

CLASS4.0 Project

WP3 Activity 3.3 Deliverable 3.3.4

LEA - Live Exercise Activity Best Practices

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Introduction

The CLASS 4.0 project aimed to test and develop new prototypes, as the Live Exercise Activity (LEA), to increase and improve the capacity for interaction between businesses and the educational realities represented by both teachers and students themselves. The goal was to provide new solutions to stimulate interest in the topics of blue digitization, increase awareness about relevant professions, and let people know how they relate to certain educational and business pathways. In this framework the LEA were developed involving high schools and SMEs. In general, this kind of activity allows to create an interactive environment where participants actively participate and overall exercise experience, promoting a better engagement to the activity.

1. Live Exercise Activity LEA

The Live Exercise Activity was implemented in the second half of the CLASS4.0 project respectively by the Maritime Technology Cluster FVG and INFORMEST from the Italian Side and from the Istrian Development Agency IDA from the Croatian side.

The general aims of LEA are:

- *Develop synergies*
 - The process of creating collaborations between different individuals involving resources, strengths, or efforts allows to produce outcomes that are greater than the sum of their individual parts.
- *Develop teamworking*
 - Developing synergies requires open communication, collaboration, and a willingness to recognize and utilize the diverse strengths and perspectives of each party involved. It often involves finding common goals, aligning interests, and establishing a cooperative environment where everyone can contribute their expertise or resources.
- *Improve the capacity to adopt innovative solutions*
 - Key aspects of adopting innovative solutions are embracing change, improve problem-solving skills and out-of-the-box thinking, stimulate a continuous learning and adaptation as an ongoing process.
- *Get closer, for students, to a business model*
 - Getting closer to business world empowers students with a well-rounded education that combines theoretical knowledge with practical application. It prepares them for the demands of the professional world, increases their employability, and provides a solid foundation for future career success.
- *Encourage participation and networking*

- Networking is important because it facilitates opportunities, knowledge sharing, career advancement, learning from others, collaboration, business growth, personal branding, and the development of long-term relationships.
- *Develop an innovation ecosystem*
 - it encourages the generation, diffusion, and commercialization of innovative ideas, leading to economic growth, positive societal impact, and technological advancement.

The specific aims of CLASS4.0's LEA are:

- *Promote data-driven approach*
 - By adopting a data-driven approach, organizations or individuals can make more informed decisions, optimize processes, drive efficiency, identify new opportunities, enhance customer experiences, and achieve better outcomes. It enables evidence-based decision-making, reduces uncertainty, and promotes a culture of data-driven decision-making;
- *Increase awareness about blue economy*
 - Blue economy is important for several reasons: through the managing marine resources responsibly ensure their long-term availability and environmental sustainability, promote the conservation of marine ecosystems, furthermore contributes to job creation, economic growth, and poverty reduction; blue economy has also an important role in climate change resilience to bridge the skill gap;
- *Simulating a real innovation process*
 - The innovation process, that is not necessarily linear, refers to the series of steps and activities undertaken to introduce new ideas, products, processes, or services into practice. It fosters a culture of experimentation, risk-taking, and continuous improvement to drive sustainable innovation.

2. METHODOLOGY

Innovative educational methodologies

Educational methodology refers to the approach or framework used to design and deliver concepts to learners. It encompasses the strategies, techniques, and principles employed to facilitate effective teaching and learning. While there are various didactic methodologies, some common ones include:

- a. **Lecture-Based Methodology:** this traditional approach involves the teacher delivering information through lectures or presentations. The teacher serves as the primary source of knowledge, while students take on a more passive role as listeners and note-takers.
- b. **Inquiry-Based Methodology:** in this approach, students are actively involved in the learning process through exploration, investigation, and asking questions. The teacher acts as a facilitator, guiding students to develop their own understanding and construct knowledge. Inquiry-based methodology promotes critical thinking, problem-solving skills, and independent learning.
- c. **Problem-Based Methodology:** this methodology revolves around presenting learners with authentic, real-world problems or scenarios to solve. Students work in groups or individually to analyze the problem, apply relevant concepts, and develop solutions. Problem-based methodology encourages collaboration, decision-making, and the practical application of knowledge.
- d. **Project-Based Methodology:** similar to problem-based methodology, project-based methodology involves students engaging in extended, hands-on projects that require them to research, plan, create, and present a final product or outcome. It promotes active learning, teamwork, time management, and the integration of knowledge and skills across multiple disciplines.
- e. **Collaborative Learning Methodology:** this methodology emphasizes collaborative activities and group work, where students work together to accomplish shared learning goals. It encourages peer interaction, communication, and the exchange of ideas. Collaborative learning methodology fosters teamwork, cooperation, and the development of social skills.
- f. **Experiential Learning Methodology:** this methodology focuses on learning through direct experience and reflection. It involves hands-on activities, field trips, simulations, or role-playing exercises. Experiential learning methodology encourages active participation, reflection, and the application of knowledge in real-life contexts.
- g. **Blended Learning Methodology:** blended learning combines traditional face-to-face instruction with online or digital learning components. It leverages technology to deliver content, facilitate interaction, and provide personalized learning experiences. Blended learning methodology allows for flexibility, individualized pacing, and the integration of multimedia resources.

Innovative educational methodologies strive to engage students, promote active participation and facilitate the acquisition and application of knowledge and skills, and are effective tools for improving students' learning process.

LEA is a multilevel transversal tool, in fact is a mix of c, d, e, f methodologies. It allows students to explore and discover independently, such as project-based approaches, can increase their ability to learn and understand concepts. With this regard, numerous studies have shown that a didactic approach in which students face real-world challenges through an inquiry-based teaching method to carry out meaningful projects, greatly enhances knowledge construction as described in the document *“Science education through project-based learning: a case study”*, by Santos et al. *Procedia Computer Science 219 (2023) 1713–1720*.

In addition, LEA develops soft skills such as *“problem solving, critical thinking, ability to cooperate, creativity, computational thinking, self-regulation that are more essential than ever before in our quickly changing society. They are the tools to make what has been learned work in real time, in order to generate new ideas, new theories, new products, and new knowledge”* as reported in the Council Recommendation of 22 May 2018 on key competences for lifelong learning.

Other positive aspects of LEA are: it encourages an active attitude of students toward knowledge on the basis of curiosity and challenge rather than a passive attitude; stimulate students to think in original ways and, last but not least, LEA promotes entrepreneurial competences, one of the eight key skills recognized by European Commission (*Key competences for lifelong learning, Publications Office, 2019*)

LEA activity details

To organize LEA, reference schools of territory has been contacted with an email presenting the background of the CLASS4.0 project and the activity in detail. From the schools that answered, one was selected from the Italian side and another from the Croatian one. Both schools participated with a class of 15-20 students and 2-3 teachers. In relation to school's course and curriculum, targeted companies were analyzed and contacted, to match with the proper one.

Subsequently, tailored online meetings were held to introduce the school and the company and to find a suitable topic for students to work on. Topic had to be within the student's capacity, school's equipment and had to lead to a final innovative result/process/product in a short period. Finally, a school-enterprise agreement was signed, and an activity timeline have been defined:

1. 2 hours lesson held by the enterprise to introduce the topic under which students will work together to design an innovative product, service or process;
2. 20 hours of work for the schools with the support or the enterprise, where needed, during regular and extra school time;
3. Most suitable period identified for Italian side: February and March 2023;
4. Most suitable period identified for Croatian side: March and April 2023;
5. Final event for dissemination of the LEA activity, in which classes present outcomes: May 2023.



