

Collaboration and research: the case of Italian teachers

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Abstract

Introduction: This study evaluates the effectiveness of a Nano Open Online Course (NOOC) on Collaborative Learning and Research Methodologies (CLRM) developed by the Italian Partner of the ENID-Teach Erasmus+ project. The course aims to enhance digital competences and foster student-centered learning in higher education. **Methodology:** The NOOC is designed for adult education, incorporating constructivist, cognitive, and sociocultural theories. It consists of four main parts covering collaborative learning, digital environments, and evaluation strategies. Data collection involved surveys and interviews. **Results:** Participants praised the course content, with 66.7% rating it as excellent. However, 50% expressed dissatisfaction with social cohesion aspects. Technological experiences were generally positive, with 83.3% evaluating them favorably. **Discussion:** The findings highlight the need for clearer definitions of interactivity and enhanced social interaction components. The study puts in evidence the resistance of Italian university teachers to take part in online courses concerning didactic innovation and digital tools and underscores the importance of policy adjustments to recognize pedagogical innovations in career evaluations, particularly in Italy.

Key words

Collaborative Learning, Research Methodologies, Nano Open Online Course (NOOC), Digital Education, Distributed Cognition, Computer-Supported Collaborative Learning (CSCL), Inquiry-Based Learning (IBL), Innovation in Italian Higher Education, Digital Transition in Italy.

Introduction¹

Within the **European Network in D-flexible Teaching (ENID-Teach)** Erasmus+ project, the **University Catania (UNICT)** was in charge of the development of the Nano Open Online

¹ Each author has undersigned with her initials the part of the article she wrote.

Course (NOOC) about **Collaborative Learning and Research Methodologies (CLRM)**. The NOOC specifically targets adult education, particularly within the university context.

Different European and international documents recommend that states and organizations involved in higher education implement effective measures to support universities and higher educational institutions in adapting their teaching and learning competencies, promoting student-centered teaching practices, encouraging research in the field of education, and fostering new digital approaches to teaching professionalism. This issue is gradually emerging in the Italian landscape as well, where, despite the limited recognition of the teaching practice compared to that of the research, some experiences are beginning to take shape, laying the groundwork for identifying an Italian specific approach to university teaching improvement (Felisatti et. al, 2022). The COVID-19 health crisis emerged in 2020 evidenced the need for innovation not only at the theoretical level but also in practical terms. The Italian Ministry of University and Research (MUR) promoted the establishment of **Teaching and Learning Centres (TLC)** and **Digital Education Hubs (DEH)** at Italian university (<https://www.mur.gov.it/it/pnrr/misure-e-componenti/m4c1/investimento-34-didattica-e-competenze-universitarie>), and during the last three years the discussion about didactic tools and pedagogical innovation has gained momentum as shown during the CRUI Conference (conference of all Heads of Italian Universities) in 2024 (<https://ict.crui.it/forum-pa-2024/digital-education-hub-linnovazione-digitale-per-il-sistema-universitario-italiano/>)

Despite these actions, in Italy, career advancement and regular merit evaluations (e.g., VQR) for university teachers have traditionally focused solely on research achievements and not on specific pedagogical training or merits. Until the last round of National Qualification (ASN), any qualifications or research conducted in pedagogy within each field of research were not recognized as scientifically valid. As a consequence, in the last decades, didactics has been considered a sort of “Cinderella science” and innovation in this field has lost interest. Moreover, the perception that online universities in Italy represent unfair competition to state universities has not helped in raising a positive interest towards the use of innovative methodologies. In addition to this and in contrast to the fact that digital teaching methods and tools were abruptly introduced during the COVID-19 pandemics, the majority of university teachers (at least in the humanities field) declare lack of computer literacy.

Given the specific choice of maintaining mainly non-distance learning environments in Italy (the 84 Italian public Universities have decided to allow only 10-20% of the course lessons online), the UNICT research team decided to structure its course on **Collaborative Learning and Research Methodology** through a series of sequential objectives supported by scientific evidence and statistical data, in order to make the research quality evident.

