HYBRID LEARNING CIRCLES AS ADAPTIVE ECOSYSTEMS: FACILITATING PARTICIPATION AND RESILIENCE IN ONLINE EDUCATION

I LEARNING CIRCLE IBRIDI COME ECOSISTEMI ADATTIVI: FACILITARE LA PARTECIPAZIONE E LA RESILIENZA NELL'ISTRUZIONE ONLINE

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ABSTRACT
This article presents results from a qualitative action-research project on hybrid Learning Circles (LCs), enhancing asynchronous learning with facilitated group sessions. The model fosters engagement, collaboration, peer support, well-being and cognitive focus by promoting learning micro-communities. As human intermediation and peer facilitation boost online learning experience, LCs emerge as adaptive, learner-centered ecosystems that promote inclusion and resilience in digital education.

L'articolo discute i risultati di un progetto di ricerca-azione qualitativa su *Learning Circle* (LC) ibridi per l'apprendimento asincrono in sessioni di gruppo facilitate. Il modello promuove *engagement*, collaborazione, supporto tra pari, benessere e focus cognitivo, creando micro-comunità di apprendimento. L'intermediazione umana e la *peer facilitation* migliorano l'esperienza di apprendimento online: i LC si dimostrano ecosistemi adattivi per l'educazione digitale, centrati sul discente, inclusivi e resilienti.

KEYWORDS
Hybrid education; Learning Circle; In-person facilitation; Engagement and motivation; Platform Pedagogy.
Educazione ibrida; Circoli d'Apprendimento; Facilitazione in presenza; Coinvolgimento e motivazione; Pedagogia delle piattaforme.

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Introduction

This paper presents findings from a qualitative action-research project conducted at Bicocca University, Milan (2022-2025), focused on Hybrid Learning Circles (HLCs) as an educational strategy to enhance engagement, sustainability, and completion rates in online courses. Responding to contemporary challenges posed by the accelerated digitalization of societies and of learning (UNESCO, 2021; Rivoltella & Rossi, 2024) and the evolving landscape of online higher education concerning access, cost, and quality (Xu & Xu, 2019), the study explores how facilitated small-group sessions, alternating with asynchronous online learning, can foster participation, collaboration and inclusion. The hybrid model acts as a buffer, enabling sustainable access to digital resources and facilitating a gradual approach for diverse populations, potentially mitigating issues related to the digital divide in terms of access and competence. The study addresses the critical need to design learning environments that nurture adaptability and resilience in learners (Oppl et al., 2017), capable of responding to the evolving digitalization of societies and to the challenges of contemporary education. It conceptualizes education within adaptive ecosystems, moving from rigid structures towards systems that are open, capable of considering subjectivity, and thus inclusive (Rivoltella, 2021), considering the socio-technical and cultural dimensions of technology integration (Rivoltella & Rossi, 2024).[1]

1. Theoretical framework

The theoretical foundation of this study is articulated around two interconnected pillars that serve distinct yet complementary functions within the project's research-action methodology. The first operates as a critical-analytical lens examining the limitations inherent in asynchronous online learning environments. The second centers on the potential of small-group and community-grounded models to foster meaningful and inclusive learning experiences. Within this framework, the concept of Hybrid Learning Circle (HLC) is reaffirmed as a methodological cornerstone, operating across in-person, synchronous, and

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asynchronous modalities, actively engaging with Virtual Learning Environments (VLEs) and Learning Management Systems (LMSs), while maintaining the human-centred, flexible, and situated dynamics of small-group interaction.

1.1 Analyzing Distance Learning and MOOCs drawbacks

In the last decade, a body of pedagogical literature has critically examined Massive Online Open Courses' (MOOCs') limitations, which, more broadly, can be extended to all fully asynchronous models of online education. In fact, MOOCs and Distance Learning (DL), despite their methodological, technological, and historical differences, can be examined through analogous theoretical and epistemological frameworks, emphasizing asynchronous design, platform-mediated learner engagement, and LMS or VLE only-based knowledge dissemination (Kotzee & Palermos, 2021; Quintana & Tan, 2019; Harasim, 2023; Bozkurt, 2019; Downes, 2023). The low levels of student engagement, completion, and social interaction of MOOCs and other types of asynchronous DL have long been debated (Sujatha & Kavitha, 2018; Pilli & Admiraal, 2017; Bonk & Lee, 2017). The literature identifies course student characteristics and especially pedagogical design as the main causes of these weaknesses (Kotzee & Palermos, 2021; Harasim, 2023; Kizilcec & Halawa, 2015). Williams et al. (2018) suggest that lack of learner motivation contributes significantly to the low completion rates of MOOCs; Kizilcec and Halawa (2015) explain course completion gaps—the difference between enrolment and completion rates—based on the learner profile factors that hinder students from finishing the course; social factors can play a significant role in attrition according also to other studies (e.g., Rosé et al., 2014); Ferguson and Clow (2015), and Williams et al (2018) discuss how different engagement behaviors are linked to learning outcomes; Hew and Cheung (2014) suggest that a lack of motivation, often compounded by insufficient time, prior knowledge, or failure to understand course content, significantly contributes to disengagement. This motivational deficit, however, can be mitigated by aspects of course design: online learning leaves learners with "no one to turn to for help" (id., p. 47), underscoring the importance of accessible interaction features to maintain engagement.

