manage quantitative data (Virtual enterprises)
Laboratory Session	**Attitudes and values** show responsibility attend to quality meet commitments follow work schedule attend to detail attend to hygiene (Gastronomy club) **Thinking** manage time make decisions think creatively **Social interaction** use appropriate language work in teams interact with others present arguments persuasively **Application of knowledge** *health and safety* follow safety precautions in work practices (Gastronomy club) follow hygienic work practices (Gastronomy club) *ICT* digital content creation (ICT Club, Math club, Virtual enterprises) digital communication and collaboration *numeracy and mathematics* manage quantitative data (Virtual enterprises)
Ethazi	Personal competences: • Autonomy • Implication • Enterprise initiatives Communication Competences: • Oral communication • Written communication Digital Competences:

	- Security - Contents' creation - Treatment of the information - Communication - Problem-solving Collaborative competences: - Team-work - Problem-solving - Decision-making
Open Space Technology	**Attitudes and values** show responsibility Collaborative competences: - Team-work - Problem-solving - Decision-making **Thinking** manage time make decisions think creatively **social interaction** address an audience use appropriate language work in teams interact with others present arguments persuasively
Word Cafe	**Attitudes and values** show responsibility attend to detail **Thinking** manage time make decisions think creatively **Social interaction** address an audience use appropriate language work in teams interact with others present arguments persuasively

Interviews to users (grandparents and elderlies of the local healthcare center)	**Attitudes and values**
	show responsibility
	attend to detail
	
	Thinking
	manage time
	
	Social interaction
	perform interviews
	use appropriate language
	interact with others
	
	Communication Competences:
	
	    • Oral communication
	
	Personal competences:
	    • Autonomy

2.2.5   Learning Activities

The teachers will plan the activities of the students' training, according with the living lab approach and the specific school environment. Here we describe a tentative **activities plan** which is in agreement with the three school system (in Greece, Italy, Spain). We underline that this plan is only one of the several possible plans, because it is supposed that, following this guidelines, different schools can plan specific activities, different each others, depending on different school environments. In "Implementing" chapter you can find examples of 3 different scenarios, eg situations where students have less voice in design phase, but may have a living lab approach in the reflection and monitoring on own work and growth of competences.

STUDENTS' LIVING LAB "KNOWING" PHASE

ACTIVITY 1 Orientation and Planning

The teachers can schedule activity for allowing tutors to propose students to select the macro-areas and scenarios.

In Students' Living lab the teachers should involve actively students in the choice of the scenario they would like to attempt, i.e. the teachers can plan a debate among the students for discussing and selecting available scenarios basing on their interest or on elements the students can consider relevant for their community. Following the living lab approach, the teachers should actively involve the students in the following sub-activities of orientation:

- **ACTIVITY 1.1 Choosing area of interest**. The teachers can schedule activities for defining the macro-area of interests of the students (example "home automation").
- **ACTIVITY 1.2 Analyzing and choosing specific needs**, linked to the chosen macro-area, which the students will deal with. (example: "grandfather/grandmother needs"). The teachers can

plan activities for eliciting inputs from students and individuating the needs (specific problem or wish of the target users) they suppose to be relevant to work on.

- **ACTIVITY 1.3 Mapping** community/network for searching stakeholders, technologies. Teachers can plan activities where the students map the local communities in terms of needs and opportunities related to the chosen area of interest and/or individuated needs. The students can search possible stakeholders (end users, researchers, enterprises, association) and comparative analysis of already existing technologies.

STUDENTS' LIVING LAB "DESIGNING" PHASE

ACTIVITY 2 Choice of idea

Following the living lab approach, the teachers may plan activities for involving actively the students in the definition the deliverables they will develop within a given scenario, for responding to the problems/needs individuated in the previous activity, This phase can fit with: "Concept Design" phase of Students' Living lab.

- **ACTIVITY 2.1** Hypotheses on deliverable/project/ business idea: Comparing needs/problems with possible solution that the students can give.
- **ACTIVITY 2.2** Analysis and Evaluation of the idea: analysis, study of the target, survey/interview for analysing the needs, contact with enterprises, research centers

Loop ACTIVITY 2.1 and 2.2 up to defining "the idea", which is the project of an industrial solution for the detected needs or a business idea.

Following this approach, students have an active role in defining the project of their alternating training.

ACTIVITY 3 ORGANIZATION / DEFINITION OF WORK GROUPS, DEFINITION OF THE DELIVERABLE FOR EACH STUDENT

Following the living lab approach, the teachers can plan activities where the students have an active role in defining the work groups and the organization of the activities for realizing the delivery, included the segmentation of the delivery in sub-delivery for each group. If conflicts between students occur, regarding work assignment, it is recommended for the teacher to intervene in order to resolve such problems.

Under the same scenario, the alternate project can be further developed and divided distinguishing various and different deliverables and several working groups of students, up to become the personalized alternating training for the student which will identify the deliverables that each student will realize.

ACTIVITY 4 Elaboration of the personalized project and present it to the Teachers Living Lab for approval

Personalizing training for the student allows to focus the special needs for pupils and to plan appropriate activities.

The TLL can plan activities in which the student and / or tutor (depending on the education system) together with the enterprise tutor prepare the student personalized alternation project in which the "deliverables" that he/she intends to achieve are identified. The personalized project is submitted for approval to the LLM, teachers and / or companies and organizations. A time frame should be scheduled for the elaboration and submission of the personalized project and another time frame

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should be scheduled for the approval. After having obtained approval for their personalized project by LLM, the students can go to the activity 5

STUDENTS' LIVING LAB "IMPLEMENTING" PHASE

ACTIVITY 5 Realization of the delivery (product/service)

In living lab approach the teachers can plan activities in which the students can be active in the developing the industrial solution. In this case, following the Living Lab methodological guidelines, this phase could be articulated in:

- Design prototype (Students' Living Lab)
- Design final (Students' Living Lab)

STUDENTS' LIVING LAB "EVALUATION" PHASE

ACTIVITY 6 Discussion and evaluation of the deliveries

The teachers can plan activities in which the students are actively involved in the discussion and evaluation of the deliveries (services/products) that the students themselves realized. Following the living lab approach, the teachers may plan to ask the students to involve also the end users in evaluating the deliveries, i.e. making interview or focus group with the end users.