Theoretical framework

During the last decades, CLRM has been recognized as a twenty-first-century educational trend (OECD, 2019) in the educational sciences, both as a teaching approach and as a transversal skill set—general, essential competencies that students are expected to develop across various stages of their education, spanning the curriculum in a longitudinal manner (Binkley et al., 2012). Rooted on the main tenets of constructivists (Vygotsky, 1978; Smith & MacGregor, 1992), cognitive (Stahl, 2013), and sociocultural theories (Vygotsky & Kozulin, 1989), the NOOC about CLRM is built upon four key principles: learning is active, immersive, multimodal, and fundamentally social. These key principles emphasize the value of hands-on participation and shared experiences in constructing knowledge.

Each objective of the NOOC in CLRM is encapsulated in a unit designed around the microlearning principles of the **Nano Open Online Courses (NOOCs)**. This approach organizes content into concise modules, supplemented with extensive materials for further exploration, facilitating agile, efficient, and inclusive learning while allowing participants to choose how much time they dedicate to deeper study (Benavídez et al., 2019). The interconnection among content promotes dynamic acquisition of digital skills, intertwining theory and practice through self-assessment activities, discussions, and a final evaluation presented in various interactive formats (Basantes-Andrade et. al., 2020). Recognizing the challenges faced in engaging a broad audience of participants, the Italian team has committed significant resources to dissemination efforts, especially since the NOOCs will remain available for potential participants even after the project's conclusion.

In order to embrace the challenge of this important and necessary transition to student-centered learning environments, the Catania unit has developed the course introducing the main scientific issues supporting the change as necessary with respect to the cognitive functioning of learners in general. A key concept of the NOOC is therefore Distributed Cognition theory (Hutchins, 2020), which posits that cognition extends across social interactions, physical tools, and digital environments. By integrating these elements, distributed cognition offers opportunities for richer learning experiences (Karasavvidis, 2002). Moreover the NOOC in CLRM promotes the creation of multimodal learning environments that incorporate digital tools to support collaboration and analysis and learning styles.

For this reason, an attempt was made to bring out the links between collaborative learning methodology, the use of digital tools within teaching and cognitive science studies. In the course design, an effort was undertaken to create content that would prompt learners

- To develop the critical and reflective capacity about the need of transforming digital educational practices into accessible online learning environments for the participation and learning of all people.
- To discover the Collaborative Learning and Research Methodologies with their main roles, rules and limits..
- To explore the most useful digital environments and tools to favor the creation of learning environments according to the criteria of Universal Accessibility and Universal Design for Learning.
- To advance in the development of university courses based on collaborative and research activities, which conform to the principles of “Distributed cognition” and “Computer Supported Collaborative learning”.
- To deepen the process of collaborative design of digital learning programs introducing diverse forms of evaluation (peer to peer, summative, etc.).

The CLRM Nano-course is rooted in the concept of *learning by doing*, in the sense that all units are created as practical examples of what university teachers can reproduce for their own disciplines. As already said, the main core of the course was the Collaborative Learning (CL) methodology, which is a valuable strategy for higher education, moving away from conventional teacher-focused methods to prioritize joint intellectual engagement among participants. CL promotes group collaboration by embracing the unique skills and viewpoints of individual learners. This approach fosters a more inclusive, democratic and dynamic learning environment, enabling participants to exchange ideas via forum, engage critically, and take ownership of their own learning process (Laal et al., 2012).

The course was set up with the intention of responding to the educational needs of the future, which require teachers of all levels to have good skills in the use of digital tools, for the creation of learning environments that respond to the capabilities and needs of the new generations. Moreover, the European Digital Education Action Plan emphasises the transformative impact of digital technologies on society, asking education to shift to personalized, adaptable, student-centered, collaborative, and innovative learning (European Commission, 2021). Research indicates that technology is primarily used to support existing educational approaches (García del Dujo and Martín-Lucas, 2020; Lillejord et al., 2018). Therefore, the creation of blended learning courses which integrate digital tools with active in-person learning appear to be a possible solution to achieve the goals of digital education outlined in the EC plan. (Røe et al., 2022). For this reason, a specific part of the course was dedicated to the exploration of digital tools considered useful within academic courses.

In this context, the NOOC highlights Computer-Supported Collaborative Learning (CSCL) (Dillenbourg & Fischer, 2007) as a critical component, leveraging digital tools and platforms to facilitate both synchronous and asynchronous collaboration. Examples include discussion forums, interactive videos, and shared workspaces. By incorporating multimodal resources—such as text, images, videos, and animations—CSCL accommodates diverse learning styles (auditory, kinesthetic, and visual) and addresses modern educational demands for accessibility, interactivity, and personalization. This flexibility allows learners to choose preferred engagement modes, deepening understanding and sustaining interest.

