Computational Thinking for Low Qualified Adults Education: Challenges and Implementation Process

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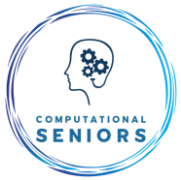
AIM and OBJECTIVES

AIM: to present the integration process of the computational thinking (CT) methodology into adult learning programmes, with a focus on key aspects, implementation strategies, and challenges encountered within the “COMPutational Seniors” project.

OBJECTIVES:

- To justify the need for the computational thinking (CT) in adults education;
- To present the key aspects of CT and its implementation process within the project “COMPutational Seniors”.
- To present the challenges the consortium partners faced during the project “COMPutational Seniors” implementation process.

Study Justification



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Computational Thinking (CT) can help older people, whose cognitive abilities may be impaired by age, to maintain and improve them. CT cognitive processes such as problem-solving, abstraction, efficient solutions, and etc. are relevant for cognitive stimulation in elderly populations.

CT has positive impact on older adults, especially when it comes to cognitive stimulation. This suggests that CT is a suitable instructional tool for this population (de Oliveira Junior & Pasqualotti, 2021). CT constant application may improve cognitive function of older people and foster greater social connection (de Oliveira et al., 2023).

There is a recognized gap in the adoption of CT education for low-qualified or older adults compared to the extensive focus on K-12 education. Challenges include adapting teaching strategies to adult learners' needs and addressing policy and structural barriers in adult education systems.

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Erasmus+ project “Enhancing low qualified adults Inclusion through Computational Thinking (COMPutational Seniors)”

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Project Coordinator	Project Partner	Project Partner	Project Partner	Project Partner
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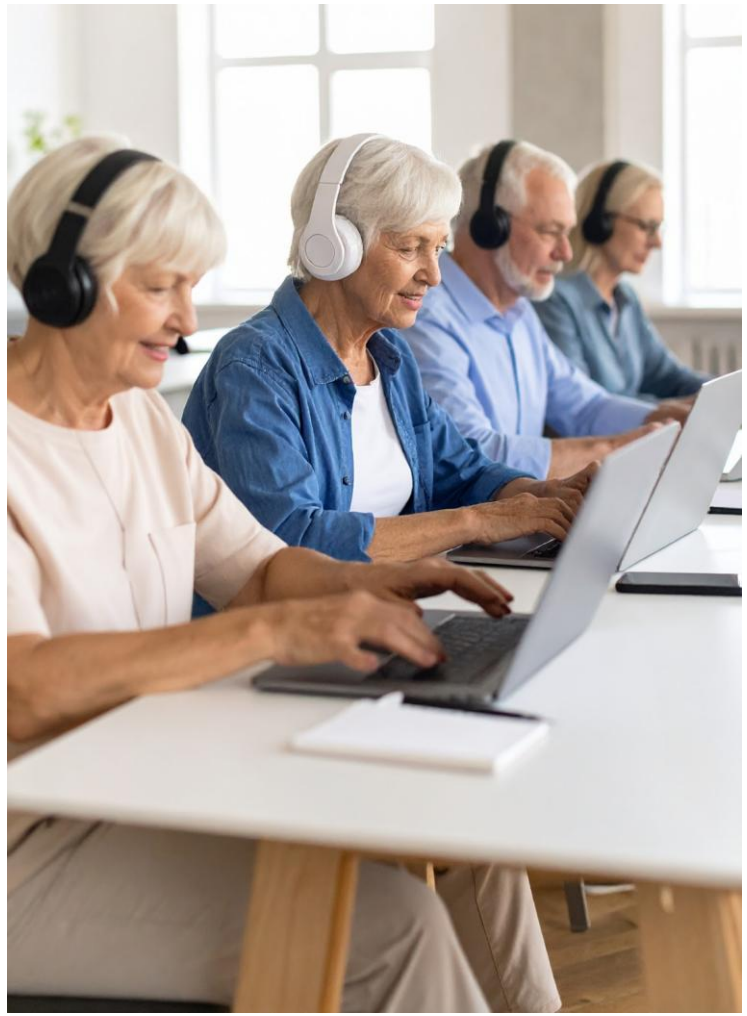
Project “COMPutational Seniors” Key Points

Aim of the Project:

To introduce the **computational thinking methodology** in the acquisition of basic skills in **adult learning programs,** as well as to bring it closer to **low-skilled groups,** thus breaking the gap that "standardises" it only as a learning strategy valid for people with high digital skills.



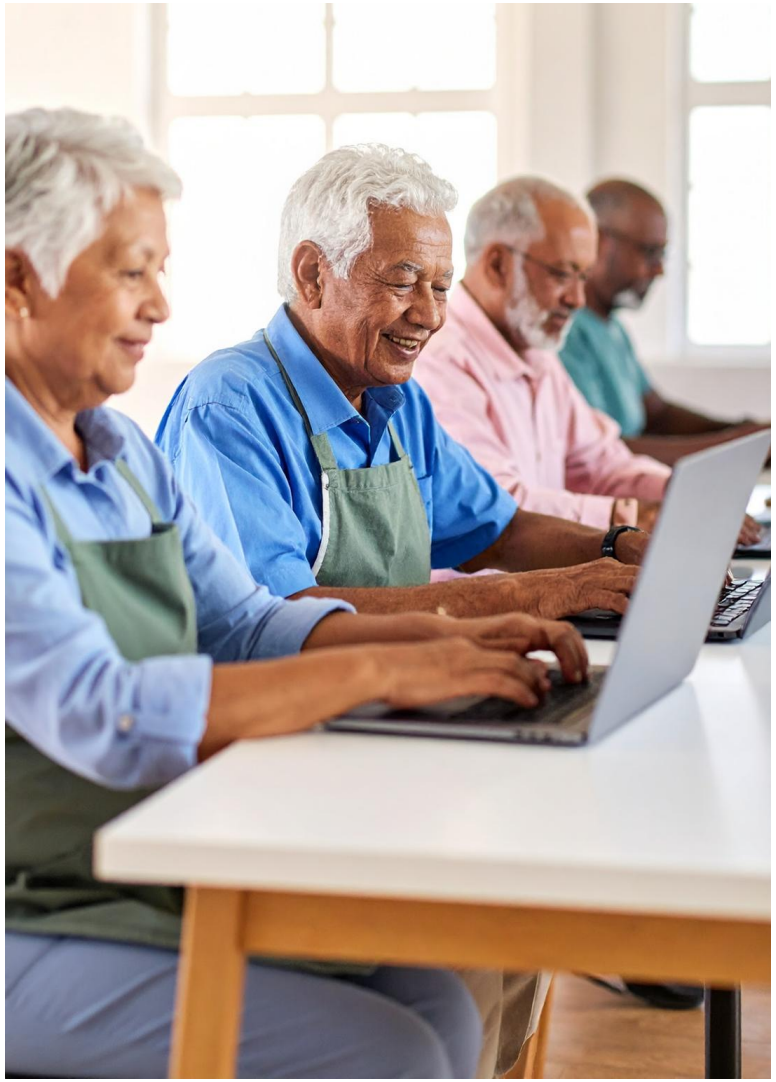
Project “COMPutational Seniors” Key Points