1.1.1 Course Design and Structure as Determinants of Success: The Role of Asynchronous Interactive Features

It is primarily course design-related issues that are being called into question, especially with the evolution from early DL models (Perraton, 2020) to sophisticated digital learning environments (Rivoltella & Rossi, 2024; Anderson &

Rivera Vargas, 2020). Completion rates are often observed varying significantly, depending on course length and assessment methods (Jordan, 2014, 2015); many studies highlight how courses designed with meaningful options for learners' access and use, modular structure, or a reduced volume of content can improve completion rates (Padilla Rodriguez, Armellini & Rodriguez Nieto, 2019, p.51). Ferguson and Clow (2015), Brooker et al. (2018), Wang and Baker (2015), and Bozkurt, Akgün-Özbek, and Zawacki-Richter (2017) show how asynchronous courses that take advantage of social interaction opportunities enabled by current technologies (quizzes, forums, and other interactive, student-centered resources) can foster learner engagement. Peters and Le Cornu note that "discussion forums have promoted collaborative learning and marked a shift away from standard behaviorist pedagogy" (2009, p.127), fostering a sense of community and mitigating the isolation often experienced in DL. Onah, Sinclair and Boyatt (2014) indicate how, within asynchronous courses, technology-mediated features of pedagogical tutoring for students, flexible course structures and adaptive learning pathways are critical to maintaining engagement and completion rates. Nevertheless, they found that not all students who paid for additional support utilized it fully, implying that motivation and time management are also significant and independent factors. However, the same argument suggests that the structural-functional features of learning platforms cannot, by themselves, determine the outcomes of students' engagement or motivation. In turn, these psychological dimensions are often implicitly portrayed in the literature as the sole and isolated endpoint—positioned diametrically opposite to the platform, the online content, the VLE, or the LMS—on which the success or failure of asynchronous online learning experiences ultimately depends. In fact, numerous studies highlight how student engagement in MOOCs tends to decline due to the self-directed and relationally isolated architecture of the learning process (Padilla Rodriguez, Armellini & Rodriguez Nieto, 2019, pp.47-52). Initially motivated, many students struggle to maintain consistency without structured support or interactions with peers (Rosé et al., 2014), experiencing progressive disengagement. As Petronzi and Hadi (2016) point out, "MOOCs are dependent on a self-guided and defined work schedule, further contributing to drop-out statistics" (p. 113).

1.1.2 The Concept of Platform Pedagogy: A Critical Perspective

The structural and design features of online courses are thus recognized as determining factors, the critical locus within which the possibilities of influencing the dynamics of engagement, completion rates, and social aspects of learning are

played out. The emphasis of many studies on the centrality of design is so pervasive that I suggest calling platform pedagogy that specific and contextualized version of online pedagogy, in which the platform goes beyond technological mediation, becoming the primary, sometimes sole educational agency interacting with the learner. Asynchronous interactivity tools—though valuable from an inclusivity standpoint (Calvani, 2020)—should be regarded as a digital extension of human pedagogical intermediation. Yet, they remain a diluted surrogate of the rich, multidimensional, sensory, emotional, and cognitive thickness that characterizes in-person interaction, lacking the immediacy and dynamic fluidity of real-time interpersonal exchanges. Indeed, asynchronous interactivity, despite being lauded as a major engagement tool, can be compared to the digitalization and remotification of human-mediated interaction, or a projection of it—shadowed onto the digital canvas of the online learning environment. Those design features of a learning platform that enable asynchronous interaction—such as quizzes, feedback mechanisms, discussion forums, and other interactive activities—can concur as core elements of course design and structure aimed at influencing student engagement. But when they end with being all learners are given to interact with, when the availability of asynchronous interactive functionalities plays a solitary role in shaping how learners interact with the content and with one another, that's when the platform becomes, from the one and only educational presidium provided to them, their only interlocutor.

1.2 Learning Circles Go Hybrid, or When Community-Based Practices Support Online Learning

A second theoretical framework element of this study is the concept of LC, as a methodological device designed to foster peer-led, small-group learning within micro-communities of practice. Rooted in dialogical and participatory pedagogies, LC promote collaborative meaning-making, mutual support, and co-construction of knowledge through structured yet flexible formats that value each participant's contribution. This approach aligns with constructivist principles and emphasizes the relational and social nature of learning. However, in the context of the present project—where small learning groups engaged with asynchronous online courses and digital content—, the pedagogical model was updated and reconceptualized to reflect the hybrid nature of DL environments, resulting in the formulation of the concept of the HLC, a tailored and context-sensitive interpretation responsive to the complexities of digital education. HLCs refer to a pedagogical configuration that integrates the traditional features of LC—such as collaborative learning, peer dialogue, and mutual support—with the specific affordances and complexities of

digital and online learning environments. Unlike conventional LC, which are historically grounded in face-to-face, community-centered educational traditions (Brookfield & Preskill, 2012; Collay, 1998; Suda, 2001; Peters & Le Cornu, 2009), HLCs function as cohesive learning groups that operate across both in-person, synchronous, and asynchronous settings—interacting within VLEs and LMSs—where the relational foundation established through face-to-face and synchronous encounters reinforces collaboration and continuity in asynchronous engagement.