The NOOC also introduces **Research and Inquiry-Based Learning (IBL)** as complementary methods to design specific tasks and activities within CL and CSCL environments. These student-centered methods promote active student engagement through the process of questioning and connecting real-life experiences. These methodologies prove to have a great impact on students' cognitive development, by improving their involvement in autonomous learning processes. They nurture critical thinking, problem-solving, and self-directed learning—skills that align with the evolving demands of the workforce and lifelong learning (Spronken-Smith & Walker, 2010; Spronken-Smith, 2012; Pedaste et al., 2015). The cognitive 5E Model (Engage, Explore, Explain, Elaborate, Evaluate) (Bybee et al., 2006) is presented as a framework associated with IBL (Pedaste et al., 2015) and employed to scaffold learning and encourage reflective practice.

By integrating collaborative and inquiry-based learning strategies, the NOOC seeks to cultivate a culture of innovation and lifelong learning. It underscores the transformative role of technology in enhancing education while prioritizing democratization, inclusivity and sustainability through digital learning tools and collaborative pedagogical environments.

Objectives

The ENID Teach project started in the first quarter of 2022 and ended in the first quarter of 2025. The Catania team, in designing the NOOC dedicated to Collaborative Learning and Research Methodology, tailored the proposed content for online learning to foster the development of digital competences, one of the eight key competences for lifelong learning (UNESCO, 2006; European Commission, 2019). The initiative was further aligned with the priorities of the European Agenda 2021–2027 (European Commission, 2023). The digital model was enriched with open and interactive educational resources (OERs), developed in accordance with the universal value of “leaving no one behind,” as emphasized in the United Nations' 2030 Agenda for Sustainable Development Goals. This has been achieved by dividing

the NOOC into a series of four main and independent **NUGGETS**, i.e very brief units provided with activities and materials, focused on specific topics:

- Collaborative Learning
- Pillars of Collaborative Learning
- Digital Environments
- Evaluation and Research

The first NUGGET presents the theoretical assumptions, basic conditions and the basic roles and rules of Collaborative Learning and Inquiry Based Learning Methodologies. It also presents the necessary changes in perspective attaining to the role of the teacher, who is no more regarded as an expert sharing knowledge with students and more as an expert designer of intellectual experiences for students. General aim of the Nugget is to guide towards the design of more emergent and autonomous learning environments (Smith, B. L. & MacGregor, J. T., 1992).

The second NUGGET introduces some basic issues of recent cognitive studies claiming that the learning subject has to be considered as mind-brain-body unit and cognition as dependent on what our bodies are capable of perceiving and doing when coupling in the world, shaping the knowledge about it by the possibilities of action (Ferreira, 2021).

The CL methodology proposed in this NOOC bases on the **4E Cognition theory** and therefore:

1. Cognition is always embedded, embodied, enacted and extended.
2. The learning process greatly depends on positive social interactions, and on the construction of multimodal, accessible, digital environments.

By leveraging the interplay of these elements, keeping in mind distributed cognition theory while developing lessons and courses, the opportunities for richer learning experiences has been proven to increase (Karasavvidis, 2002). Keeping these basic issues in mind and to promote the construction of interactive, flexible, multimodal and accessible learning environments, the NOOC suggests applying **Computer-Supported Collaborative Learning (CSCL) methodologies**

The third NUGGET introduces the use of specific digital tools to create effective digital learning environments. Here the creation of digital environments and online courses is also discussed in terms of their limitations, with attendant guidelines and quality checklists. It includes two specific sections:

1. One dedicated to Netiquette—essential etiquette for respectful and constructive communication within digital spaces—addresses the expectations of both instructors and students.
2. One section dedicated to the different learning styles (see. VARK Test: <https://vark-learn.com/>), and to the creation of **accessible and flexible digital learning environments**.

The fourth NUGGET introduces different assessment possibilities, proposing a combination of digital formative and summative evaluations tests. Indeed, we suggest that the design of course modelled on CL and Research Methodologies should be started by considering the quality and contents of the assessments keeping in mind that:

- Formative assessments, such as peer reviews and reflective exercises, help participants refine their skills in real-time.
- Summative assessments provide a comprehensive evaluation of their learning outcomes.