Target groups:

- Adults´ trainers (as staff, primary target group);
- Low qualified adults (as learners, primary target group);
- Adult training organizations (primary target group);
- Public and private organizations providing support and inclusion services to adults (NGO, social and employment services from municipalities, labour advisors…) (secondary target group).

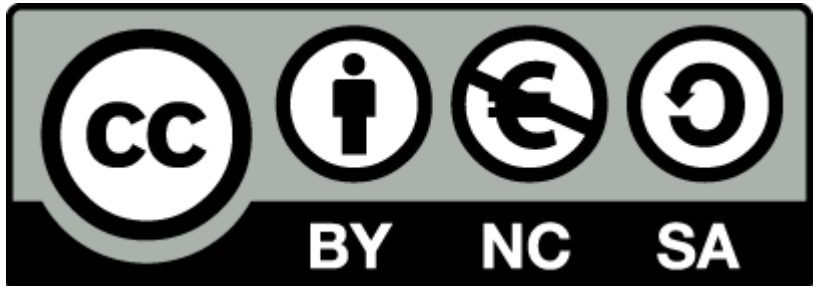
Project “COMPutational Seniors” Key Points

- **WP1** Project Management
- **WP2** COMPutational Seniors OERs for Adult Trainers
- **WP3** COMPutational Seniors e-Guide for Adult Trainers
- **WP4** COMPutational Learning Box of Unplugged Activities
- **WP5** Dissemination and Impact



Project “COMPutational Seniors” Key Points

CREATIVE COMMONS LICENSE



- The resources and content can be customized and reused in the trainer’s teaching contexts without legal restrictions.
- It also provides the opportunity to access and share resources openly.

Project “COMPutational Seniors” Key Points

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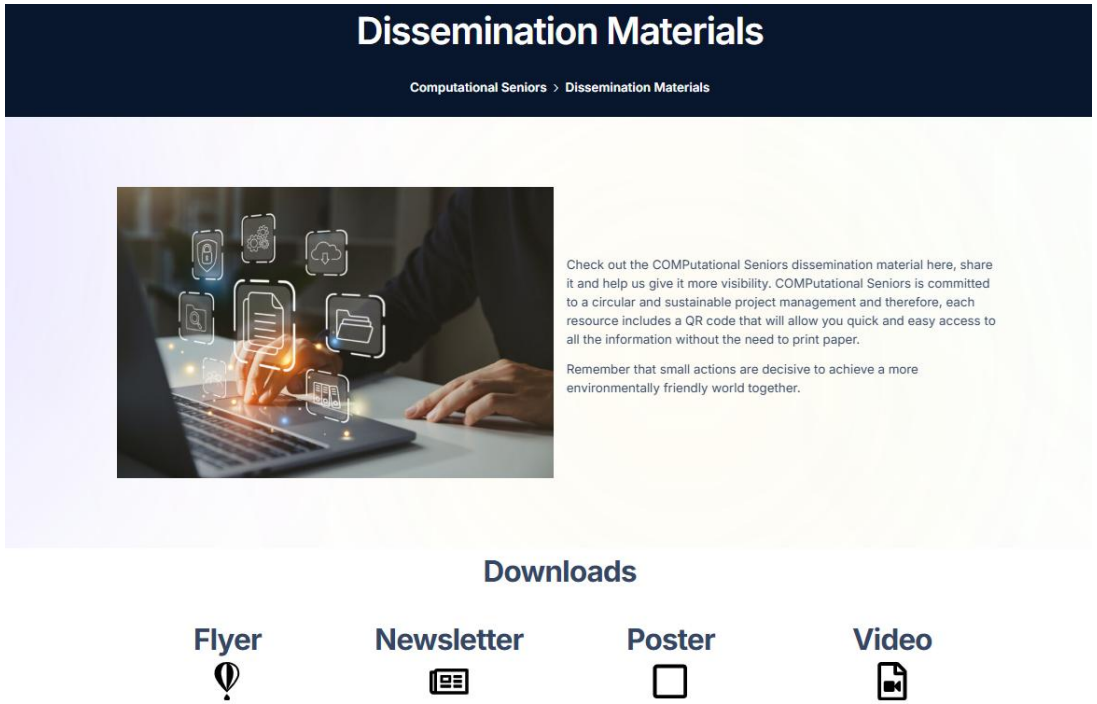
Dissemination goals

- Enhance visibility and outreach of the project.
- Promote feedback-driven dissemination for sustainable impact.
- Ensure partners actively engage and report on dissemination efforts.