ACTIVITY 7 Exploitation: commercialization (start-up) or free diffusion (if open)

The teachers can plan activities in which the students are actively involved in the discussion of the possible commercialization or free diffusion of the deliveries (services/products) that the students themselves realized. The teachers can plan or ask the students of analyzing the hypothesis of commercialization through a business plan or to explore possible impact of free diffusion, in case they would like to use an open license.

In the field of alternating training, an important topic is to develop a business culture. In the scenario design TTL will care insert modules to this aim.

ACTIVITY 8 Evaluation of the Alternating Training experience (within Teachers living Lab)

The teachers should plan activities to make the students evaluate the training process, and their experience, specially aimed to measure their satisfaction in order to improve the training in the future. The teachers can use the DESCI evaluation toolkit.

ACTIVITY 9 Reports from Students (to Teachers' Living Lab)

The teachers may plan activities in which the students report their experience to the Teachers, to their class, to other students of the school, to the communities. These activities aim to evaluate the students and, at the same time, to follow-up and share the learning outcomes of the experience.

Especially we suggest the students realize a video for sharing experience with other schools.

ACTIVITY 10 Students' skills evaluation. Teachers and tutors should evaluate students' skills. In this context the student will also has means to self-evaluate. See DESCI Evaluation Toolkit (IO4)

For each activity, the teachers should define: students target, time, duration, learning outcomes (in terms of knowledge, soft skills, technical skills, competences), prerequisites, output of the activity, stakeholders involved, pedagogical methodologies, materials.

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2.2.6   DESCI CHECK LIST

The checklist is aimed at identifying if an alternate training plan can be considered a "DESCI Alternate Training plan". It can be used by schools and researcher for monitoring and assessment purposes. See the external document "DESCI Check List".

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3. IMPLEMENTING

3.1 Samples of The Management & the Teachers Living Lab activities

In the implementation phase, the school shall follow the procedures designed. Each school can plan a different implementation of the function and activities of the TLL, in dependence of the school environment. Here we report a possible plan of the activities of the TLL.

Activities
- A1.   Analysis of school scenarios already existing and to be developed in DESCI framework, based on the assessment of past experiences and on other European schools (available for example on DESCI platform) (F5)
- A2.   Contact entities (enterprise, research institutions, associations), preliminary meetings. (F2)
- A3.   Elaboration of new scenarios
  - a. Co-design scenarios with entities (enterprise, research institutions, associations) (F2, F4)
  - b. Connection of scenarios with School Education Plans, selecting the "learning objectives", taking into account the transversal and technical skills. (F5, F4, F1)
- A4.   Elaboration and approval of the "tools"
  - a. form for personalized project for the student on the basis of DESCI model (F4, F5)
  - b. form for agreements entities-school(F2)
  - c. assessment tools (test, observation forms) based on the DESCI model (F4, F5)
- A5.   Elaboration of personalization of the trainings for students
  - a. Facilitating the choice of scenarios by students (and/or the selection of the students by enterprise) and the personalization of the trainings (F5). In particular
  - b. Co-developing personalized trainings for students involving the students (F5)
  - c. Co-design personalized trainings for students involving entities (identification of products / phases / prerequisites required by the entity / guidance activities) (F4, F1)
  - d. Finalizing the scenario with participation of the students (F4)
- A6.   Legal Procedures
  - a. Approval of personalized project for the students (F3)
  - b. Signing agreement with entities (F2)
- A7.   Realization of student trainings: tutoring and monitoring
- A8.   Evaluation
  - a. Student assessment
  - b. Scenarios assessment
  - c. Process assessment

Samples of Management in the DESCI Living Lab - Case Studies

The above fuctions can be carried out by bodies already present in the educational systems and therefore these bodies can become or can include the LLM:

- Istituto Tecnico Tecnologico "Enrico Fermi" (Frascati) Italy : The Scientific-Technical Committee (CTS), composed by internal and external members.
- Centro de Formacion Somorrostro (Spain): The Scientific-Technical Committee plus 2 representatives of the Company involved in the Scenario.

- 1st Experimental Middle School of Athens (Greece): there is no alternation institute, the project is included in the economics teaching and the teachers living lab are managing the school alternating system.

3.2 Samples of Implementation Scenarios

In the implementation phase, the students will follow the training designed by TLL. Each school can plan specific implementation scenarios, in dependence of the school environment.

Here we report a possible plan of the activities of the DESCI School Partners.