These assessments are aligned with collaborative goals, ensuring that individual contributions and group dynamics are both considered.

This NUGGET also aims to emphasize the importance of adapting learning courses to real-world contexts, so for instance, participants are encouraged to explore how collaborative and inquiry-based methods can address interdisciplinary challenges in STEM and non-STEM fields. By applying these strategies to practical scenarios, such as solving real-life problems or designing innovative research projects, educators develop transferable skills that can be used to enhance students' soft skills and prepare them for their future life at work.

All the contents, videos, materials, in-depth sheets, digital resources, and interactive tools are provided in five languages: English, Italian, Spanish, French, and Portuguese, with the aim of facilitating the training by limiting any language barrier. All the materials for the NOOC have been developed also considering all the tools to enhance inclusivity and the construction of a European teacher's network, **ReCOinTad**, in order to support the transmission of ideas and good practices. (RG)

Sample

Four online, open (free of charge iterations) of the NOOC on CLRM were conducted between 2023 and 2024. The first iteration (June-July 2023) put in evidence the need for a massive dissemination effort to implement the number of participants. The dissemination was conducted in a joint effort through the organization of online events (Multiplier Events) and sponsorship of activities via personal channels (e-mail addresses) and online platforms (social media). In order to actively contribute to the dissemination in Italy, the Catania team activated a dissemination campaign, participating in various national and international meetings (Didacta Italia Fair, Florence, 2024; Conference “Modelli organizzativi e ruolo dei Teaching and Learning Centre nelle Università”, Palermo, April 2024; Conference “New Trends in English Studies: Evolving Paradigms”, Enna, April 2024; 12th Mediterranean Interdisciplinary Forum on Social Sciences and Humanities - MIFS, Catania, May 2024; International Conference Cognitive Futures in the Humanities, Catania, June 2024). A total of 1,814 email addresses of Italian and European professors were collected and used to invite participants to the following iteration spans. In agreement with other partners, the Catania team also launched dissemination campaigns on social networks (Facebook, LinkedIn, X) and platforms dedicated to university professors (EPALE).

Period	Participants	
Iteration1 -19/06/23 - 19/07/2023	52	21%
Iterarion2 - 20/11/23 - 20/12/2023	175	19%
Iterarion3 - 15/05/2024 - 31/07/2024	229	20%
Iteration4 - 15/09/2024 - 15/11/2024	128	18%

Table 1. Number of enrolled participants for each iteration

This dissemination policy soon yielded results, as shown in the following diagram and, starting from the second iteration, the numbers increased, decreasing slightly during the last iteration (see Table 2).

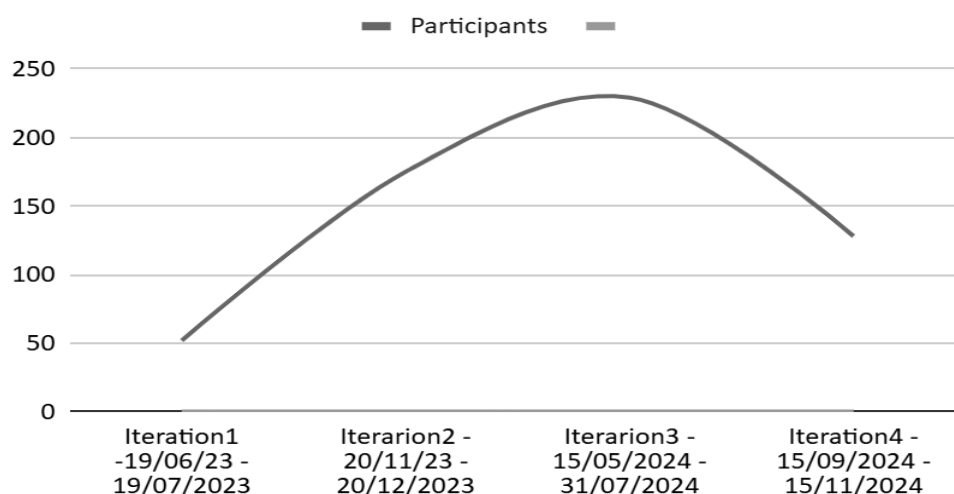


Table 2. Diagram showing the trend of participants' enrollment during the four iterations

Across the four iterations of the course, a total of 584 participants enrolled. Unfortunately, a significant proportion of these participants did not fully complete the demographic survey, which limited the availability of detailed demographic data. Among those who did provide demographic information, a notable trend emerged: the majority of participants identified as female (see Table 3). This observation highlights the importance of encouraging participants to complete demographic surveys to ensure more comprehensive data analysis in future studies.