This hybrid model acknowledges the structural and epistemological transformations brought about by digital technology, especially in the wake of the COVID-19 pandemic, which catalyzed processes of both expansion and deepening of digital pedagogy that were already in course (Calvani, 2020; Rivoltella & Rossi, 2024). HLCs strategically interweave the digitalization of learning contents and self-directed flexibility of asynchronous access to them with moments of synchronous or in-presence group facilitation (Linder, 2020), aiming to restore the human dimension of learning within the digital ecosystem. Moreover, HLCs respond to critical challenges in online education—such as learner isolation, lack of personalization, and high dropout rates—by reintroducing embodied, enacted, and embedded dimensions of learning (Varela, Thompson & Rosch, 1991; Garavaglia & Petti, 2022). Their implementation reflects a complex interplay between cognitive, emotional, and social-relational variables, and serves as a fertile ground for inclusive, accessible, and metacognitively rich learning practices, particularly relevant in the field of special education (Molinari et al., 2022; Trentin, 2014). By situating the LC within digitally mediated contexts, HLCs embody a paradigmatic shift toward adaptive, learner-centered, and community-sensitive ecosystems of learning—aligned with the vision of education as on-life, as proposed by Floridi (2015), and with the principles of Universal Design for Learning (UDL; CAST, 2018). The HLC concept thus captures not merely a technical hybridization of formats, but a deeper pedagogical reconfiguration responsive to the post-digital condition of contemporary learning. This blended approach aims to capitalize on the distinct advantages offered by each learning modality, thereby cultivating a more resilient and versatile educational experience (Bonaiuti & Dipace, 2021), which is particularly pertinent within the realm of special education, where tailored support and collaborative learning assume critical importance (Trentin, 2019). The integration of in-person or synchronous facilitated group sessions is crucial, as it activates sensory, affective, and symbolic dimensions that enrich the learning process, impacting both personal well-being and cognitive engagement. The student-centeredness of the model offers a valuable resource for expanding the range of pedagogical possibilities compared to mere platform pedagogies,

integrating and expanding instructional design, facilitation strategies, and the methodological toolkit available in digital learning environments.

The theoretical underpinning of this framework draws from concepts of community-grounded ecosystems, learner-centered pedagogies, and adaptive educational practices, all of which are crucial for fostering inclusive and effective learning environments (Hege, 2011). The Community of Inquiry framework (Garrison, Anderson, & Archer, 2000) is used to intentionally design, facilitate, and direct a collaborative constructive learning environment, for students to learn how to co-regulate their learning (Vaughan, 2022). Scientific research exploring learning and cognition, from both neuroscientific (Kandel, Schwartz & Jessel, 2000) and neuro-phenomenological (Varela, 1996; Thompson, 2007) perspectives, positions the mind-body-environment connection as fundamental. This same interconnection is central to recent frameworks in enactive teaching (Rossi, 2011) and Neurodidactics (Rivoltella, 2012). The creation of hybrid learning environments necessitates the intentional design of meaningful opportunities that foster robust social interaction and collaborative engagement. This extends beyond mere academic support to encompass the development of crucial social skills, including emotional intelligence and a strengthened sense of community, all vital for holistic development and academic success (Singh, Singh & Matthees, 2022). The focus on pedagogical relationships within the LC model aims to build these connections.

Within this framework, the P2PU@Unimib action-research project implemented and studied HLCs based on the development of collaborative peer dynamics in a facilitated group context, through which different types of participants were offered online training courses of varying size and composition in adult training and in higher education.

2. The P2PU@Unimib Project

2.1 The action-research

The action-research is centered on the establishment of HLCs for small groups of participants to carry out and complete online training courses in a climate of satisfaction and gratification, alternating asynchronous digital learning with facilitated face-to-face or synchronous small-group sessions, and designed to foster active participation and peer collaboration. In fact, the P2PU@unimib project is partially inspired by the Peer To Peer University network, founded in the United States in 2008, applied in adult education settings to make MOOCs accessible to disadvantaged groups or to self-organized groups of higher education students.

P2PU@Unimib pursued two main objectives: firstly, to test the HLC-based approach with diverse populations, adapting it to heterogeneous groups: university researchers, administrative staff, students, doctoral students, socio-educational trainers, and (in partnership with nonprofit training providers) adults facing social and occupational integration challenges. The project recontextualized the P2PU model, developing it in original ways in the local pedagogical, organizational, and design contexts of application. The second aim was to analyze the training impact of HLCs, identifying strategies to improve learners' engagement and interaction, as well as their enjoyment, satisfaction with the learning experience, and perceived self-efficacy, to develop a more widely applicable hybrid model.