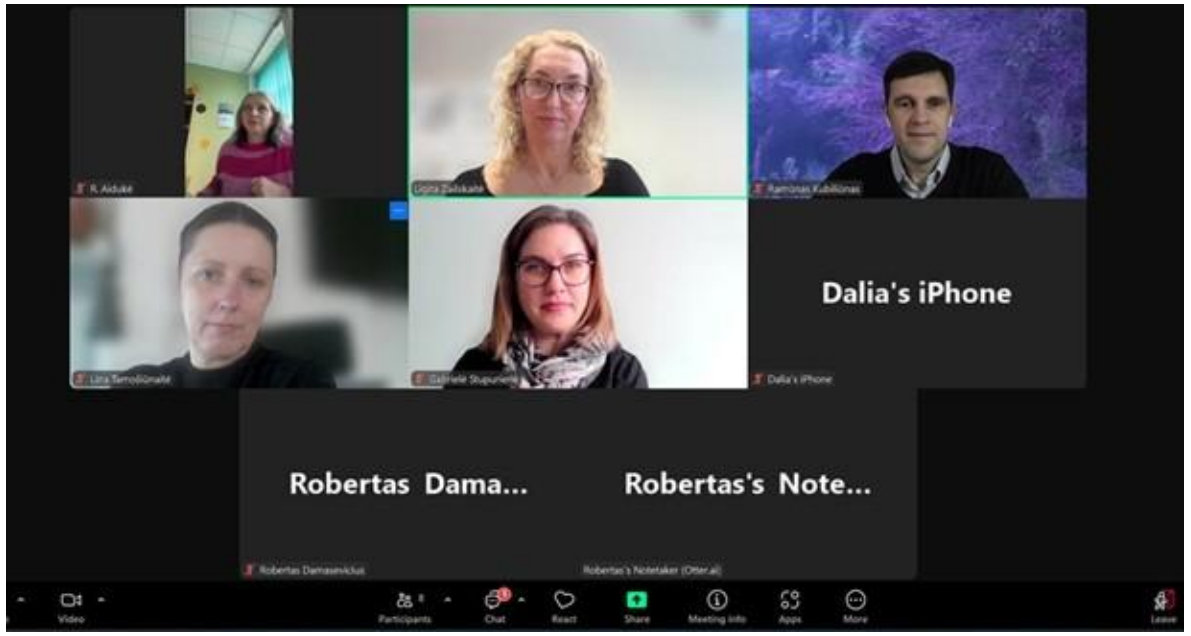


Project “COMPutational Seniors” implementation process

National Piloting Committee (NLP) Meetings in Spain, Greece, Poland, Lithuania

Company/organization

- Joniškis Region Education Centre
- Jonava Education Assistance
- Services
- Kaunas University of Technology
- Panevėžys Regional STEAM Open
- Access Centre
- Vilniaus University



Project “COMPutational Seniors” implementation process

MODULE	RESPONSIBLE PARTNER
M0. Introduction	DFA
M1. Why is it important to teach computational thinking? Challenges and Opportunities in Promoting Computational Thinking in Adult Education	KTU
M2. How Do Computers Think? Key Concepts of Computational Thinking	FUTURE LEARNING
M3. Integrating Computational Thinking in Adult Education	DFA
M4. Teaching Strategies. How can we use programming to improve 21st-century soft skills	DFA
M5.Computational thinking as an inclusion tool for disadvantaged adults	MIS

Project “COMPutational Seniors” implementation process

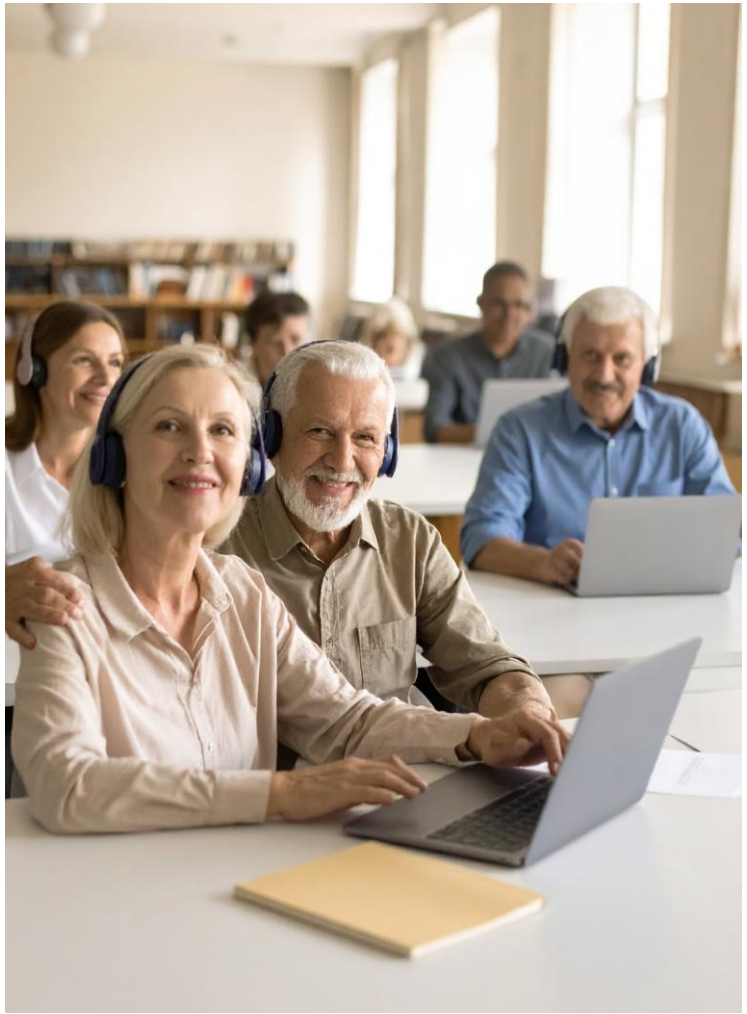
Key questions arise, such as:

- How CT principles can be applied in both daily and professional life of low qualified people?
- What challenges and opportunities exist in this context?
- What is the potential impact of CT on adult education?
- What specific teaching strategies can be employed to effectively integrate CT into adult learning?
- Furthermore, how can CT serve as an inclusive tool for individuals with disabilities?