3.2.1 Sample "TECH-CARE: NEW TECHNOLOGIES AND THE ELDERLY"

Title						
Title of Scenario TECH-CARE (NEW TECHNOLOGIES AND THE ELDERLY)	I.T.T"E.Fermi" , Frascati . Upper Secondary School					
Type of school and school system		Age of the students 16		Total Duration Three years	*How many years, period From 2015 to 2018*	Number of hours 400 hrs	
Classes: 3F IT 3A and 3B Electronics	*The idea is to design devices to be installed at the internodes of a house inhabited by an elderly person with the aim to solve specific problems .(e.g. smartband for the detection of anomalous movements (falls etc.) or voice activated lighting systems).* *The activities envisaged in order to develop the device are the following:* · *Local area survey to detect the elderly's specific needs ;* · *Selection of HW and SW tools according to the chosen device, using the resources made available by the project partner enterprise ;* · *Design of the device by the students in cooperation with external tutors (company) in close correlation with the stakeholders.*					
Short Description	*Device, user manual and website .,.*					
Outputs	*Soft skills:* · *Responsible behaviour ensuring attendance and punctuality* · *Team work* · *Decision making abilities* · *Problem solving abilities* · *Project presentation abilities* · *Ability to apply theoretical knowledge to real life problems* *Technical skills:* · *Ability to identify the functional and structural features of an enterprise* · *Ability to act independently in a specific work environment* · *Ability to develop electric and IT applications with the implementation of electronic interfaces and IT platforms* · *Ability to communicate technical innovation* · *Ability to devise advertising campaigns for the local community* · *Ability to design and differentiate according to marketing strategies*					
Learning Outcomes	*Stakeholders:* *Senior Centres, Comune di Frascati, Local Health Board, CNR, Formascienza, B-TICINO, teachers, students.* | *ROLES*	*ACTORS* | |---|---| | *Innovators* | *CNR, Formascienza, Makers Community,* | | *Producers* | *Students (S.L.L.), teachers(T.L.L.)* | | *End Users* | *Municipality of Frascati, Local Health Board , Senior Centres , elderly population of Frascati* |					
Stakeholders involved	*The scenario meets the students' need to face and solve problems connected with the real world.* *This approach is in line with current curricula which in vocational disciplines favour laboratory practice for the construction of the relevant competencies.* *The scenario meets the community' s needs identified through the analysis of demographic studies carried out by ISTAT (population distribution by age, sex and marital status) and Chamber of Commerce.*					
Environment	*The living lab approach in students' training is achieved through the adoption of the following methodologies:* *Active learning:* · *The students identify the problem , analyse it and find solutions, working in groups to learn new topics and the use of new technologies.* *Brainstorming, Metaplan, Design Thinking, Web Inquiry* *Participatory methodologies:* *development of strategies (junior science cafè) aimed at the involvement of the Senior Centre, the Health Board and the local community* *Round table, Interview*					
Methodologies	*The school has always met the requirements of the various territorial dimensions developing learning paths with the living lab approach, as is testified by the following projects :* · *EEE (cosmic rays)* · *School magazine 3G* · *Videolab* · *junior science cafe*					
Inspiring practices	*Domotics, elderly care, assistive technologies, IoT,*					
Key words						

STUDENTS LIVING LAB – KNOWING PHASE

ACTIVITY 1 Orientation and Planning

- **ACTIVITY 1.1** Choosing areas of interest

- **ACTIVITY 1.2 Analyzing and choosing specific problems/needs**, linked to the chosen macro-area, which the students will deal with. (example: "grandfather/grandmother needs",)

- **ACTIVITY 1.3 Mapping** the community/network for searching stakeholders (enterprise and research centers but also users) and technologies

STUDENTS LIVING LAB – DESIGN PHASE

ACTIVITY 2 Choice of the Idea

The students have an active role in defining the project of their alternating training. This phase can fit with: "Concept Design" phase of Students' Living lab.

- **ACTIVITY 2.1 Hypotheses on deliverable/project/ business idea: The students compare needs/problems with possible solution that they can give.**
- **ACTIVITY 2.2 Analysis and Evaluation of the IDEA: analysis, Study of the target, Survey/interview for analysing the needs, contact with enterprises, research centers**

Loop ACTIVITY 2.1 and 2.2 up to defining THE IDEA, which is the project of industrial solution for the detected needs or a business idea.

ACTIVITY 3 Organisation. (Business Model), Definition of work groups, definition of the deliverable for each student

ACTIVITY 4 Elaboration of the personalized project and present it to the Teachers Living Lab for approval

The student and / or tutor (depending on the education system) together with the enterprise tutor prepare the student personalized alternation project in which the "deliverables" that he/she intends to achieve are identified. The personalized project is submitted for approval to the LLM, teachers and / or companies and organizations.

STUDENTS LIVING LAB – DESIGN PHASE

ACTIVITY 5 Realization of the delivery (product/service)

The students develop the industrial solution. In this case, following the Living Lab the students will realize:

- **Developing prototype (Students' Living Lab)**
- **Developing final (Students' Living Lab)**

STUDENTS LIVING LAB – DESIGN PHASE

ACTIVITY 6 Discussion and evaluation of the delivery

The students discuss and evaluate the realized deliveries (services/products). The students involve the end users in evaluating the deliveries, i.e. making interview or focus group with the end users.

ACTIVITY 7 Exploitation: commercialization (start-up) or free diffusion (if open)

The students debate about the possible commercialization or free diffusion of the deliveries (services/products) that the students themselves realized. The teachers ask the students of analyzing the hypothesis of commercialization through a business plan or to explore possible impact of free diffusion, in case they would like to use an open license.

ACTIVITY 8 Evaluation of the Alternating Training experience within Teachers living Lab

ACTIVITY 9 Reports of the experience from Students to Teachers' Living Lab

ACTIVITY 10 Students' skills evaluation. Teachers and tutors should evaluate students' skills. In this context the student will also has means to self-evaluate. See DESCI Evaluation Toolkit (IO4)

3.2.2 Sample "ELECTRICITY GRID AND SMART CITIES "

Title of Scenario: Electricity Grid and Smart Cities						
Type of school and school system	Vocational Education and Training- Intermediate VET (upper secondary level) and Higher VET (tertiary level). Multidisciplinary groups.					
Class		**Age of the students**	17-40	**Total Duration**	*1 school year (Sept 2016- June 2017)*	**Number of hours**	300 aprox.