P2PU was not born as a methodological approach—let alone one aimed at 'recovering' presence—but rather and foremost as a practical solution to a challenge of full social realization of the promised "openness" of MOOCs. P2PU@Unimib aimed at analyzing the positive effects that can derive from attending together between peers online courses originally designed for individual asynchronous use. The formula for the attendance is that of small group meetings, basically in presence, oriented to the sharing of the training experience by the participants (use of online contents; navigation through the training pathway) and to the dimension of reinforcement and support, stimulation and confirmation that the group setting, if suitably facilitated, can offer to everyone. Emphasis on peer support and group self-management aligns with findings suggesting that such dynamics can enhance inclusion and accessibility, sometimes obviating the need for specific technological aids (Calvani, 2020).

2.2 Methodology

The methodology employed in this study is rooted in qualitative action research, allowing for iterative cycles of planning, implementation, observation, and reflection—which is particularly well-suited to understanding the nuanced dynamics of HLC within specific educational contexts (Morrison & Jacobsen, 2023), with a multi-method qualitative design (Creswell, 2013). From 2022 to October 2024, 52 groups participated in an online training course of their interest (a total of 16 different courses were delivered), through participation in LCs, each focused on accessing, using, and completing the content and activities offered by their online course. About 252 learners participated (on average, 4.8 participants per group), with a total of 189 meetings (on average, 3.6 meetings per group). The composition of the group (number of participants, participation rules related, for example, to attendance) and the number of meetings depended on several contextual

variables, such as the objectives and complexity of the course and the diverse and changing needs of the participants. Sample composition resulted from a purposive recruitment strategy within organizational proximity networks, primarily targeting diverse populations within the University of Milano-Bicocca (undergraduate and doctoral students, administrative staff) and a partnering non-profit consortium in the Milan metropolitan area. The consortium component included both training professionals and service users representing socio-economically marginalized populations. While organizational convenience influenced recruitment, this approach aligned strategically with the study's dual focus on higher education and adult lifelong learning contexts, particularly among underserved communities. This sampling framework, though constrained by accessibility factors, enabled systematic comparison across educational levels and socio-cultural backgrounds, supporting the action-research objective of testing HLC implementation across heterogeneous learning contexts (Merriam & Tisdell, 2016).

Drawing on participant observation, field diaries, semi-structured interviews, and questionnaires, the research adopted a phenomenological and ethnographic approach (Varela, 1996; Van Manen, 1990), allowing a deep understanding of learners' experiences within LCs. Pre-/post-course questionnaires mapped participants' prior learning (in-person vs. remote; synchronous vs. asynchronous; individual vs. group) and probed their experience of LCs. Throughout 130 meetings we gathered Meeting Logs—structured forms that functioned as phenomenological diaries, recording group dynamics, facilitator actions, peer-learning incidents and affective states. In 84 meetings members also submitted personal ethnographic journals. Complementing these artifacts, we conducted 20 semi-structured interviews with learners and facilitators and compiled extensive field notes as participant-observer in 84 sessions and as non-participant observer in a further 32, using audio/video recording where ethically appropriate. Data analysis employed two complementary approaches tailored to material characteristics. Content analysis was applied to structured data sources (Meeting Logs, pre/post questionnaires, and demographic information) to identify patterns in group dynamics, facilitator interventions, and participant engagement levels. Textual analysis was employed for unstructured narrative materials (personal ethnographic journals, interview transcripts, and field notes) to capture nuanced meanings, lived experiences, and emergent themes within participants' learning journeys. This dual analytical framework enabled both systematic categorization of observable phenomena and interpretive understanding of subjective experiences.

The methodological approach adopted in this project combines qualitative data collection with the implementation of hybrid learning models, allowing for an in-depth investigation of the socio-technical configurations that influence motivation and learning in online education (Fidalgo-Blanco, Sein-Echaluce, & Garcia-Peñalvo, 2016).

2.3 General outcomes

Participants consistently reported a high level of appreciation for the Learning Circles' hospitable and well-curated environment, which fostered engagement for 75,4% of learners. The role of facilitation and peer mediation emerged as a key factor in shaping the learning experience, with 93,25% of participants acknowledging their positive influence. The hybrid model proved highly effective in supporting learner persistence and success: of the 252 enrolled participants, 251 completed their courses, with the sole exception being a learner who never engaged with the activities.

3. Reflections on Impact. Key Features of HLC Emerging from the Action-Research

This section discusses the main findings of the project by focusing on the pedagogical characteristics of the HLCs that proved most relevant and impactful. Each of the following sub-sections explores a distinctive feature that contributed meaningfully to the success of the intervention, shedding light on its implications for inclusive, community-based online education. These features will be further substantiated by empirical findings and participants' reflections.

