INTERNATIONAL REPORT ABOUT
ACTIVE METHODOLOGIES AND TECHNIQUES FOR
INCLUSIVE AND PARTICIPATORY TEACHING

Grant agreement	2021-1-IT02-KA220-SCH-000032798
Programme	Erasmus+
Key action	Cooperation partnerships in school education
Action	Strategic Partnerships
Project acronym	ThINKER LAB
Project title	ThINKER LAB: Tinkering Laboratories for inclusive and active learning
Project starting date	01/11/2021
Project duration	24 months
Project end date	01/11/2023

In order for our population to be capable of being actively involved and responsible, creative and imaginative citizens, able to work cooperatively, and fully aware of and conversant with the complex difficulties facing society, knowledge of and about science is essential (Science Education for Responsible Citizenship, EC, 2015). The OECD Education Working Paper No. 227, 2020; Ambrose, S., Bridges, M.W., DiPietro, M., Lovett, M.C., & Norman, M.K. 2010; Lawrie, G., Marquis, and Fuller, 2017; and the UNESCO Guidelines for Inclusion, Paris, UNESCO, 2005; all highlight the importance of social inclusion in today's society, where the school population is becoming more and more diverse.

The ThINKER LAB partnership aims at increasing the range of educational opportunities for students by constructing learning pathways that are more closely linked to collaborative learning processes based in laboratories and less dependent on technical knowledge.

According to the Erasmus+ priorities, the project intends to promote the **inclusion and diversity**. Indeed, schools must be able to develop inclusive learning processes, offering adequate and effective responses to each one, in a dimension of equity. ThINKER LAB aims at working on improving **teaching skills to create inclusive pathways for all**.

It fosters digital transformation through development of **digital readiness** and **environmental sustainability** thanks to the project's innovative idea of co-construction (teachers/students) and use of low-cost laboratories for learning, using recycled material.

In the specific field of **school education**, the priority of the project is to **promote interest and excellence in science, technology, engineering, and mathematics (STEM) and the STEAM approach.** Indeed, scientific subjects such as mathematics, physics, engineering, science and IT will be the basis for the construction of the fablabs.

General goals for ThINKER LAB:

1. to improve the **social integration** of young students (14–19 years old);
2. to improve **students' STEM skills** through active **inclusion** approaches, working practices based on Tinkering, and the development and use of inexpensive fab laboratories made from recyclable materials.

Specific goals of ThINKER LAB are:

1. to improve the teaching staff's ability to employ i**nclusive learning methodologies**;
2. to improve the teaching staff's ability to use didactic-pedagogical **tactics to promote STEM** learning in inclusive settings;
3. to improve instructors' and students' **digital skills** by using low-cost labs that use recycled materials and co-built simulations;

4. to strengthen students' competences in the area of **technical/scientific micro-language** using the TechnoCLil technique;
5. to strengthen the partnership's ability for **internationalization** through comparative and collaboratively crafted studies in order to produce "European" outcomes.

The project's results will be the following:
- R1. ACTIVE METHODOLOGIES AND TECHNIQUES FOR INCLUSIVE AND PARTICIPATORY TEACHING (=ThINKER LAB methodologies);
- R2. EUROPEAN PLATFORM "ThINKER LAB COMMUNITY FOR AN ACTIVE AND INCLUSIVE LEARNING";
- R3. TEACHER'S HANDBOOK;
- R4. STUDENT'S HANDBOOK.

Aim of the Result 1

Create a more e inclusive e participatory context in order for all the students (Special Education Needs students included) to have the opportunity to learn through a practical experience of building their own learning process.

Desktop analysis of European success case histories

We used the following methodology to analyse the best practices in each country:

1.1 Collection of best practices: methodologies and techniques of teaching; methodologies and techniques of evaluation.

Through partner collaboration, a mapping of best practices in Europe on Tinkering has been done based on TEL processes. Each partner had the same starting point and utilising a form has been responsible for collecting best practices in their country, to produce a clear and precise mapping.

1.2 Selection of the more suitable best practices for an inclusive and participated learning and for the assessment and evaluation of acquired competences. Focus groups provided opportunities for comparison and reflection. Thus, each focus group reflects the point of view of the involved target group (teachers, students and parents).

Focus Groups

In addition, we have organized focus groups in Spain, Italy, Sweden, Finland and Slovenia with Teachers of technical-science subjects in high schools and technical-vocational institutes and with students 14-19 years old in order to find out the best practices around Europe where students learn by doing taking into account inclusive learning and low cost sustainable teaching materials.

At Apro Formazione we organized three focus groups addressing 6 STEM teachers, 10 parents and 20 students divided into 2 groups

At Politeknika Txorieri we organized three focus groups addressing 6 teachers, 4 parents and 10 students.

At Salpaus we have organised three focus groups addressing 6 technology teachers, 4 parents and 48 students from two study groups.

At Göteborgs Tekniska College we had three focus groups addressing 8 STEM teachers, 4 parents and 24 students divided into two groups.

At SIC we had 3 teachers, 18 students and 5 parents.

Below, you can find the set of questions used as guidelines for the focus groups on each country.