Short Description	*Short description of idea and activities* *The Living Lab in Somorrostro activates the project and is composed of 2 teachers, one headteacher, the External Relations Manager, the EU project manager and 2 representatives of an industrial company in the electricity management sector.* *The Living Lab has presented a real problem that needs to be solved in order to improve the services provided to the municipalities: the need to anticipate failures in the electricity grid of a city/town, through a simulator or an early failure detection system.* - *Students in their 2º year of Intermediate VET Electrical and Automatic Installations* - *Students in their 2º year of Higher VET Electrotechnical and Automated Systems* *The living lab considered that putting together students from 2 different educational levels, will provide an added value to the outcomes and will enrich the acquisition of knowledge and skills provided that Intermediate VET students are more on the "do" and execution side of the work, and Higher VET students are in the design and theoretical part of the work.*
Outputs	*Students will have to produce different outputs at different stages of the process:* 1) *A project technical description with a limit of 30 pages that will include:* - *List of possible operations that can be undertaken with the simulation device.* - *Technical specifications of each operation.* - *Electrical layouts of all operations.* - *Design of PLC programmes* - *Layout of the simulator device* - *Description of the proposed innovations in respect of the initial layout/design.* - *Total budget including components, staff costs for the design, programming and assembly.* - *The technical fiche of each component will be included.* 2) *The team (between 2 and 4 students) with the best project evaluation, will be selected to undertake the traineeship in the company during 3 months and will be able to assembly and set up the simulator device.*
Learning Outcomes	**Skills** - *Divergent thinking* - *Initiative* - *Leadership* - *Responsibility* - *Autonomous learning* - *Research skills* - *Ability to get questions by examining data* - *Learn to understand* - *Team working* - *Conflict resolution* - *Communication* - *Team awareness* *Plus the technical skills included in the rubric matrix that are those mandatory in order to accomplish the course.*
Stakeholders involved	*List the stakeholders, people that may be involved in the activity of the living lab. Some examples of stakeholders: enterprises, research organization, interested local communities and associations (of patients, of citizens, of consumers, environmental, ...), other institutions (other schools, municipalities, policy institution, health units, ...). Identify, if possible, the function related to the living lab approach: producers, innovators, users. Specify If and How the target (users) is involved. Specify If and How other stakeholders are involved. You can find suggestion in the section 1.4* - *Tecuni (Vinci Group): USER, member of the Living Lab.* - *Hetel (Association of non profit VET Schools of the Basque Country). Stakeholder.* - *Tknika (Center for Research and applied innovation in VET of the Basque Country, Basque Regional Government) Stakeholder.* - *VET Schools of the network of the Church (Elizbarrutiko Ikastetxeak) Stakeholder.*
Environment	

3.2.3 Sample "ELECTRICITY GRID AND SMART CITIES "

Title of Scenario: Electricity Grid and Smart Cities						
Type of school and school system	Vocational Education and Training- Intermediate VET (upper secondary level) and Higher VET (tertiary level). Multidisciplinary groups.					
Class		Age of the students	17-40	Total Duration	*1 school year (Sept 2016- June 2017)*	Number of hours	300 aprox.

Short Description	*Short description of idea and activities*
	The Living Lab in Somorrostro activates the project and is composed of 2 teachers, one headteacher, the External Relations Manager, the EU project manager and 2 representatives of an industrial company in the electricity management sector.
	The Living Lab has presented a real problem that needs to be solved in order to improve the services provided to the municipalities: the need to anticipate failures in the electricity grid of a city/town, through a simulator or an early failure detection system.
	    - *Students in their 2º year of Intermediate VET Electrical and Automatic Installations*
	    - *Students in their 2º year of Higher VET Electrotechnical and Automated Systems*
	
	The living lab considered that putting together students from 2 different educational levels, will provide an added value to the outcomes and will enrich the acquisition of knowledge and skills provided that Intermediate VET students are more on the "do" and execution side of the work, and Higher VET students are in the design and theoretical part of the work.

Outputs	*Students will have to produce different outputs at different stages of the process:*
	    1) *A project technical description with a limit of 30 pages that will include:*
	    - *List of possible operations that can be undertaken with the simulation device.*
	    - *Technical specifications of each operation.*
	    - *Electrical layouts of all operations.*
	    - *Design of PLC programmes*
	    - *Layout of the simulator device*
	    - *Description of the proposed innovations in respect of the initial layout/design.*
	    - *Total budget including components, staff costs for the design, programming and assembly.*
	    - *The technical fiche of each component will be included.*
	    2) *The team (between 2 and 4 students) with the best project evaluation, will be selected to undertake the traineeship in the company during 3 months and will be able to assembly and set up the simulator device.*

Learning Outcomes	**Skills**
	    - *Divergent thinking*
	    - *Initiative*
	    - *Leadership*
	    - *Responsibility*
	    - *Autonomous learning*
	    - *Research skills*
	    - *Ability to get questions by examining data*
	    - *Learn to understand*
	    - *Team working*
	    - *Conflict resolution*
	    - *Communication*
	    - *Team awareness*
	Plus the technical skills included in the rubric matrix that are those mandatory in order to accomplish the course.

Stakeholders involved	*List the stakeholders, people that may be involved in the activity of the living lab. Some examples of stakeholders: enterprises, research organization, interested local communities and associations (of patients, of citizens, of consumers, environmental, ...), other institutions (other schools, municipalities, policy institution, health units, ...). Identify, if possible, the function related to the living lab approach: producers, innovators, users. Specify If and How the target (users) is involved. Specify If and How other stakeholders are involved. You can find suggestion in the section 1.4*
	    - *Tecuni (Vinci Group): USER, member of the Living Lab.*
	    - *Hetel (Association of non profit VET Schools of the Basque Country). Stakeholder.*
	    - *Tknika (Center for Research and applied innovation in VET of the Basque Country, Basque Regional Government) Stakeholder.*
	    - *VET Schools of the network of the Church (Elizbarrutiko Ikastetxeak) Stakeholder.*