3.1 Welcoming, Inclusive and Collaborative Environment

Great attention was dedicated to setting up spaces, so that a welcoming and comfortable environment would guarantee favorable material and symbolic conditions, allowing participants to best channel energies and skills in active participation. The importance of the learning setting, whether physical or digital, is increasingly recognized as a factor influencing learning processes (Garavaglia & Petti, 2022, pp. 71 ff.). The design of the HLC setting is intentionally crafted to foster collaborative and virtuous dynamics. Notably, the hybrid model fostered adaptive learning environments that aligned with the principles of learner-centered design and UDL, without rigidly adhering to pre-established templates but evolving through context-sensitive practices (Oppl et al., 2017). Gestures of sensory and symbolic care—such as offering refreshments, accommodating dietary needs, and

designing welcoming rituals—were unanimously and overwhelmingly appreciated by participants, who testified for their crucial role in fostering emotional ease, social cohesion, and cognitive readiness. Participants widely appreciated the relaxed and hospitable climate, the micro-social situation, which, starting from the creation of a comfortable atmosphere (aspects of agreeableness, hospitality, welcoming), created, according to almost all participants, optimal conditions for commitment and fostered positive interdependence.

As shown in Figure no.1, in end-of-course questionnaires, among the 204 participants (81% of the total sample) who attended in-person sessions, 40.20% rated the physical space as "fairly" adequate in supporting participation and enjoyment of online content, 59.31% rated it "very much," while only one participant (0.49%) gave a neutral response.

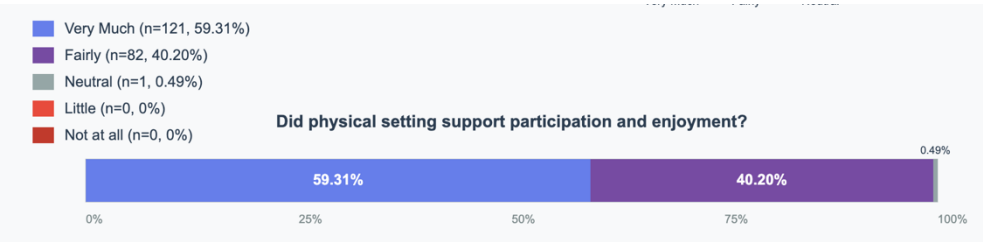

Figure 1. Was the physical setting adequate to support participation and enjoyment of online content?

These findings highlight the relevance of environmental care and spatial design in fostering engagement in hybrid learning contexts. While some professionals may misread these actions as signs of informal benevolence or non-professional kindness, such interpretations overlook their deliberate pedagogical function. As supported by enactive, embedded and embodied learning theories (Rivoltella, 2012), these practices are not peripheral but central. These dimensions are central to understanding how the mind-body-environment connection influences learning (Thompson, 2007; Varela, 1996).

3.2 Sustainability

The implementation of LCs prioritized a principle of organizational and individual sustainability, reducing to a minimum the number of in-person or synchronous LC meetings and keeping under control the workload outside the LC meetings—to ease logistics, ensuring accessibility and manageability for both participants and host organizations. Also maintaining the voluntary or rotational nature of the

facilitator role proved a sustainable strategy. Field observations proved that keeping the experience under sustainable conditions let HLCs effectively support collaboration, motivation, inclusivity and well-being while reducing the need for specialized instructors. These aspects suggest that the proposed framework can guarantee cost-effectiveness, adaptability across different learning contexts and participants' wellbeing, fostering resilience, flexibility and collaboration. One participant reflected during a final group session: “We talked about it during one of our last sessions and agreed that the format worked well because it didn’t overwhelm us. The structure helped us stay focused and motivated without feeling pressured—just enough support, without the need for constant expert guidance.”. As an interviewed facilitator also pointed out: “The fact that we could shape the schedule and rhythm of our meetings together really made a difference. That freedom—deciding as a group how to proceed—created a relaxed atmosphere where everyone felt respected and engaged.”

3.3 Facilitation Role

HLC were carried out with particular attention to the role of the facilitator, integrating diverse interdisciplinary competencies, from coordinating group dynamics, to supporting collaborative navigation of online contents, and nurturing a positive climate (Fedeli & Frison, 2018). Facilitators need to intercept interaction patterns, promoting mutual help, fostering motivation, and mediating cognitive-affective dimensions, including well-being, concentration, and stress management. As shown in Figure no.2, in response to the question "To what extent did the group facilitation contribute to the effectiveness of the training course?", 125 (53.19%) responded "Fairly" and 110 (46.81%) answered "Much".

Figure 2. To what extent did group facilitation contribute to training effectiveness?