Period	MEN		WOMEN		ND	
Iteration1 -19/06/23 - 19/07/23	11	21%	14	27%	27	52%
Iteration2 - 20/11/23 - 20/12/23	13	7%	35	20%	127	73%
Iteration3 - 15/05/24 - 31/07/24	18	8%	37	16%	176	76%
Iterarion4 - 15/09/24 - 15/11/24	24	18%	34	25%	76	57%

Table 3. Gender distribution among enrolled participants.

A consistent part of the enrolled participants did not complete the course. This was interpreted as negative feedback and the Catania team decided to shift some contents of the instruction to the in-deep sections, in order to shorten the reading time of instructions and encourage participation. The changes gave good results, as the increase in the number of participants who completed the course in later iterations attest (see Table 3).

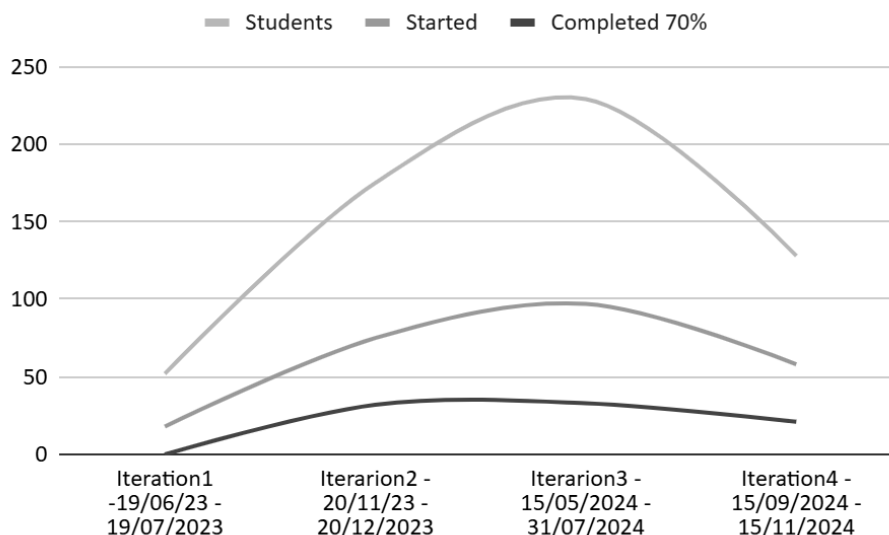


Table 3. Diagram showing the trend of participants who enrolled and completed the course.

The main part of the 584 students attending the course chose to follow it in the English version, while those who chose to follow the Italian version kept under the threshold of 20% as shown in the Diagram below (see Table 4).

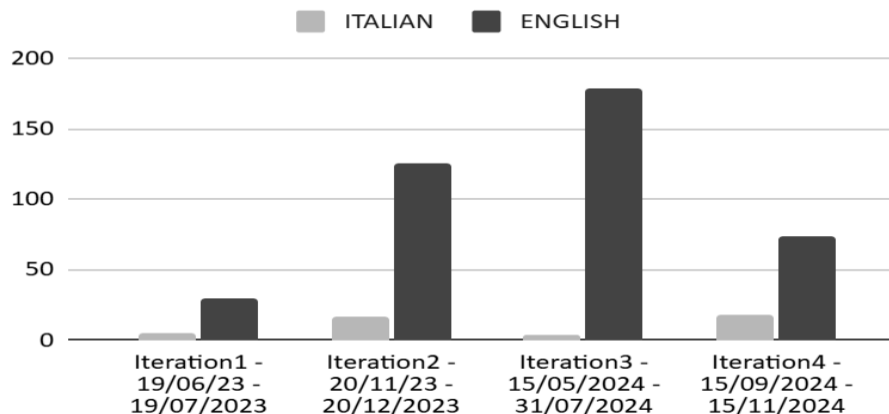


Table 4. Diagram showing the proportion of participants who enrolled in NOOC CLRM using the English version vs. those using the Italian version.