Project “COMPutational Seniors” implementation process

Exercises and content for self-development, case studies and videos:

- 1 Case Study
- 1 Video
- Exercises (2 minimum)
- Gamified activities (quiz, puzzle, trivial, matching exercises, crosswords, quest…)
- Challenges
- Knowledge test



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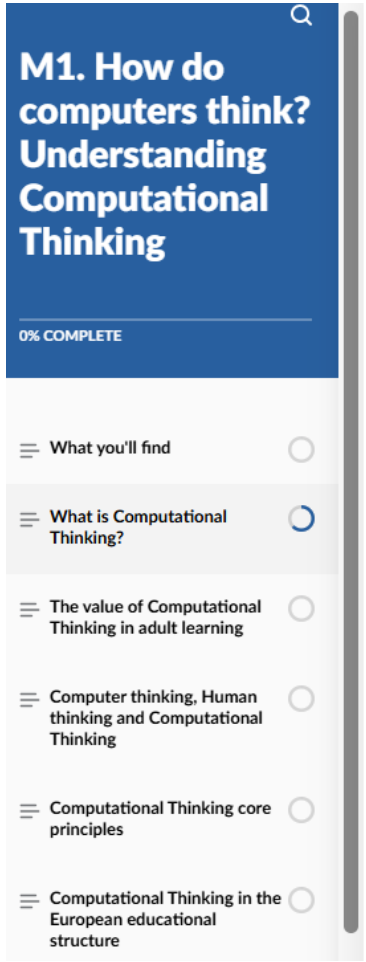
Project “COMPutational Seniors” implementation process



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- *“Computational thinking is the thought processes involved in formulating problems and their solutions so that the solutions are represented in a form that can be effectively carried out by an information-processing agent.”*

We selected these definitions because they lay the groundwork for understanding CT as both a mindset and a problem-solving approach beyond technical skills. Two ideas from this last definition are particularly important for education:

- ☐ Computational Thinking is a **thought process** not dependent on computers or technology.
- ☐ It is a specific type of **problem-solving** that involves designing solutions executable by humans, machines, or both.

Wing’s definition gave us a starting point, but many educators and researchers have expanded on this idea. Let’s look at **a few more definitions** that add depth and nuance to our understanding of CT.

Project “COMPutational Seniors” implementation process

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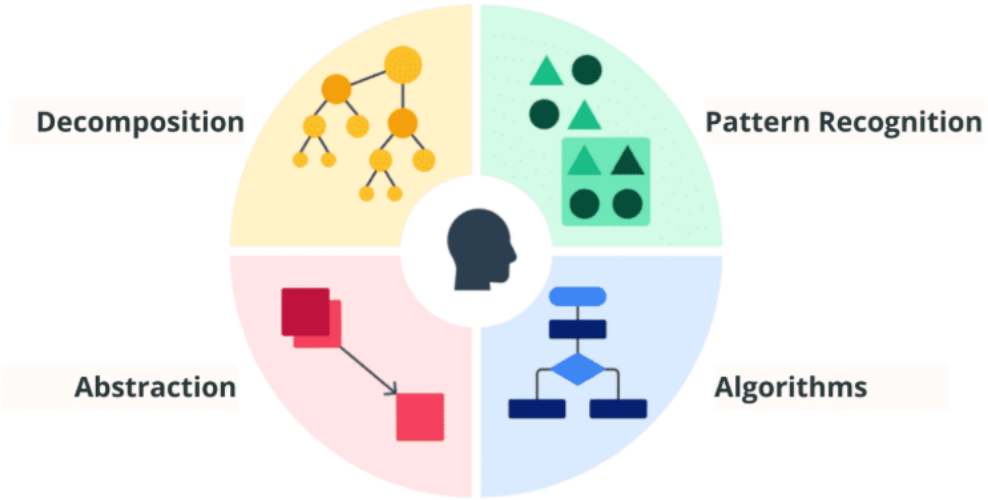
M1. How do computers think? Understanding Computational Thinking

30% COMPLETE

- What you'll find
- What is Computational Thinking?
- The value of Computational Thinking in adult learning
- Computer thinking, Human thinking and Computational Thinking
- Computational Thinking core principles
- Computational Thinking in the European educational structure
- Case study and activities
- Summary

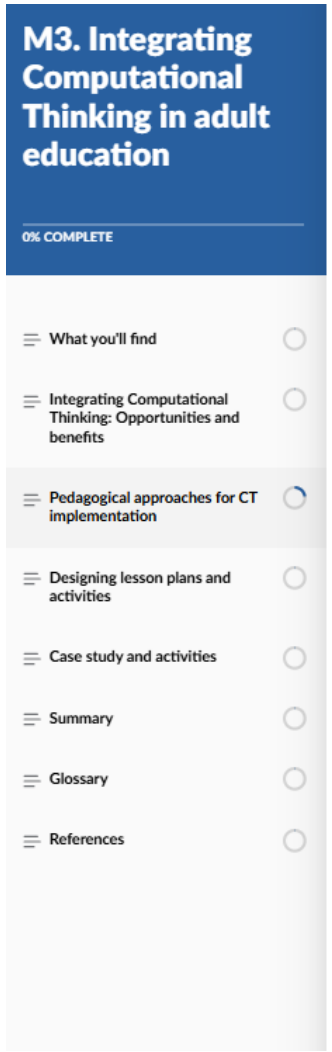
We've already defined the concept, now it’s time to explore how it works.

Computational Thinking can be broken down into four core components: **Decomposition**, **Pattern Recognition**, **Abstraction** and **Algorithms**.



Source: https://www.dicoding.com/blog/kuasai-computational-thinking-skill-penting-era-digital/

Project “COMPutational Seniors” implementation process



how they engage with new information and how they prefer to learn.

Here's a look at what makes adult learners distinct from other age groups:

- [x] Adults decide for themselves what is important to be learned
- [x] They need to validate new information by connecting it to their own beliefs and experiences
- [x] With their experience, adult learners may have established viewpoints that influence how they approach new concepts
- [ ] Adult learners expect what they are learning to be immediately useful in their personal or professional lives
- [ ] They can serve as a knowledgeable resource to trainers and fellow learners

Understanding how adults learn is key for effective education.

To design effective learning experiences for adults, it’s important to understand the **assumptions that underpin their approach to education**. These assumptions help explain how adults engage with new information and skills, and how their prior experiences impact their learning process.

Project “COMPutational Seniors” implementation process

M3. Integrating Computational Thinking in adult education

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- What you'll find
- Integrating Computational Thinking: Opportunities and benefits
- Pedagogical approaches for CT implementation
- Designing lesson plans and activities
- Case study and activities
- Summary
- Glossary
- References

Understanding how adults learn is key for effective education.