Observation fieldnotes consistently highlight that small-group facilitation helped activate the embedded, embodied, and enacted dimensions of learning

(Thompson, 2007; Rivoltella, 2012). The facilitator emerged as pivotal in establishing a convivial and hospitable relational climate. In a fieldnote from a HLC session on advanced Excel use among administrative staff, I describe a facilitator who appears

> “particularly attentive to fostering inclusive dynamics in a group heterogeneous as to technical proficiency. He strategically engages participants perceived as less prepared during moments of experiential exchange, thus ensuring their active involvement in phases of the discussion that are less specialized and more accessible. This approach seems to mitigate asymmetries in prior knowledge, granting less experienced participants a more central role in collective meaning-making.”

In another session, fieldnotes record an instance in which

> “a light-hearted, humorous atmosphere among group members appear to risk distracting from cognitive objectives. The facilitator's intervention, while tactful and respectful of the group's spontaneity, redirect attention toward the shared learning goals: “Alright, what do you say we go back to watching the video-lesson on the platform?””.

Facilitators act not only as relational mediators but as regulatory agents of pedagogical tempo, enabling groups to oscillate productively between play and discipline, dispersion and concentration, in a dynamic yet intentional learning rhythm. Participants' feedback highlights the perceived usefulness of facilitation across organizational, relational, cognitive, and affective dimensions, confirming its central function for the effectiveness of HLCs, and leading the project to develop specific research on the skills necessary to effectively fill this role. Many facilitators reported strengthening their leadership, group management and interpersonal communication, enhancing metacognitive awareness and self-evaluation abilities. During an interview, a facilitator explains:

> “I don’t think my role was particularly necessary or influential—the group worked well on its own and was fully capable of managing the tasks. Still, it was nice to be in a position where I could support the group, especially when someone was falling behind or had missed a session. I was glad to help, and in a way, it even felt good for me too.”

This perspective underscores the distributed nature of facilitation in HLC, where leadership is not imposed but situational and reciprocal. The testimony affirms how inclusive, flexible learning environments foster agency and recognition through

quiet, non-intrusive forms of contribution—further anchoring the emotional and relational value of peer support within a sustainable group structure.

3.4 Well-being and Pleasure Factors

Beyond what discussed in § 3.1, two further forms of wellbeing— distinct but interconnected—emerged as significant in our research: a passive comfort wellbeing related to psychological safety and relaxation, and an active and activating stimulative wellbeing connected to engagement, humour, and cognitive triggering. The first form manifested through a judgment-free environment where participants could freely express themselves and authentically interact. As one participant noted in their journal: "I never felt judged when asking questions, which made me more willing to take risks in my learning." On the other side, stimulative wellbeing was characterized by moments of good humour, carefree jokes, smiles about the most different topics, converging or diverging from that course themes. These elements created a stimulating atmosphere that strengthened interpersonal bonds while encouraging deeper cognitive engagement.

As shown in Figures no. 3 and 4, in the end-of-course individual questionnaires, regarding the statement "The atmosphere was serene, acceptance and lack of mutual judgement ruled within the group", 53.97% (136 participants) responded with "Fairly", and 45.24% (114 participants) with "Much", totalling a 99.21% of participants (250 out of 252), and confirming the widespread perception of a safe, respectful and non-judgmental group climate. Similarly, in response to "There were humour, light-heartedness, fun", 91.27% of participants (230 out of 252) selected either "Fairly" or "Much", with 67.86% (171 participants) choosing "Fairly" and 23.41% (59 participants) selecting "Much."

Figure 3. To what extent did group facilitation contribute to training effectiveness?

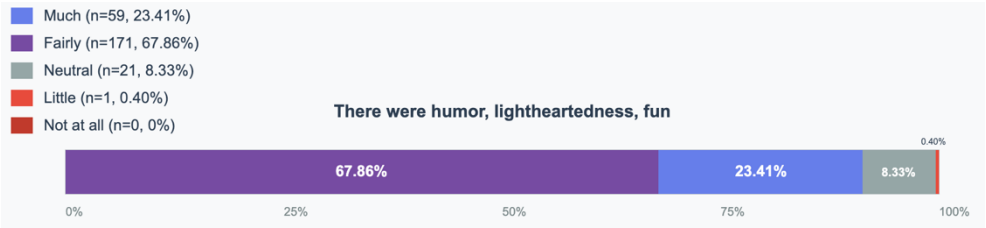

Figure 4. There were humor, lightheartedness, fun?

These figures indicate the frequent presence of levity and conviviality, often cited by participants as contributing factors to group cohesion, mutual engagement and a relaxed yet productive learning environment.

3.5 Affective Foundations of Cognitive Engagement: The Interplay Between Group Climate and Learning Performance

The data collected reveals the functional interdependence between socio-emotional dynamics and cognitive–attentional performance, aligning with established research on the impact of emotional states on learning (Immordino-Yang & Damasio, 2007; Pekrun, 2019). I suggest describing what emerges as an integrated learning ecology, in which socioemotional climate and cognitive achievement operate in synergy rather than as separate domains. Tens of participants reflected on this relationship explicitly in their autoethnographic journals. For example:

> “These meetings are an opportunity to reflect on how a positive, relaxed, pleasant working climate, with small gestures of care—a coffee, a chocolate—but also moments of relationship within the group, can be fundamental for instilling motivation to learn, to concentrate, to work with greater intensity. I am very grateful for this experience which, among other things, allowed me to better know my colleagues and see them in a light I had never had the opportunity to experience. Perhaps this also helped me to always stay so focused on the course, which truly went beyond my expectations."