Considering that all enrolled participants are not native english speakers, the fact that they were able to engage with the course in English is a positive outcome, as it suggests that an increasing number of university teachers feel confident in their English language skills. This achievement should be tempered by the realization that the multilingual offering required a significant investment of the team's time, without yielding a substantial benefit for the users.

Despite all disseminating efforts, among all 584 enrolled participants to the NOOC about CLRM, the Italian participants were fewer (less than 20 per iteration) and only between 5-10% completed 70% of the course (see Table 5). The number of Italian teachers who enrolled was

disappointing and also the feedback collection phase from Italian participants produced few results.

Period	Participants		Italian		IT Completed 70%	
Iteration1 - 19/06/23-19/07/23	52	21%	5	10%	0	0%
Iteration2 - 20/11/23 - 20/12/23	175	19%	17	33%	18	10%
Iteration3 - 15/05/24 - 31/07/24	229	20%	4	8%	3	2%
Iteration4 - 15/09/24 - 15/11/24	128	18%	18	35%	9	5%

Table 5. Total participants and percentage of Italian ones who completed 70% of the course.

Despite numerous requests sent via e-mail to each participant and the prominent inclusion of a Satisfaction Questionnaire in all NOOCs across all iterations, as well as a dedicated feedback section in the final Nugget of the last iteration, a small number (only 18 participants) of Italian participants were willing to fill in the questionnaire or participate to the research phase and data collection through recorded interviews or focus groups. In consensus with the international staff, the Italian Team decided to implement an alternative strategy to collect feedback by preparing an online form in multiple languages. All the enrolled participants were invited via e-mail to fill in the form. This approach made it possible to collect some more data (6 forms in total).

Results

All the data of the recorded interviews, focus groups, and forms, which were collected by the Italian team will be analyzed together. All results reported below refer **exclusively to the Italian teachers** who participated in the course CLRM and joined the final research phase. The questions in all feedback forms concerned 5 core issues: Structure, Content, Methodology, Technology, Cohesion and Affiliation and gave mainly positive results.

Regarding the structure and content of the NOOC on CLRM, specifically the distribution of topics in the NUGGETS and the in-depth learning materials (as shown in Table 6), participants demonstrated high satisfaction, with 66.7% rating it as excellent, 16.7% as good, and 16.7% as adequate. In interviews, participants generally praised the course length and timing, finding it manageable despite their busy schedules, particularly for professors juggling teaching and research responsibilities. Notably, no negative evaluations were reported.

Structure & Content

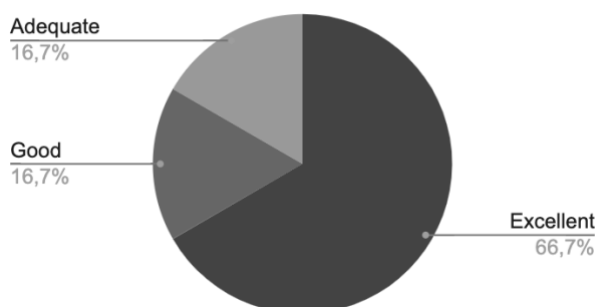


Table 6. Diagram concerning the evaluation of Structure and Content.

The methodology employed by the NOOC, encompassing communication and interaction processes, the assessment system, teaching staff performance, and the overall learning experience (as detailed in Table 7), received evaluations of excellent from 33.3% of participants, good from 50%, and poor from 16.7%. In interviews, participants generally praised the methodologies as innovative and engaging. However, one participant raised concerns about adapting these methodologies to courses more closely aligned with construction engineering.

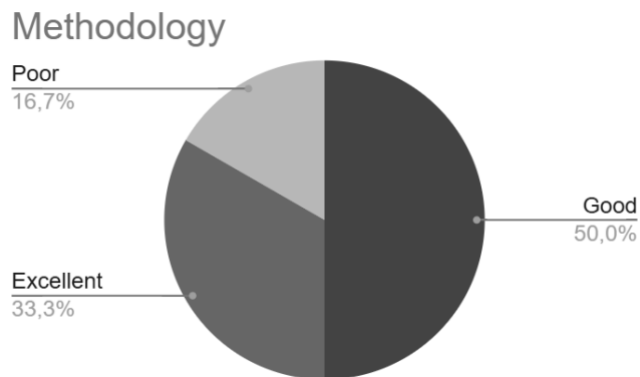


Table 7. Diagram showing the evaluation percentage concerning the process of communication and interaction among participants, the assessment system, the teaching staff performance, and the general learning experience.