STEFANO MALAGODI FROM XUNORD SRL TAKES THE 2-HOURS LESSONS TO STUDENTS

Main actions for the key stakeholders involved

School

- Provide feedback on interest and availability of class and students;
- Explain competences available with reference to educational path;
- Clarify the most suitable solution for inclusion of the activity in the educational program and calendar of the students;
- Define the reference school personnel that will be involved to follow the activity – coordinator for the class, teachers, responsible for education program, administrative support;
- Support the students during the 20 hours of LEA and set up the agenda;
- Interact with the enterprise and with CLASS 4.0 reference persons;
- Provide feedback on the activity and expectations;
- Support for the attendance of the event with the schools and presenting the activity outcome.

Enterprise

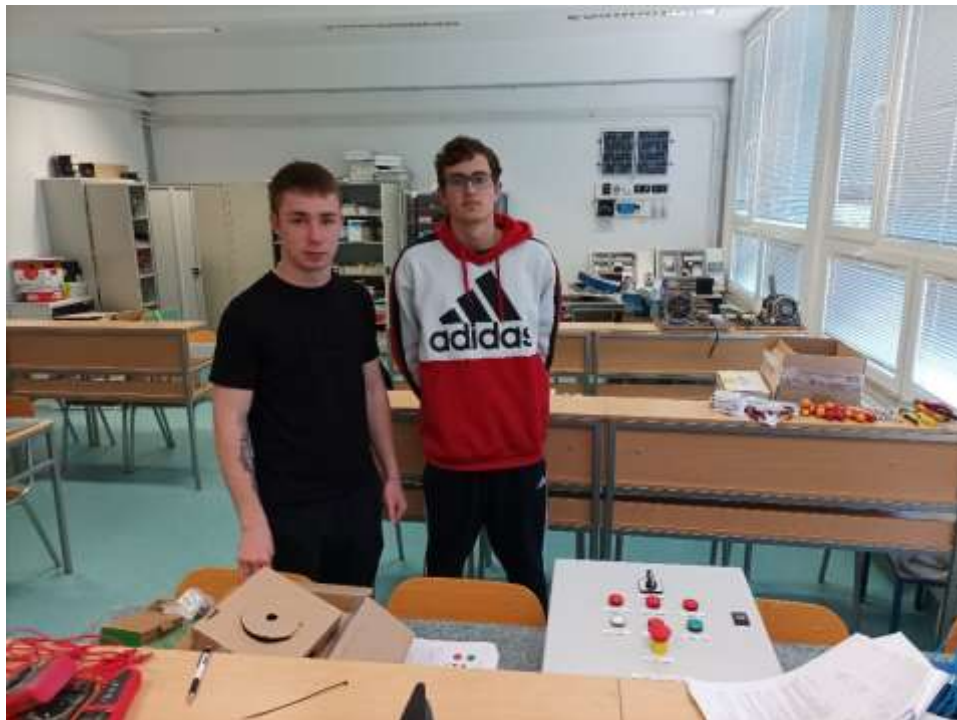
- Provide feedback on interest and availability to implement the activity with the class;
- Identify a key topic connected to an innovation priority to be developed during the LEA;
- Present the innovation priority and the related framework during a tailored 2 hours lecture;
- Give availability to support and related material to the class, teachers and project partner during the LEA development (ref. 20 hours class involvement);
- Provide references of enterprise personnel involved in the activity;
- Bring back feedback on the expectations and LEA related outcomes;
- Eventually participate to the LEA presentation event.

Project partner

- Verify interest and availability of school and enterprise that will be involved in the LEA;
- Matching the field of action between school and enterprise involved in relation to CLASS 4.0 field of actions;
- Set up the framework for the development of the LEA (plan of action, timing, parts involved);
- Track and monitor progressing of the activity;
- Support and facilitate the implementation of the LEA;
- Coordinate feedback collection and finalization of LEA outputs.