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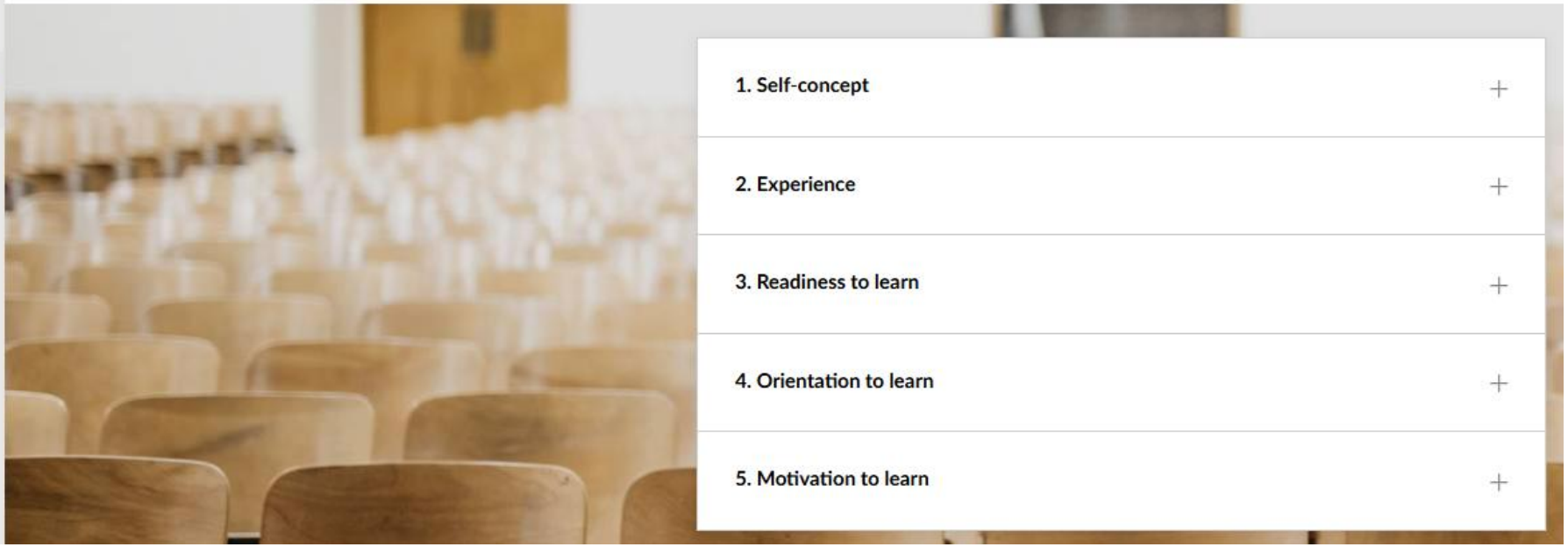

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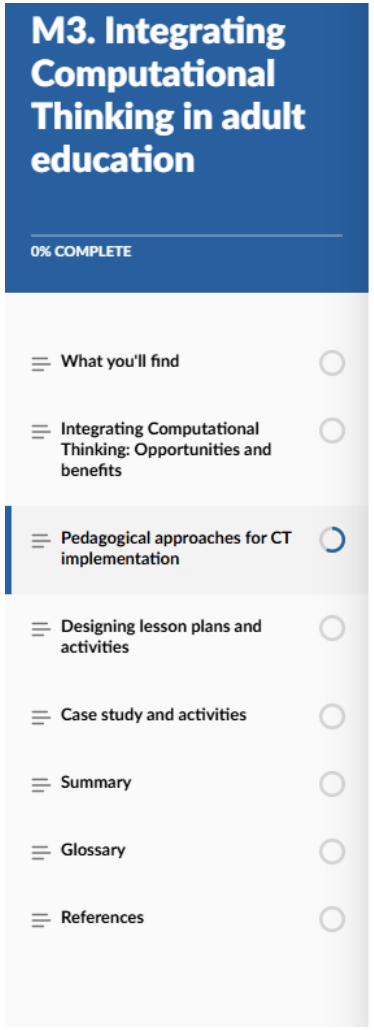
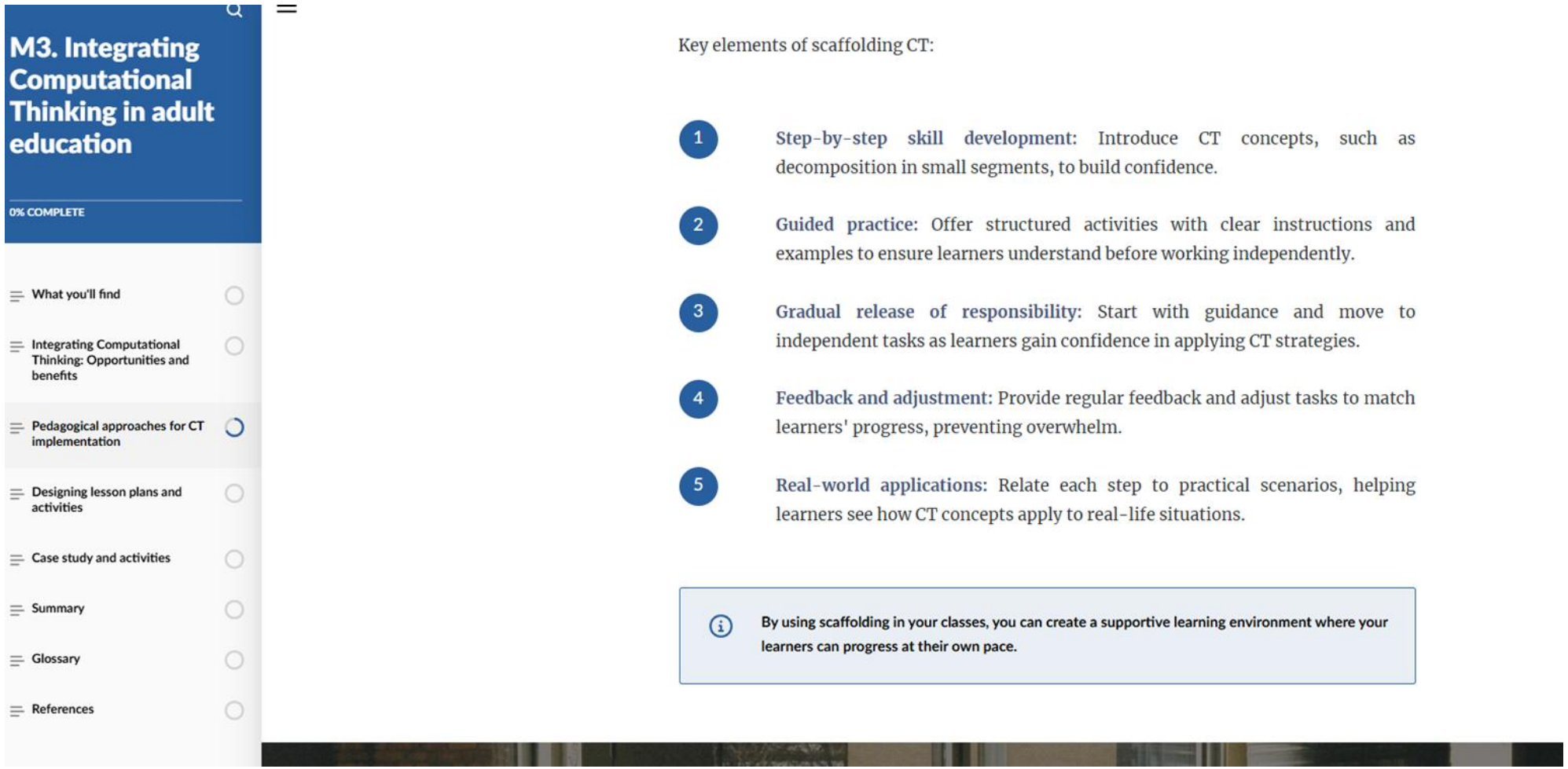