Environment	

3.2.4 Sample "DEVELOPING VIRTUAL ENTERPRISES IN ORDER TO PROMOTE ENTREPRENEURSHIP AMONG MIDDLE SCHOOL STUDENTS"

Title of Scenario: Developing virtual enterprises in order to promote entrepreneurship among middle school students						
Type of school and school system		General Middle School				
Class	2nd	**Age of the students**	14	**Total Duration**	*2 years one hour per week*	**Number of hours**	25 per year
Short Description		*Students will experience running a business and they will come into contact with business structure issues and business organization, with each student taking a position of responsibility in a virtual enterprise. The 26 middle school second graders of the elective course will be divided into two groups of 13 students and each group will create a virtual enterprise. Students will undertake specific roles within the virtual enterprise and will simulate the operation of a normal business (product development, sales & marketing, market analysis, human resource management, financial analysis, evaluation of investment projects, etc.) in order to eventually produce the business plan of their enterprise and their business web presence.* *In order to identify the areas in which their virtual enterprises will operate, the students will come into contact with other peer groups seeking products produced within the school, in various after-school clubs. The aim is to create a bridge of cooperation between the students who participate in virtual enterprises and the students who participate in after-school clubs, in which students of the after-school clubs will supply the virtual enterprises students with real work scenarios, while the virtual enterprise students will act as advisors to students of after-school clubs by suggesting ways to transform their products into marketable ones. Then, students will come into contact with real businesses operating in the specific fields chosen by the school virtual enterprises, seeking both material support and expertise. Experts from the real businesses will come to school to teach students issues concerning the operation of businesses and students will conduct on-site visits to companies.*					
Outputs		*The outputs of the project will be data taken from the operation of the virtual enterprises (minutes for their establishment, organizational structure, program calendars) and the final products which will be produced by both students of the virtual enterprises (business plan, website of the enterprise) and the final products of the partner after-school clubs.*					
Learning Outcomes		➢ *study of the structure and operation of an enterprise (types of business entities, department roles and responsibilities - organizational structure, financial analysis, marketing strategy, business plan, etc.)* ➢ *search for ways of cooperation with other groups on a win-to-win basis* ➢ *contact with groups that could be potential clients, suppliers, or partners* ➢ *process of converting an idea or finding a marketable product* ➢ *market research and promotion as well as risk-taking* *Students develop the skills of:* ➢ *Ownership of learning: students take responsibility for their own learning* ➢ *Experiential learning: students' learning is based on hands-on experience* ➢ *Cooperation: students learn with and from others and understand the dynamics of working as part of a team* ➢ *Reflection: students experience the consequences of their decisions and apply that knowledge to future challenges*					
Stakeholders involved		*The list of stakeholders involved in the project may include researchers, organisations of the Ministry of Education offering career orientation programs for students, the Athens Chamber of Commerce and Industry, services of the Greek Labour and Employment Organisation, students' parents who own successful businesses after pursuing a business idea, student groups participating in after-school clubs and dealing with issues that could also be the subject of virtual businesses within the project, real businesses operating in relevant fields, which could offer either expertise or material support.*					
Environment		*This scenario reflects students' need for professional orientation since familiarity with enterprises and their operation is particularly important, regardless of the professional inclination that each pupil has. This need was detected both by the counseling program in which school students have expressed their desire to get help by the school in order to detect possible future career solutions, but also by the high student participation in the entrepreneurship school club in the past. The scenario is not part of the official state educational program for middle schools; instead, it is part of the internal program developed exclusively by our school. Specifically, entrepreneurship is an elective course to be chosen by 26 second graders, while the 'services – products' of virtual enterprises, will be the deliverables of some groups of interest that operate at the school, after the official class program.* *The need for support of the business venture is not only the need of our school students but is something that generally worries young people today in Greece, according to data we have obtained from the Counseling and Career Guidance Centre (KESYP) and the Labour and Employment Organisation (OAED).*					
Methodologies		➢ *Mobilizing students by using the brainstorming method.* ➢ *Finding and studying articles and statistics from various literature sources. regarding the business contribution to employment growth internationally.* ➢ *Taking on leading roles through experiential contact with the business world.* ➢ *Group work to ensure active participation of students and development of communication among them.* ➢ *Case studies.*					

4. EVALUATING

Tools and methodology for monitoring testing and evaluating the alternating training, are available in the **DESCI Evaluation Toolkit,** so as indication on who and what evaluate.

1.1.　　　　Ex ante Evaluation
Before starting a DESCI training, in knowing phase, teachers living lab participants can collect information about wishes of the stakeholders: students, parents, teachers, enterprises, research centers, etc... Evaluation Toolkit provide ex-ante questionnaire for detecting them.

1.2.　　　　Ongoing Evaluation
DESCI evaluation toolkit provide tools for monitoring alternating training by means of observation grids and self-assessment of the students.

1.3.　　　　Ex post Evaluation

DESCI evaluation toolkit provide tools for Ex post Evaluation. The final evaluation has 3 main typologies, that we distinguished basing on who is the evaluator, who is the examinee, what is evaluated

1.2.1 Delivery Assessment
Students evaluate the delivery that they produced to decide on the future exploitation: commercialization (start-up) or free diffusion (if open). A large variety of methodologies can be used and coexist (swot, business model, living lab elements by check list)
In Living Lab approach one of the main feature is the user involvement in evaluating the delivery. The users evaluate the delivery produced by the students.

1.2.2 Students' assessment
The teachers evaluate the students' skills. The evaluation can be exogenous, based on delivery assessment by users, or endogenous, based on the observation grid filled by internal and external tutors.

1.2.2 Process assessment
The teachers can plan activities to make the students evaluate the training process, and their experience, specially aimed to measure their satisfaction in order to improve the training in the future.

The teachers can evaluate both processes they experiences: students training (Students' Living Lab) and didactic planning (Teachers Living Lab) specially aimed to measure their satisfaction in order to improve the training in the future.

At the beginning of each year, while planning alternating training, we suggest to use the results of previous year monitoring and evaluation for improving training activities.

ADDENDUM

Teacher Checklist for Internal Control

AT System questionnaire aims to help teachers and tutors, in knowing phase of the teachers living lab, to detect main feature of the alternating training system of your school and to reflect on the degrees of freedom in designing DESCI training.

SECTION I - Information related to the alternating training system

1. Basic features of the alternating training system

1.1 In your school the alternating training is part of:

A. Education (part of the official school education. The student do not earn money from enterprises)
B. Work experience (the student is a worker of the enterprise that pays him a salary)
C. Other. Please, describe:

_____

If possible, give further informations

1.2 Who is responsible for student evaluation during alternating training?

A. The teacher
B. School entities (please specify):_____
C. The government
D. The enterprise
E. Both school entities and enterprises
F. A mixed system that also includes other stakeholders
In all cases, please give further information on the evaluation methods and specify if standard methodologies are used:

1.3 Who is responsible for post course (ex post) evaluation of the alternating training program of the students?

A. The teacher
B. School entities (please specify):_____
C. The government
D. The enterprise
E. Both school entities and enterprise
F. Nobody
G. A mixed system that also includes other stakeholders
In all cases, please give further information on the evaluation methods and specify if standard methodologies are used:

1.4 Which are the course of studies and the curricula involved in this typology of alternating training:

2. How does the process work for this typology of alternating training?

Clarify:

2.1 School grades and age of student involved in alternating training (for both, please indicate the time lag):_____

2.2 Total number of hours/days for students of this typology of alternating training:_____ _____

2.3 Is the training articulated on 1 year or more?_____

2.4 If possible, indicate the amount of hours/days for years: _____

2.5 How much time in the school? How much time in the enterprise? _____

2.6 How are the phases articulated in this typology of alternating training? (e.g. phase 1: orientation, at school, by teacher, phase 2: choice of the training by students and presentation of the proposal, approval by school 3rd year 16y.o., phase 3: implementation of the alternating training with the enterprise, by students, 4: evaluation, etc…):_____

2.7 How, when and by whom the student program of alternating training is chosen, and which are the criteria: _____

2.8 Clarify which time and phases in school/enterprise are defined by law in this typology of alternating training: _____

3. Roles for each part/stakeholders (student, teacher, school director, enterprise, other possible stakeholders)

3.1 Who defines the alternating training program of the student?

Several parts may be involved. Clarify *all the parts/stakeholders involved in the student program definition:*

A. The student
B. The teacher
C. School entities (please specify): _____
D. The enterprise
E. Other possible stakeholders (please specify): _____
F. The competences are defined by law (please specify) : _____

Track further information about the role of each part in defining the alternating training program of each student that you consider relevant for planning alternating training:

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3.2 Is there a list of opportunities on which to develop students training programs?

    ☐ Yes
    ☐ No

If yes, clarify which entity and how produces the list.

3.3 Who defines the alternating training competences?

Several parts may be involved. Clarify *all the parts/stakeholders involved in the competences definition:*

A. The student
B. The teacher
C. School entities (please
    specify):_____
D. The enterprise
E. Other possible stakeholders (please
    specify):_____
F. The competences are defined by law (please specify)

Role of each part in defining the competences to be developed in the alternating training:

3.4 Are schools financed for alternating training system?

    ☐ Yes
    ☐ No
If yes, who finances and who may finance the schools:

3.5 Are enterprises financed for alternating training?

    ☐ Yes
    ☐ No
If yes, who finances and who may finance the enterprises

3.6 Clarify the role of teachers and enterprises in the development of students' alternating training:

A. Teacher education interventions focus on:

B. Enterprise tutor interventions focus on:

SECTION II - Environment of the school partners

4. Connection with the local community

4.1   Think about examples of enterprises already in contact with schools

Names and short description of the mission

4.2   Think about examples of further enterprises in the community, including enterprises that virtually could be included in the community (eg: on the net)

4.3   Think about examples of further parts/stakeholders involved in your local community (Authorities, Decision Makers, Associations)

5. Deliveries

5.1   Think about examples of delivery already produced in this typology of alternating training.

Provide an abstract or the annex with documentation/description

5.2   Think about examples of delivery that the school is willing to propose

5.3   Think about examples of deliveries that the enterprise is willing to propose

SECTION III - DESCI Implementation

6. Participatory methods

6.1   Have you already experienced of Living Lab or similar participatory practices? which experience ?

6.2   Are there tensions between DESCI model and you school system? Have you any suggestion to avoid these tensions?

7. Implementation of DESCI participatory modules.

Reflection on the degree of freedom in defining DESCI training

7.1   In which phase may participatory modules be included in the process?

7.2   Which basic or technical skills can be related to these participatory modules?

7.3   Is it possible to modify/widen roles or add stakeholders in a participatory discussion?

Video experiences about the implementation of the DESCI methodology

Objective: sharing the experience of the schools in the application of the DESCI methodology.

Short videos are a highly effective dissemination tool to share with other schools the experience of implementation of the DESCI project. The short videos can tackle different aspects of the experience of the school in applying the DESCI methodology and involve different agents who have participated in it.

Short videos can share the following experiences:

- Description of the scenario applied in the school.
- Personal experiences and perceptions about their initial expectations, the process and the outcomes of the project by the agents involved in the project, such as teachers, students and companies.
- Presentation of how a Living Lab works, how it is activated and how the meetings are managed.

All this experiences can be recorded with a smartphone and edited to be uploaded in social networks.

The video should include a mention of the project, the name of the school where it is recorded and the names and positions of the people interviewed.

This experiences can be of great interest for other partners in Europe who want to apply the DESCI methodology and get more information about how it was done in other schools who already did it.

Additionally, students from the school can be involved in the design of the script, the recording and the edition of the video, especially if the school students in the area of audiovisuals.

Glossary

Word	Meaning	Where it appears in the toolkit
Alternating Training	**Alternate** between theoretical and practical **training.** Several alternating training systems (ATS) are adopted by European Countries. - traditionally in VET schools - also considered in all schools by several ATS as practical **training** in workplaces We refer AT to all typologies of practical training included in the different ATS [1], [2] , [3], [4], [5], [6], [7]	"DESCI Alternating Training – How To. Guidelines for Teachers" Section 1.1.1
Living Lab	The European Network of Living Labs ENoLL defines a Living Lab as "*an open innovation environment in real-life settings in which user-driven innovation is fully integrated within the co-creation process for new services, products and societal infrastructures*" [8] DESCI Living Lab is specifically addressed to school activities and alternate training. It also includes among own characteristics: participatory approach, active learning and social inclusion. In the schools we distinguish two level of living lab: • Teachers Living lab • Students Living Lab	"DESCI Alternating Training – How To. Guidelines for Teachers" Section 1.2.1 "
Living Lab Output (LLO) CLLO TLLO SLLO	Product/service realized through the Living Lab. We refer as Teachers Living Lab Outputs (TLLOs) scenarios, alternating training plans and other outputs produced by teachers using Living Lab approach in the Teachers Living Lab We refer as Students Living Lab Outputs (SLLOs) the outputs of Students Living Lab. Among Students Living Lab Outputs (SLLOs), we refer as "delivery" the product/service, realized by the students trough the Living Lab, on which the exogenous students alternating training evaluation is based. The Consortium of the partners of the DESCI project and the network of stakeholders involved can be seen as a living lab: "the Consortium Living Lab" CLL. In this case, the output of the CLLOs can be identified with the Intellectual Outputs (IOs) of the project, i.e. IO2, which is the set of toolkits for guide the teachers to design the DESCI scenarios.	"DESCI Alternating Training – How To. Guidelines for Teachers" section 1.4
Delivery	Product/service realized trough the Living Lab during the alternating training by the students. It is the SLLO (Students Living Lab Outputs) on which the exogenous students alternating training evaluation is based.	"DESCI Alternating Training – How To. Guidelines for Teachers" section 1.4
Scenario	Scenario is carefully constructed snapshot of the future and the possible ways a sector might develop. Scenarios help focus thinking on the most important factors driving change in any particular field. By considering the complex interactions between these factors, we can improve our understanding of how change works, and what we can do to guide it. • The "why" to help define the goals of scenario studies: Exploration or pre-policy research? • The "how" to help define the design of scenario process: Intuitive or analytical?	"DESCI Alternating Training – How To. Guidelines for Teachers" section 2.2