Questions for the Focus Group - Teachers:
1. Do you have students with special needs?
2. Have you received any training in order to teach students with special needs? If so, was it provided by your School, please, specify:
3. Are you able to provide guidelines for teachers to implement group challenges, where students learn by doing, for students with special needs? Please, collect methodologies for students with special needs.
4. Do you teach (or your school) through a TINKERING methodology? This means though an informal learning process where students learn by doing? Please, collect methodologies for teachers that implement this methodology.
5. Does your School foster Technology Enhanced Learning (TEL), based on the use of digital technologies and linking the learning process to active experimentation? Please, collect examples and links of the platforms.
6. At your School do you have low-cost laboratories made from recycled materials? If so, please specify.
7. Do you (or your school) apply inclusive techniques? If so, which ones?

Focus Group Questions – Students/Parents:
1. Is the school and teachers providing quality personalised training for you or your son/ daughter?
2. Is the training based on learning by doing better for your understanding / for the understanding of your son / daughter?
3. Do you believe a learning by doing (TINKERING) process is more efficient for an inclusive teaching?
4. Do you use digital technologies (Technology Enhanced Learning) in class? Do you think they foster your STEM skills though these methodologies?

For the aforementioned collection and selection of best practices, we used the template below:

THINKER LAB – GOOD PRACTICE CASES

[Name of the good practice]
Brief introduction to the practice	
Period of implementation	
Country where the practice was developed	
Provider of the practice	
Target group (students 14-19 y.o.)	
How to implement the practice	
Necessary knowledge from teachers and students prior to the practice?	■ Yes ■ No In case of answering yes, specify here which knowledge is needed:
Mention some of the learning outcomes from the practice	
List which digital tools were needed	
The practice was carried:	■Online ■ybrid ■other way *(specify which):*
Mention which were the critical points to shift towards STEM learning and how to manage them:	

Briefly mention the <u>positive aspects</u> of participatory learning	
Briefly mention the <u>negative aspects</u> of participatory learning (if any)	
The practice includes green education:	■Yes ■No In case of answering yes, specify here which:

The good practices collected by Partners are published in the website with a detailed description of how to carry out the challenges. **https://www.thinker-lab.eu/best-practices**

INTERNATIONAL REPORT ABOUT ACTIVE METHODOLOGIES AND TECHNIQUES FOR INCLUSIVE AND PARTICIPATORY TEACHING

This international report aims to provide insights and best practices on active methodologies and techniques for inclusive and participatory teaching, focusing on technical-science subjects in high schools and technical-vocational institutes. We conducted focus groups in Spain, Italy, Sweden, Finland, and Slovenia, involving both teachers and students aged 14-19. The report highlights the strategies and approaches adopted by each country, emphasizing the principles of inclusive learning and the use of low-cost sustainable teaching materials. See below a small summary

FINLAND: Promoting Inclusive Learning Through Practical Experience

In Finland, inclusive learning is at the forefront of vocational education. This approach recognizes the uniqueness of each student and encourages their participation regardless of their background or abilities. Special needs students are integrated into regular study groups based on an inclusive education strategy. The decision to provide special support is made after assessing the students' needs.

Key Strategies:
Collaboration between vocational and special education teachers to provide tailored support.
Utilization of the "learn-by-doing" pedagogical method.
Creation of FabLabs for Technology Enhanced Learning (TEL), promoting digital manufacturing and innovation.

Emphasis on low-cost and recycled materials for sustainability.

ITALY: Promoting Inclusive Learning and Empathy Through Practical Methods

In Italy, around 5% of students aged 14-19 have special educational needs, and even more may need support. Students with special needs are integrated into regular study groups, with support determined through assessments and collaboration with care services.

Key Strategies:

Adoption of "learn-by-doing," Tinkering, and Technology Enhanced Learning (TEL) methodologies.

Use of low-cost FabLabs to encourage innovation and experimentation.

Encouragement of collaborative, project-based learning.

Utilization of digital tools and platforms to enhance learning experiences.

SWEDEN: Fostering Inclusive Learning Through Unique Approaches

Sweden also promotes inclusive learning by recognizing students' individuality and integrating special needs students into regular study groups. Special education qualifications for teachers are available, and collaboration between special education and vocational teachers is encouraged.

Key Strategies:

Implementation of the "learn-by-doing" pedagogical method.

Utilization of FabLabs to promote digital technology and innovation.

Emphasis on personalized training for students.

Fostering a positive attitude toward Technology Enhanced Training (TEL) and STEM subjects.

SLOVENIA: Personalized Approaches and Sustainable Learning

Slovenia integrates special needs students into its education system with a strong focus on personalized support. Teachers collaborate to implement group challenges, emphasizing clear communication and additional support.

Key Strategies:

Use of project-based learning, combining theory with practical work.

Adoption of Technology Enhanced Learning (TEL) tools like Kahoot and Quizlet.

Creation of low-cost, sustainable laboratories from recycled materials.

Engagement with local companies to access resources and practical experience.