Teaching methods that work best for adult education

To effectively integrate computational thinking into adult education, it is essential to align teaching methods with the principles of CT, such as problem-solving, critical thinking, and logical reasoning. Strategies like **project-based learning, collaborative learning, and experiential learning** are especially effective in supporting CT by encouraging students to decompose complex tasks, identify patterns, and create structured solutions. These methods foster engagement, stronger understanding and the practical application of CT concepts.

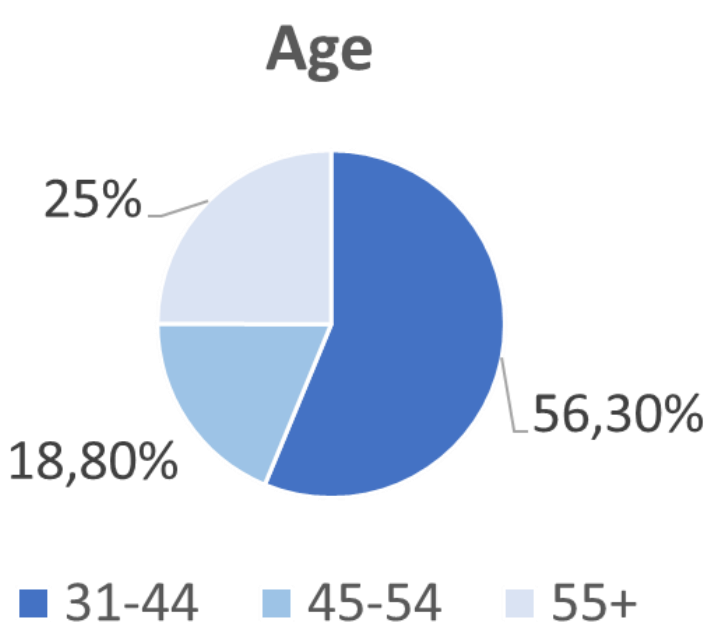
1. Project-Based Learning
2. Problem-Based Learning
3. Collaborative Learning
4. Experiential Learning
5. Self-Directed Learning
6. Flipped Classroom

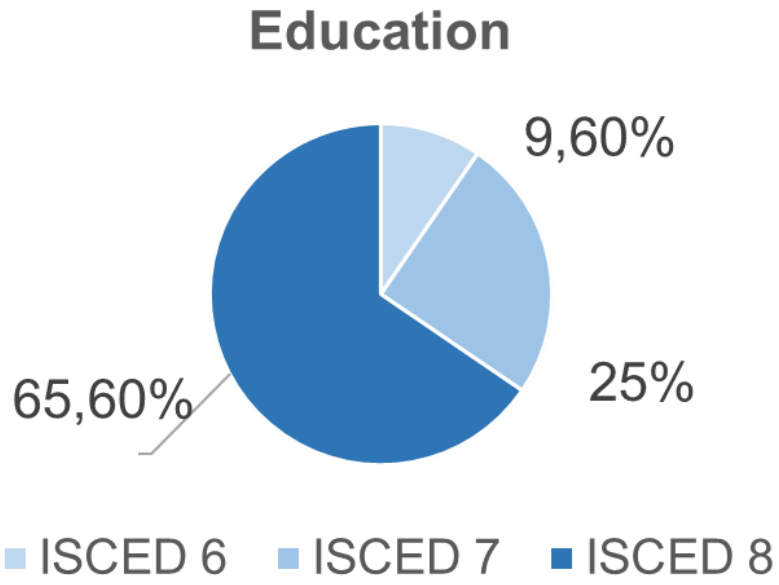
Project “COMPutational Seniors” implementation process