	The "what" to help define the content of scenarios: Complex or simple? Philip van Notten, *Scenario Development: A Typology of Approaches*, Think Scenarios, Rethink Education, 2006 A DESCI scenario has to guide the design of the alternating training plan for the specific school environment or normative or work sector. The activities of the alternating training can be considered unified under the same snapshot of the scenario because, i.e. they are finalized to the same delivery or the same category of end users or because the activities follow the same process.	
Learning outcomes	Learning outcomes are statements of what a learner knows, understands and is able to do on completion of a learning process. Learning outcomes are defined in terms of **knowledge**, **skills** and **competence** (Recommendation of the European Parliament and of the Council on the Establishment of a European Qualifications Framework for Lifelong Learning, 2008) http://www.ecvet-info.de/_media/Guidelines_for_describing_units_of_learning_outcomes.pdf	"DESCI Alternating Training – How To. Guidelines for Teachers" section 2. 2.1;
Knowledge	The body of facts, principles, theories and practices that is related to a field of work or study. It is described as theoretical and/or factual knowledge; (Recommendation of the European Parliament and of the Council on the Establishment of a European Qualifications Framework for Lifelong Learning, 2008)	
Skill	The ability to apply knowledge and use know-how to complete tasks and solve problems. They are described as cognitive (logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments); (Recommendation of the European Parliament and of the Council on the Establishment of a European Qualifications Framework for Lifelong Learning, 2008)	"DESCI Alternating Training – How To. Guidelines for Teachers", section 2.2.1;
Competence	The proven ability to use knowledge, skills and personal, social and methodological abilities in work or study situations and in professional and personal development. It is described in terms of responsibility and autonomy. "8 key competences for lifelong learning" - 2006/962/CE, **COUNCIL RECOMMENDATION of 22 May 2017 on the European Qualifications Framework for lifelong learning and repealing the recommendation of the European Parliament and of the Council of 23 April** 2008 on the establishment of the European Qualifications Framework for lifelong **learning** - 2017/C 189/03), the EC 17.1.2018 Proposal for a COUNCIL RECOMMENDATION on Key Competences for Lifelong Learning	

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Module/unit of learning outcomes	A unit of learning outcomes (also called "unit" or "module") is a component of a qualification consisting of a coherent set of knowledge, skills and competence that can be assessed and validated (cf. http://www.ecvet-info.de/_media/Guidelines_for_describing_units_of_learning_outcomes.pdf pag.10). In DESCI project, learning unit o module consists in a series of activities finalized to one or more learning outcomes. It involves the same group of students and a final evaluation for testing the learning outcomes. A learning unit (or module) should clearly identify: • prerequisites (knowledge/skills/competence that the students need have before starting the module), • the learning outcomes (knowledge/skills/competence that the students should have developed at the end of the module), • duration A module should be self-consistent: the prerequisites should declaire all the needs for adopting the module with a group of students. If the teacher wants to adopt the module, wherever he/she teachs in Europe, he/she just has to check that the students have the prerequisites, no matter what courses the students have attempted until now.	

Alternating Training Plan/programme/ Implementation Scenario	The plan of the Alternating Training (or "Implementation Scenario") is the plan of the activities that compose the alternating training.
	
	 The alternating Training plan is composed mainly by a series of learning units/modules finalized to one or more learning outcomes. with the timeline of the specific modules/unit of learning. In addition to the learning units, DESCI Alternating Training Plan has to identify all the relevant elements of the training.
	
	 It involves the same group of students and a final evaluation for testing the learning outcomes. A module should declare
	
	 - the target students group,
	 - prerequisites (knowledge/skills/competence that the students need have before starting the modules),
	 - the learning objectives (knowledge/skills/competence that the students should have developed at the end of the modules),
	 - the learning units/modules ,
	 - the resources, didactic materials, tools, manuals, made available to the students
	 - time foreseen for the accomplishment of the module
	 - the evaluation methods
	
	 Living lab approach is based on the use of participatory methodologies and active learning, so in DESCI Alternating Training Plans/Implementation Scenarios we need also to specify:
	
	 - possible deliveries
	 - roles of students
	 - possible stakeholders and, among them:
	     o end users
	     o producers
	     o innovators
	 - when and how each stakeholder will be involved in the process
	 - the teaching/learning methodologies (percentage of lectures, team-work, class discussion, laboratory, extra-school activities; balance between self-guided/teacher-guided tasks and between individual/collaborative work)
		"DESCI Alternating Training – How To. Guidelines for Teachers",section 2.2;