Digital Tools

In the focus groups we gathered digital tools that facilitate collaborative working and Tinkering approach:

- **Trello.com** – a collaboration tool that organizes your projects into boards. Trello brings all your tasks, teammates, and tools together. Trello is a visual tool that allows teams to manage any type of project and workflow, as well as monitor tasks. Add files, checklists or even automations, you can customize it according to your team's needs;

- **Stormboard.com** – This tool is used to generate collaborative brainstorming and discussions enabling the exchange of ideas in projects and teamwork;

- Quite simple to use, **Plickers.com** is a free tool that allows you to create online questionnaires and then send the questions to the students in a dynamic and attractive way, obtaining the results of each participant in real time;

- **Mentimeter.com** – to collect ideas, suggestions and to brainstorm;

- **Miro.com** - That is a collaborative whiteboard platform for teams of any size. Easily collaborate and ideate. Easy to be used in teaching;

- **Prezi.com / Canva.com** - That is an online software that makes it easy and creative to create presentations;

- **Videoscribe.co** – That is an animation software best known for its iconic hand-drawn chalkboard animation style. With VideoScribe you can easily create mixed 2D and multimedia animations;

- **Storyboardthat.com** - Storyboard That can be used in the classroom as a storytelling tool to create simple narrative comics;

- **GeoGebra.com** - That is a mathematics learning and teaching software that provides tools for studying geometry, algebra and analysis.

Overall Findings and Recommendations

1. Inclusive learning benefits from personalized support and clear communication between regular and special education teachers.

2. Practical methodologies such as "learn-by-doing," Tinkering, and project-based learning enhance student engagement.

3. FabLabs and digital tools play a crucial role in promoting Technology Enhanced Learning (TEL) and fostering innovation.

4. Sustainability should be a priority, with a focus on low-cost and recycled materials.

5. Collaboration between schools and local companies can provide valuable resources and practical experience for students.

6. The use of digital tools and platforms enhances interactive and collaborative learning.

This international report provides a comprehensive overview of active methodologies and techniques for inclusive and participatory teaching across Europe. By sharing these best practices, we hope to inspire educators and policymakers to create more inclusive, engaging, and sustainable educational environments for students of all abilities.

Making Education Inclusive

Incorporating inclusive education principles into project-based learning (PBL) can be a powerful way to create an accessible and equitable learning environment for all students. Here are some strategies to consider when implementing PBL with inclusivity in mind:

1. **Clear Learning Objectives and Expectations**: Ensure that the learning objectives and expectations for the project are well-defined and communicated to all students. This helps students, including those with diverse learning needs, understand the goals and purpose of the project.

2. **Flexible Grouping**: Allow flexibility in group formation. Encourage students to collaborate in diverse teams, considering different abilities and strengths. Consider mixing students with varying skill levels to promote peer learning and support.

3. **Universal Design for Learning (UDL)**: Apply the principles of UDL, which involves providing multiple means of representation, engagement, and expression. Offer various ways for students to access information, participate actively, and demonstrate their understanding.

4. **Differentiated Instruction**: Tailor instruction to meet the individual needs of students. Provide additional resources, supports, or alternative assessments for students who require them. Differentiation can include varying the complexity of tasks or adjusting expectations based on individual abilities.

5. **Clear Instructions and Resources**: Offer clear, concise instructions and provide accessible resources. Ensure that materials are available in various formats (text, audio, video) to accommodate different learning styles.
6. **Assistive Technology**: Familiarize yourself with assistive technology tools that can assist students with disabilities. Encourage students to use these tools if needed and provide guidance on their use.
7. **Regular Check-Ins**: Schedule regular check-ins with each student or group to monitor progress, address questions, and offer support. Be open to feedback from students about their needs.
8. **Accessible Materials**: Ensure that all project materials, including digital contents and handouts, are accessible to students with disabilities. Use alt text for images, provide captions for videos, and choose fonts and colors that are easy to read.
9. **Scaffolded Learning**: Break the project into manageable steps and provide scaffolding as needed. This helps students build their skills and knowledge progressively, reducing potential barriers.
10. **Peer Support**: Encourage peer support and cooperative learning. Assign buddies or mentors within groups who can assist students with disabilities and promote collaboration.
11. **Feedback and Reflection**: Provide regular feedback on student work and encourage self-reflection. This helps students identify areas for improvement and promotes metacognition.
12. **Flexibility in Assessment**: Allow for flexibility in how students demonstrate their understanding. Permit alternative assessment methods, such as presentations, videos, or written reports, based on students' strengths and preferences.
13. **Teacher Training**: Ensure that educators are trained in inclusive teaching practices and understand how to support students with diverse needs effectively.
14. **Accessibility Policies**: Familiarize yourself with your school's accessibility policies and accommodations procedures. Ensure that students are aware of the available resources and how to request accommodations if needed.
15. **Celebrate Diversity**: Embrace and celebrate the diversity of your students. Encourage them to share their unique perspectives and contributions to the project.

Remember that inclusive education is an ongoing process, and it requires continuous reflection and adaptation. By incorporating these strategies into your PBL approach, you can create a more inclusive and equitable learning experience that benefits all students, regardless of their abilities or backgrounds.