This account highlights how positive social dynamics not only enhance the relational experience but directly contribute to sustained cognitive focus and motivation, echoing research on the role of social belonging in educational contexts (Walton & Cohen, 2011). Another participant noted the transformative effect on their subject-matter engagement:

> “Finally, a pleasant course. Among other things, the subject was initially of little interest to me, yet now that we are at the end, I find myself thinking that I will miss this positive and serene climate, and I think it is no coincidence if even GDPR [course subject, Editor's note] is now much less daunting and unpleasant to me.”

This testimony reveals how affective dimensions of learning environments can substantially alter learners’ perceptions of and engagement with challenging subject matter, suggesting a direct pathway between emotional comfort and cognitive accessibility, consistent with findings on emotional regulation and academic performance (Ladd et al., 2014).

These reflections point to a bidirectional relationship between wellbeing and achievement—not merely parallel experiences but dimensions mutually holding to one another, reflecting Vygotsky's socio-cultural theory of learning and the zone of proximal development (Shabani, 2016). What I call the pathway from connection to cognition becomes evident as social bonds foster intellectual engagement. A facilitator elaborated the point:

> “I think that without the collaborative atmosphere, the absence of judgment [...], the aspects of wellbeing that we mentioned [...], our group and our journey would not have been the same: that is, the group and the journey were that very thing—effective, productive, successful—precisely because there were those beautiful things related to being together, helping each other, the coffee at the beginning [of each meeting], etc.”

This layered interdependence reinforces the pedagogical value of intentionally fostering emotionally attuned environments in small-group online settings (Garrison & Akyol, 2015).

These dimensions produced an "acceleration effect" on cognitive faculties that enhances learning performance both individually and collectively. This facilitative effect appears to depend primarily on three elements: the embodied presence of others sharing a workspace and relational field; the material objects inhabiting the setting; and the facilitator's gestures and caring interventions. These ingredients transform the setting into something more profound: a field of relations that is simultaneously material and immaterial, sensitive and symbolic. Such an environment appears to unleash renewed cognitive and affective energies, creating what can be understood as emotional scaffolding for cognitive success (Means et al., 2013; Shea, Li & Pickett, 2006; Bernard et al., 2009).

3.6 Creating Collaborative Micro-communities: From Platform Pedagogy to Human-Centered Educational Ecosystems

The HLC implementation revealed a remarkable capacity to foster collaborative micro-communities—cohesive social units characterized by shared purpose and collective identity, bringing a fundamental shift from platform-centered to relationship-centered educational paradigms.

The Development of Relational Ecosystems. The relational structure of HLC enhanced participants' sense of belonging, mutual support, and psychological resilience, supporting gradual development of transversal skills, including critical thinking, adaptability, leadership, and interpersonal communication (Collay, 1998; Wardale, 2013; Fedeli & Frison, 2018). Despite the reduced number of meetings and limited hours spent together, physical presence proved to be a key factor in triggering cognitive engagement and motivational activation. As an interviewed facilitator observed:

> "We gradually stopped perceiving ourselves as isolated learners accessing the same platform and began functioning as a learning collective with shared goals and complementary strengths" (emphasis added).

This transformation of identity from individual consumers of content to members of a purposeful community favours what Trentin (2014) describes as knowledge flows within hybrid interaction systems.

Spontaneous Community Formation and Educational Effectiveness. Throughout the courses, participants spontaneously demonstrated what appeared to be an intrinsic tendency toward building a collective sense of "we." In post-course questionnaires, as Figure no.5 shows, 247 participants (98,01%) indicated that significant interaction occurred within their groups—212 (84,13%) selecting "Much" and 35 (13,89%) selecting "Fairly" for the statement "There was interaction in the group," with only 5 participants (1,98%) selecting "Neither a little or much."

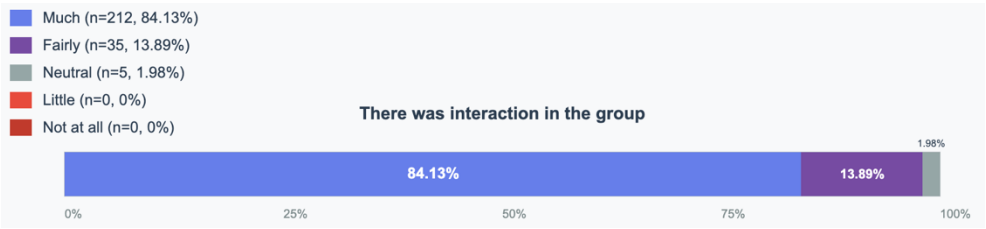

Figure 5. There was interaction in the group?