Participants' experiences with technology, specifically their interactions with the Eco Platform hosting the NOOC and the course resources (as outlined in Table 8), were positively evaluated by 83.3%, while 16.7% considered it poor. In interviews, participants found the content highly engaging, clearly presented, and valuable for enhancing their knowledge in the subject area. However, some participants reported difficulties with the platform's interface, noting that navigation and readability were less intuitive compared to platforms like Moodle. Additionally, technical errors on the platform negatively impacted the experience for some users.

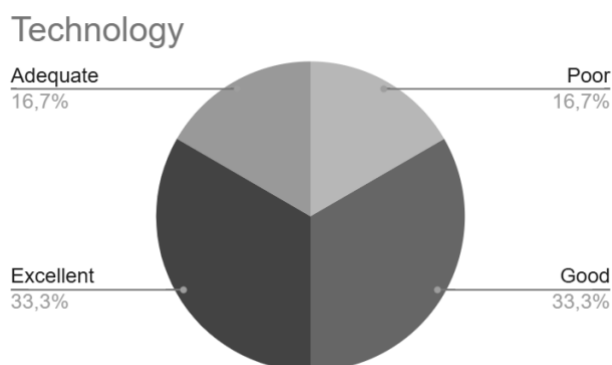


Table 8. Diagram showing the results of the questions about the experience with the technology of the course.

Fifty percent of the participants provided negative evaluations regarding cohesion and affiliation, specifically in terms of feeling part of a group during the course, collaborating with peers, engaging in discussions on the forum, and networking for future collaborations (as detailed in Table 9).

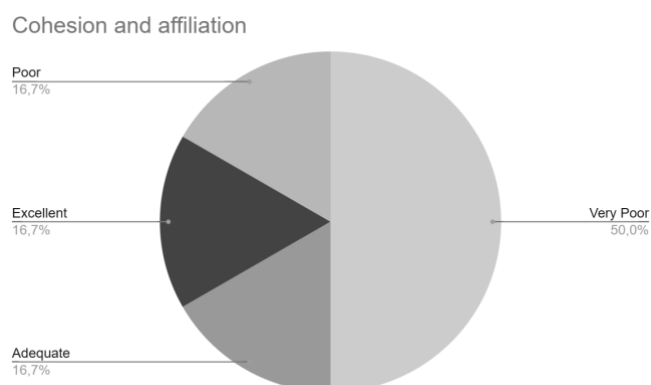


Table 9. Evaluation in percentage about Cohesion and Affiliation.

The negative feedback regarding cohesion and affiliation is largely attributed to participants' limited engagement with forum activities and a misunderstanding of the concept of "interactivity" in the resources. Many participants expressed a desire for more collaborative activities and interactions among peers and between tutors and participants in a NOOC focused on CLRM. Although the Open Educational Resources (OERs) require active user participation to be considered interactive, this nuance was not fully appreciated. Consequently, there is a need for future clarification on the definition of "interactivity" to align expectations with the actual interactive nature of the resources.

Conclusions

What has been shown so far leads us to two main conclusions. From an international perspective, the NOOC developed by the Catania team achieved good results as the number of participants who completed the training is within the statistical percentages for courses delivered online on a large scale. The NOOC is in fact a reduced form of the MOOC (Massive Online Open Courses), and statistics from literature on these kinds of courses reported that no more than 40–50% of students who enroll in MOOCs actually start the course, and of those, only 5–15% complete it (Jordan, 2015). Therefore, the number of participants who completed the course is perfectly in line with the KPI rate of Nano/Massive Online Open Courses.