Results after OER testing: Lithuania

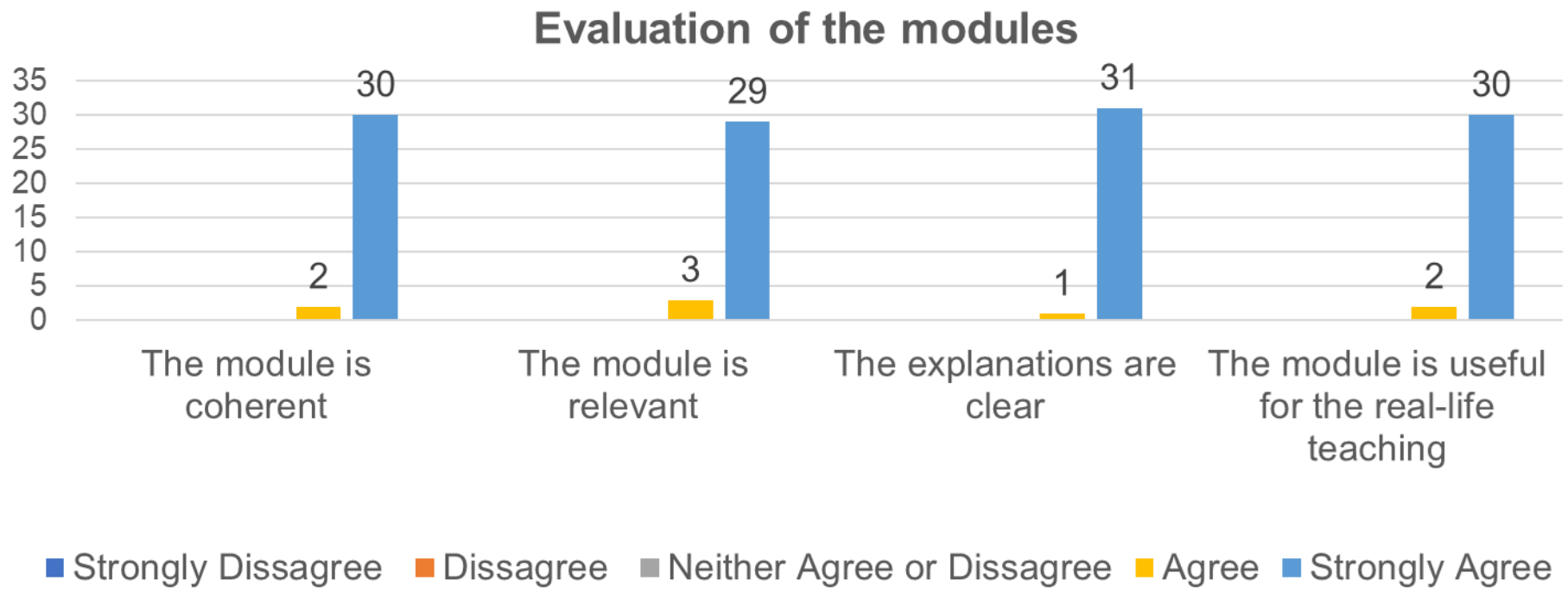
Characteristics of adult teachers, who participated in piloting process. 90,6% female and 9,4 male.





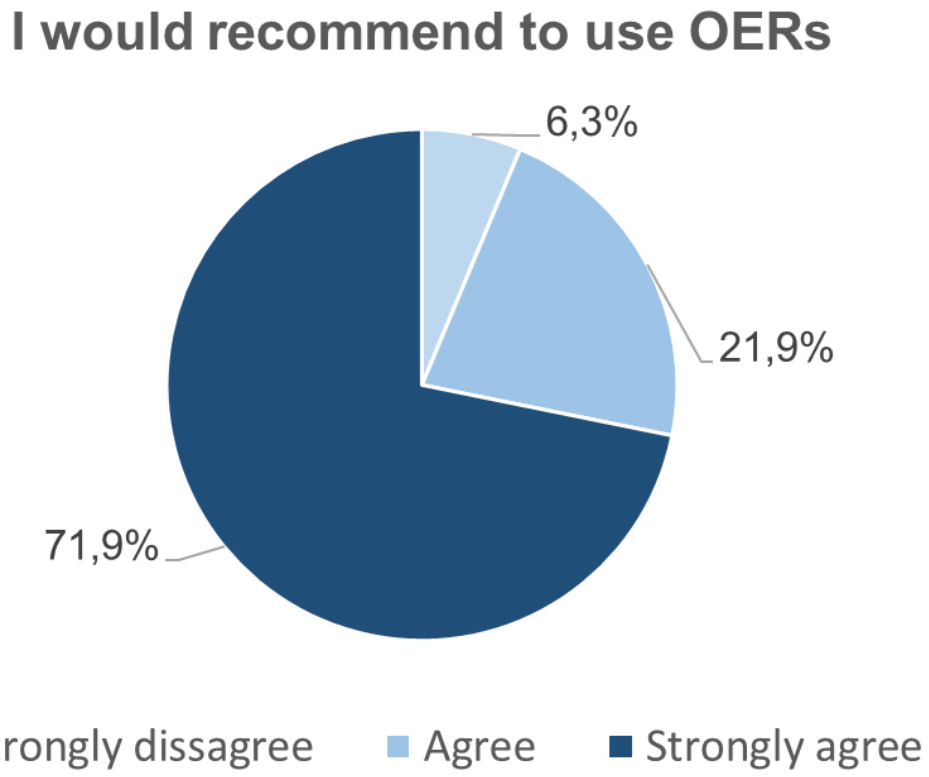
Results after OER testing: Lithuania

The feedback on „Computational Thinking“ modules that were tested: **coherence across the module, relevance of the content, clarity of the explanations and usefulness for the real-life teaching.**