This strong affirmation of interactive engagement aligns with constructivist learning theories that emphasize knowledge co-construction (Fedeli & Frison, 2018). Similarly, participants reported substantial benefits regarding attentional capacity, with 195 participants (77,38%) selecting “Much” and 51 (20,24%) selecting “Fairly” when asked if “The group activity made it easier for me to raise my attention,” while only 6 (2,38%) selected “Neither a little or much.” Comparable figures emerged for sustained attention (190 selecting “Much,” 56 selecting “Fairly,” and 6 selecting “Neither”). These findings suggest that the socio-relational dimension of HLC functions as an attentional scaffold (Molinari et al., 2022).

From Platform-Centered to Human-Centered Educational Paradigms. The HLC model emphasizes interpersonal relationships as key for participants navigate the complexities of online learning, conceptualizing educational environments as community-grounded ecosystems characterized by knowledge flows and hybrid interactions (Trentin, 2014) that sustain engagement, reduce isolation, and promote active, self-regulated learning trajectories. This reimagining of educational structures as adaptive ecosystems responds directly to the need for pedagogical paradigms that are open, flexible, and inclusive (Molinari et al., 2022). The deliberate emphasis on individual needs and flexibility in organizational aspects (scheduling, group formation) addresses student centrality in ways that purely algorithmic or platform-based approaches cannot. A group member writes in her journal: “After many courses and MOOCs that I've tried in the past, I've realized that my inability to complete them, unless obligated or with great difficulty and doubts about the effectiveness of learning in the end, wasn't entirely my fault. Fundamentally, I understood that I felt somewhat guilty. I thought I was a bad student. Instead, I've come to understand that it takes very little—just doing some bits together—to completely change the scenario.” This testimony illuminates what Garrison and Cleveland-Innes (2005) define as “social presence” in online learning—the transformation from self-attribution of failure toward an ecological understanding of learning as an inherently social phenomenon. The participant's realization resonates with Zimmerman's self-regulation theory, highlighting how socially supportive learning environments can fundamentally recalibrate perceived self-efficacy.

Building Resilience Through Collaborative Learning. The mutual construction of learning experiences within small groups contributes significantly to reinforcing psychological resilience—a critical capacity for navigating the uncertainties of contemporary education. As participants collaboratively processed content, they simultaneously developed adaptive capacities and metacognitive awareness—

essential for lifelong learning—showing how the educational potential of digital mediators fully emerges only when integrated into a complex pedagogical framework oriented toward interactivity and inclusion (Garavaglia & Petti, 2022).

Conclusion: Toward a Pedagogy of Human Intermediation

The P2PU@Unimib project constitutes a methodologically significant contribution to contemporary discourse on hybrid educational practices, demonstrating that well-designed learning ecosystems can simultaneously promote educational equity, enhance learner well-being, and foster adaptability while challenging the artificial dichotomy often presumed between social-emotional and cognitive-achievement dimensions of learning (Immordino-Yang, 2016; Garrison & Cleveland-Innes, 2005). Through careful facilitation and community design, HLCs function as micro-ecosystems in which human mediation prioritizes relationships and adaptability over rigid curricular structures, creating what Vygotsky would recognize as collective zones of proximal development that enable cognitive development exceeding individual achievement potential (Shabani, 2016). The ritual and symbolic dimensions of shared physical space emerge not merely as support mechanisms but as qualitative transformations of the educational experience, with material artifacts and facilitator interventions activating positive interdependence dynamics that accelerate cognitive processes (Thompson, 2007; Rivoltella, 2012). This research evidences the inseparability of theory and practice described by Rivoltella (2021), fusing learners with their learning ecosystem through layered interdependence that reinforces the pedagogical value of emotionally attuned environments in small-group configurations (Garrison & Akyol, 2015). The findings suggest that investment in small-group facilitation significantly enhances digital education quality and inclusivity, a modality recognized for benefiting learners requiring additional support who often experience heightened isolation in purely digital environments (Mitra, 2021; Ryle & Cumming, 2007). While acknowledging technology's limitations alongside its potential (Anderson & Rivera Vargas, 2020), effective learning futures reside in harmonizing asynchronous tool flexibility with human-mediated interactions to ensure holistic educational experiences that counter the reductionist risks of platform pedagogy (Bernsmann & Croll, 2013; Means et al., 2013). These insights open analytical directions warranting investigation: emotional ergonomics examining physical and emotional comfort impacts on learning environments; ritual and symbolic dimensions in creating meaningful educational frameworks; metacognition's role in community awareness of working climate and productivity impact; and evolving

conceptualizations of effectiveness in contemporary learning dynamics (Immordino-Yang & Damasio, 2007; Walton & Cohen, 2011). Ultimately, HLCs represent generative structures supporting cognitive and emotional well-being while offering sustainable models for lifelong learning that bridge asynchronous digital capabilities with essential human connection, positioning hybrid modalities as crucial for creating equitable, effective learning environments that empower academic, social, and emotional thriving in digital-age education (Fedeli & Frison, 2018; Garavaglia & Petti, 2022).

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