Our findings indicate a contrasting perspective regarding the participation of Italian teachers in digital courses and their readiness for a digital transition. Despite efforts by the Catania team, the results show significant resistance to the changes in teaching delivery demanded by both the European Community and the Italian Ministry of Research and Education. This resistance may be attributed to the Ministry's assessment criteria for career advancement in universities, which do not recognize self-training and didactic research as valid scientific contributions for qualification purposes. This paradox creates a situation where Italian lecturers are caught between bureaucratic and scientific demands that do not value their efforts to improve teaching quality. This dynamic highlights a need for policy adjustments to align recognition of teaching innovations with broader educational goals. (FA)

References

- Basantes-Andrade, A., Cabezas-González, M., & Casillas-Martín, S. (2020). Los nano-MOOC como herramienta de formación en competencia digitales de los docentes de la Universidad Técnica del Norte. *Revista Ibérica de Sistemas e Tecnologías de Informação*, (E32), 202–214. <https://bit.ly/3guNOpT>
- Benavídez, P. G., Francés, J., Heredia-Avalos, S., Hernández Prados, A., & Rodes Roca, J. J. (2019). Análisis de la primera edición del NOOC: introducción a los fundamentos físicos para las ingenierías y la arquitectura. *Memorias del Programa de Redes-13CE de calidad, innovación e investigación en docencia universitaria. Convocatoria 2018-19*.
- Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., Miller-Ricci, M., & Rumble, M. (2012). Defining twenty-first century skills. In P. Griffin, B. McGaw, & E. Care (Eds.), *Assessment and teaching of 21st century skills* (pp. 17–66). Springer.
- Dillenbourg, P., & Fischer, F. (2007). Basics of computer-supported collaborative learning. *Zeitschrift für Berufs- und Wirtschaftspädagogik*, 21, 111–130.
- European Commission. (2019). *Key competences for lifelong learning*. <https://data.europa.eu/doi/10.2766/569540>
- European Commission. (2021). *Digital Education Action Plan (2021–2027): Resetting education and training for the digital age*. https://ec.europa.eu/education/education-in-the-eu/digital-education-actionplan_en
- European Commission. (2023). *Digital education action plan 2021–2027 – Improving the provision of digital skills in education and training*. <https://data.europa.eu/doi/10.2766/149764>
- Ferreira, J. M. (2021). What if we look at the body? An embodied perspective of collaborative learning. *Educational Psychology Review*, 33(4), 1455–1473. <https://doi.org/10.1007/s10648-021-09607-8>
- García del Dujo, Á., & Martín-Lucas, J. (2020). Towards ‘onlife’ education: How technology is forcing us to rethink pedagogy. In A. V. Martín-García (Ed.), *Blended learning: Convergence between technology and pedagogy* (pp. 1–19). Springer International Publishing.
- Hutchins, E. (2000). Distributed cognition. In *International encyclopedia of the social and behavioral sciences* (Vol. 138, pp. 1–10). Elsevier Science.
- Jordan, K. (2015). Massive open online course completion rates revisited: Assessment, length and attrition. *The International Review of Research in Open and Distributed Learning*, 16(3), 341–358.
- Laal, M., & Ghodsi, S. M. (2012). Benefits of collaborative learning. *Procedia - Social and Behavioral Sciences*, 31, 486–490. <https://doi.org/10.1016/j.sbspro.2011.12.091>
- Lillejord, S., Børte, K., Nesje, K., & Ruud, E. (2018). *Learning and teaching with technology in higher education: A systematic review*. Oslo, Norway.

Lotti, A., Serbati, A., Doria, B., Picasso, F., & Felisatti, E. (2022). Teaching and learning centre: Analysis of key elements. *Formazione & Insegnamento*, 20(2), 75–88. https://doi.org/10.7346/fei-XX-02-22_06

Organisation for Economic Co-operation and Development (OECD). (2019). *Trends shaping education*. https://doi.org/10.1787/trends_edu-2019-en

Røe, Y., Wojniusz, S., & Bjerke, A. H. (2022). The digital transformation of higher education teaching: Four pedagogical prescriptions to move active learning pedagogy forward. *Frontiers in Education*, 6, Article 784701.

Smith, B. L., & MacGregor, J. T. (1992). What is collaborative learning? In A. Goodsell, M. Maher, V. Tinto, B. L. Smith, & J. T. MacGregor (Eds.), *Collaborative learning: A sourcebook for higher education*. Pennsylvania State University; National Center on Postsecondary Teaching, Learning, and Assessment Publishing.

Stahl, G. (2013). Theories of cognition in collaborative learning. In *The international handbook of collaborative learning* (pp. 74–90).

UNESCO. (2006). *ICT competency standards for teachers: Competency standards module*. Paris: UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000156207>

Vygotsky, L. S. (1978). *Mind and society: The development of higher mental processes*. Harvard University Press.