	- inclusiveness As in CREAT-IT project and Discover the Cosmos project, the "Implementation Scenario" is used as synonymous of "lesson plan", In these two project has been pointed out as a relevant element of the implementation scenarios is the choice of the methodology through which the learning outcomes are carrying out (references below). Different modules/unit of learning can be composed for creating an Alternating Training Plan/Implementation scenario. In the modules/unit of learning is not specify the methodologies. The methodologies and the learning activities are declared in the Alternating Training Plan In view of validating the living lab approach, even if two the alternating training plan have the same delivery, topic and learning outcomes, we should distinguish them if different methodologies and/or learning activities are planned. *1. Implementation scenarios definition and analysis*, Discover the Cosmos project deliverable 2. OPIR Guidelines to design and describe units of learning outcomes; Project Name/Author: OPIR; Date Posted: 27 January 2012; Description: This document presents the OPIR methodology to design and describe units of learning outcomes. It focuses on the method used. It is in French. http://www.ecvet-projects.eu/toolbox/ToolBoxList.aspx?id=14&type=1 3. In Technological Pedagogical Content Knowledge, Springer pp 209-224 Date: 24 October 2014 Design and Implementation of Educational Scenarios with the Integration of TDCK: A Case Study at a Department of Early Childhood Education Aggeliki Tzavara , Vassilis Komis 4. Other useful definition and documents on training plan http://www.education.vic.gov.au/training/employers/apprentices/Pages/what.aspx	
Phases	Sequential element in a process. It is a temporary sequence of the learning activities of the Alternating Training Plan / Implementation Scenarios. In DESCI scenarios we use 4 phases, named macro-phases: Knowing, Designing, Implementing, Evaluating In the living lab, the phases can be: Planning, concept design, prototype design, final design, commercialization, evaluation A phase can be composed by one or more modules.	"DESCI Alternating Training – How To. Guidelines for Teachers" introduction, section 1.2;
Macro-phase	In DESCI project and in DESCI conceptual map, the element of the process trough which the school manages the alternating training. It describes logical/conceptual	"DESCI Alternating Training – How To"

	described identifying 4 macro-phases: Knowing, Designing, Implementing, Evaluating	Guidelines for Teachers 2.1Hypothesis of structure
Stakeholder	Stakeholder are the subjects that may be affected or affect an activity, i.e. an economic initiative. In DESCI project, stakeholder are all the people that may be interested in the activity of the living lab, i.e. in knowing, designing, implementing and/or evaluating the product/service developed by the students during the alternating training. Basing on literature and REPOPA results, we list some examples of stakeholders: enterprises, research organization, interested local communities and associations (of patients, of citizens, of consumers, environmental, ...), other institutions (other schools, municipalities, policy institution, health units, ...), cultural institutions, institutions for equity (trade unions, disabled people associations, migrants associations, associations for protecting women, GLBT associations, ...), departments of the schools, different group classes (internal stakeholders), individuals from all these entities and potential users of products and services A careful analysis of living lab points out that among the stakeholders, it is useful to identify the stakeholders that play the following roles: * _innovator_ – they provide expertise / research needed to the development of innovation (service/ system / product); i.e. researchers or enterprises * _producer_ – they develop the innovation (service/ system / process); i.e. the students in the students living lab, the teachers in the teachers living lab, etc. * _utilizer /end user_– they use the innovation (service/ system / product). [18]	"DESCI Alternating Training – How To. Guidelines for Teachers", section 1.4; - "LIVING LAB & DESCI:Methodological guidelines" (check)
End User	Among the stakeholders, they are identified as the stakeholders that use the innovation (service / system / product) In the students Living lab the end users are the people that will use the (service/system / product) that the students develop during alternating training in Students Living lab. In the teachers living lab the end users are the students	"DESCI Alternating Training – How To. Guidelines for Teachers", section 1.4; "LIVING LAB & DESCI:Methodological guidelines" (check)
Innovator	They provide expertise / research needed to the development of innovation (service/system / product); i.e. researchers or enterprises	"DESCI Alternating Training – How To. Guidelines for Teachers", section 1.4; "LIVING LAB & DESCI:Methodological guidelines" (check)
Producer	They develop the innovation (service/system / process); i.e. the students in the students living lab, the teachers in the teachers living lab, etc.	"DESCI Alternating Training – How To. Guidelines for

		Teachers", section 1.4; "LIVING LAB & DESCI:Methodological guidelines" (check)
Policy making	Taking decisions about the proposal and/or implementation of a program, project or activity aimed to an institutional goal, and having the responsibility on it. This definition has been written merging and integrating some definitions found in literature[15], [16], [17].	"DESCI Alternating Training – How To. Guidelines for Teachers", section 1.2

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Tools & Resources

The main support tools for implement DESCI trainings are the DESCI toolkit

- o **Teachers Toolkit: "DESCI ALTERNATING TRAINIG – HOW TO, guideline for teachers&tutors"**, the present document, that guides teachers in designing and implementing DESCI alternating trainings in the school in cooperation with companies and other stakeholders, based on living lab approach. (DESCI Project – IO2)
- o **Student Toolkit: "DESCI ALTERNATING TRAINIG – HOW TO, guideline for students"**, that guides students in designing and implementing DESCI alternating trainings in the school in cooperation with companies and other stakeholders, based on living lab approach. (DESCI Project – IO3)
- o **DESCI Evaluation Toolkit**, which provide the tools for the assessment and self-assessment of the students and for the evaluation of the processes. (DESCI Project – IO4)

THIS TOOLKIT IS LINKED TO:

1. THE FOLLOWING KEY DOCUMENTS INCLUDED IN THE ADDENDUM SECTION:

- o Teacher Checklist for Internal Control
- o Glossary
- o Guide for video experience about your DESCI training

2. THE FOLLOWING EXTERNAL DOCUMENTS:
- o DESCI Check List
- o List of Methodologies

3. THE FOLLOWING PAPERS:
- o Valente A. et al., "Actors and Practices in Living Lab for Alternating Training". In: "Responsible Research and Innovation Actions in Science Education, Gender and Ethics". Springer Briefs in Research and Innovation Governance. Springer, Cham (2018)
- o Valente A. et al., "Building key competences in Alternating Training for knowledgeable and reflexive citizens" (2018)
- o Valente A. et al., "Seeking co-production of knowledge in alternating training" in GIREP-ICPE-EPEC 2017 conference, Journal of Physics Conference Series (JPCS) (2018)

Other tools can be considered the **DESCI Implementation Scenarios**, a collection of possible case of implementation in specific school system and/or in relation to specific delivery developed by students, following the Living Lab methodology. Three main scenarios will be developed by the three DESCI school partners and included in the teacher toolkit.

Finally the present guideline refers also the following documents uploaded in the DESCI website (www.desci.eu) :
- o "Comparative analysis of European upper secondary schools and alternating training systems" (DESCI Project – IO1)
- o Presentation brochure of DESCI trainings for companies / institutions / users