In the LEA's CLASS 4.0, two high schools have been engaged, ISIS "Mattei" in Latisana (Italy) and Industrijsko-obrtnička škola in Pula (Croatia). From Italian side both students from the electronic-electrotechnical address and lyceo students was involved in the programming and realization of a weather station for an autonomous surface vehicle in collaboration with Xunord enterprise. From Croatian side the students with their teachers in cooperation with Tehnomont brodogradilište from Pula, developed a device to be used on board, and the result of the collaboration is an innovative hydraulic control system for the ship's rudder.

Working groups from the schools had the opportunity to present the work done within special events organized at local level. As for the Italian project, students presented during the "mareINfvg festival" organized in Trieste by the Maritime Technology Cluster FVG, meanwhile for the Croatian project, students presented their innovative output during a dedicated event at the Industrial and Craft School in Pula.



STUDENTS FROM INDUSTRIJSKO-OBRTNIČKA ŠKOLA IN PULA (CROATIA) WORKING ON CONTROL SYSTEM

3. IMPACT ON STUDENTS AND TEACHERS

LEA fosters experiential learning and shortens the distance between theory and practice by giving students the opportunity to try their hand at practical-application activities and with meetings with an out-of-school sector to supplement their lessons, with the aim of providing them with skills in addition to knowledge. As exposed in innovative educational methodologies chapter, the impact of LEA on students is multilevel and transversal, and it can be summarized as follows: students saw their own expectations and ideas come to reality, step by step, operating and collaborating in the first person, learning to coordinate with each other to succeed in the shared purpose. They had the possibility to relate with a concrete innovation case and to progress the whole lifecycle of the product.

Although teachers involved had subject matter expertise and although the electrical-electrotechnical schools offer numerous laboratory and extracurricular activities, teachers faced several challenges with the LEA. First of all, LEA proposes an operational situation similar to that of a company engaged in the development of an innovative product/process/service. It is not just a matter of building a control or measuring prototype; with the LEA, teachers address relevant technological issues, economic-territorial aspects are analyzed, and a product is hypothesized to be finalized. LEA is an element of innovation in didactic because introduce a dimension of dynamism within a constitutively static reality, as schools often are. LEA's model, in its characteristic articulation, is proactive in terms of solutions for a school that has to deal with a business-technological world that changes very quickly.

In general the feedbacks from both part were positive and great appreciation by students that enjoyed to be involved in hands-on activities on the field in relation to specific innovation areas in maritime technologies.

4. HOW TO REPLICATE ACTIVITY

The activity of the LEA was structured on a process that involved the following steps:

1. Meetings with project's partners from other Country's side to coordinate each other;
2. Analysis of schools and companies to be involved;
3. School and company selection;
4. Illustration of the overall project idea and specific activity to teachers and enterprises selected;
5. Explain to teachers competences available with reference to educational path;
6. Clarify the most suitable solution for inclusion of the activity in the educational program and calendar of the students;
7. Meeting to present each stakeholder's ideas and critical discussion;
8. Identify jointly a key topic connected to an innovation priority to be developed during the LEA;
9. Entering into school-company agreement;
10. Set up the framework for the development of the LEA (plan of action, timing, parts involved);
11. Supporting the school and giving related materials;
12. Track and monitor progressing of the activity;
13. Organizing the final public give-back event;
14. Request feedback on LEA expectations and outcomes.

The overall process requires constant communication and cooperation among involved partners to proceed adequately in all the steps and all the phases. A clear knowledge of the respective innovation and education framework is important to better address and match needs and features of both partners.

From the implementation phase the LEA experience brought the organizers to test and assess a new prototype of activity that involved an education player and the entrepreneurial and innovation scenario with close interaction between students, teachers, technician and entrepreneur. The activity could be replied to foster cooperation among these players that could benefit respectively in aligning profiles and careers in respective needs and priorities. Often aggregations witness the difficulties of enterprises in finding specific competences and profiles and the schools the need to get closer to the production and innovation world. In this sense LEA could represent a positive test case to be replied with similar or wider structure that could differ on complexity of the topic.