Results after OERs testing: Lithuania

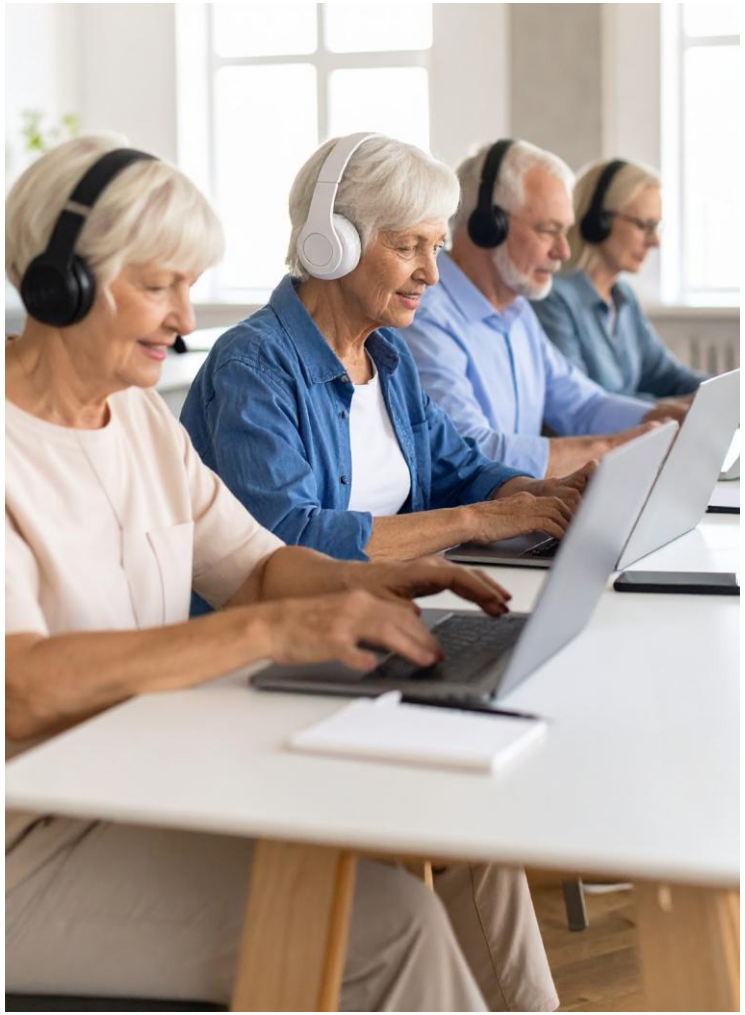
I would recommend the use of the “COMPutational Seniors“ OERs to other adult trainers seeking to incorporate CT into their teaching practices.



Results after OERs testing: Lithuania

Suggestions (1):

- More practical exercises, more real-life examples
- Apply it practice
- It would be valuable to provide examples of partnerships - how community centers, libraries or NGOs can put this module into practice.
- More AI tools, provide tools for training
- Optional reflection questions could be included
- Everything is Ok. I would suggest putting more than just a video in the introduction, if that is the logical idea of the developers



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Results after OERs testing: Lithuania

Suggestions (2):

- Everything is very good, every concept is explained
- To further enhance the impact of the module, I would suggest including **brief historical or cultural contexts** on how computational thinking evolved and why it is relevant today.
- I would suggest adding more **interactive examples related to everyday situations** to make it easier to apply the principles of computational thinking in practice
- I would recommend including more examples of subject integration that show how computational thinking can be applied not only in the field of technology, but also, for example, in language teaching, social

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Challenges: Design Process and Target Audience

Target Audience

- **Fears of older people** about their skills and capabilities to test the OER
- **Low engagement.** The understanding of real value of computational thinking application for real life solutions
- **Appropriate time.** During summer seniors and seniors teachers like to spend time outside
- **Responsibility**. Who is responsible for low-qualified adult raining? What about national policy?

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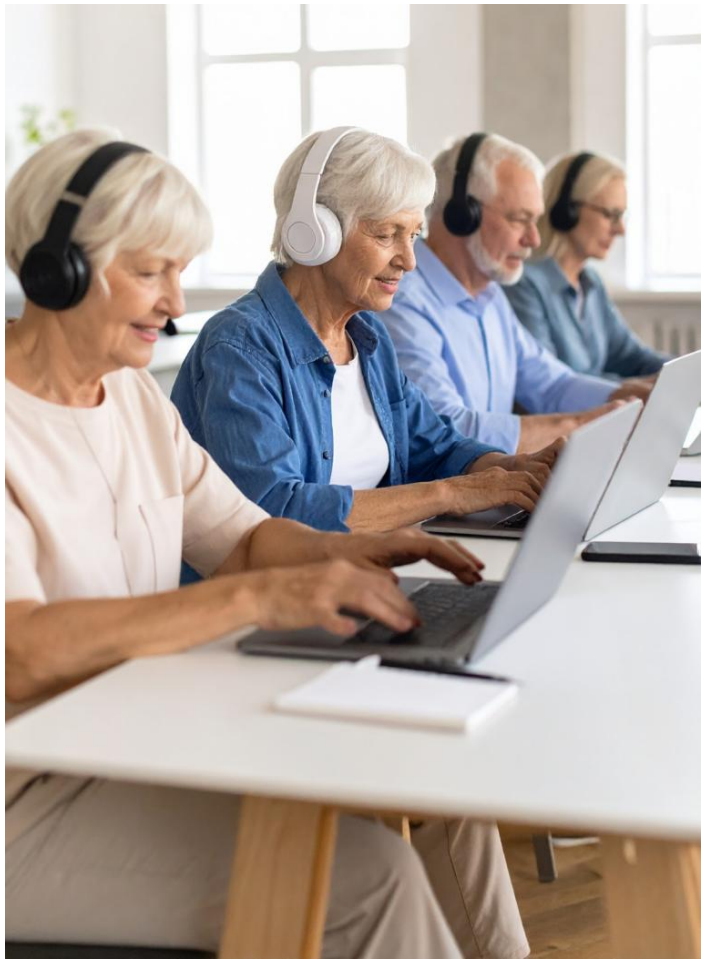
Challenges: Design Process and Target Audience

Design Process:

- **To ensure the consistency** through all the modules
- **To provide similar types of content and similar length, similar style**

Common:

- **Relationship between time spent on engagement and project deadline.** How to manage?



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Conclusion

- The findings from the project indicate a critical need to enhance CT competencies among low-qualified adults to improve their adaptability, critical thinking, and decision-making across various professional domains.
- CT is recognized as an essential skill for navigating technological advancements and addressing real-world challenges in education, work, and daily life.
- The primary evaluations of adult trainers are very positive: 92% of adult teachers, who participated in piloting process, will recommend the project OERs.
- However, challenges have also been identified, particularly concerning national policies that influence the implementation of CT education for low-qualified adults.

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Thank you. Questions?

https://computationalseniors.eu/